RAD 4000 SERIES
SOFTWARE REQUIREMENTS SPECIFICATION

RAD4000 V2.09

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RAD4000 CONTROL AND CONFIGURATION

The operation of each RAD4000 is controlled by sending commands to selected units via the network. The RAD4000 returns data or information over the same network to the requesting client/host.

RAD4000 COMMANDS

This section describes the commands used to control the RAD4000. The RAD4000 software performs the following general tasks:

1) Read and filter the raw A/D counts that represent pressure and temperature.
2) Convert the pressure A/D counts to user chosen pressure units.
3) Receive and execute commands via the Ethernet or Serial.
4) Output converted data, status, setup and calibration data over the Ethernet or Serial outputs.

NOTES: When an RAD4000 module is in a “not ready” mode, all commands are disabled except STATUS and STOP.
When a communications variable is modified, the RAD4000 system computer must be restarted, in order for the changes to take effect.

COMMAND FORMAT

Each of the commands are explained with the following sections: command, syntax, arguments, description, and returns.

COMMAND lists the name of the command.
SYNTAX lists the format of the command. The following conventions are used:

BP	Boldface letters indicate command keywords and operators. Within the discussion of syntax, bold type indicates that the text must be entered exactly as shown.
expression	Words in italics indicate place holders for information you must supply, or information returned by the calibrator, such as a coefficient name or pressure data.
[/H]	Items in square brackets are optional.
,	Commas separate options, only one of the options may be used.
<CR>	Items in angle brackets are used for names of keys on a typical keyboard. The carriage-return key, sometimes marked as a bent arrow, Enter, or Return on the key board, is called <CR>.

Spaces, as used in the syntax, are entered as spaces.
DESCRIPTION describes the function of the command.
RETURNS lists the format of the information that the unit returns to the host.
A **PROMPT (>)** will be output when the RAD4000 is ready to accept a command.

TCP/IP does not guarantee that packet boundaries will be maintained between a Host and a RAD4000 module. **ALL** commands from a Host **MUST** be terminated properly with CR-LF (ASCII 13 - ASCII 10).

Scanivalve DSP Boot Loader

The Scanivalve DSP Boot Loader loads the RAD4000.hex file from PROM to RAM at bootup. The boot loader also allows a user to easily update the RAD4000 application. The boot loader runs an FTP server. It has been tested with Fire Fox FTP, Windows Explorer, Windows Command Line FTP client, and Linux FTP client.

Any additional file transfer protocols or additional FTP client support modification will be made solely to the application.

FTP Server

The FTP server supports the following FTP commands prior to login:

USER	Allows the user to enter a user name. Anonymous is allowed.
PASS	Allows the user to enter a password.
QUIT	Disconnects from the FTP server.

The FTP server supports the following FTP commands prior to login after login:

RETR	Initiates a file transfer from the RAD4000 to the host.
STOR	Initiates a file transfer from the host to the RAD4000.
PASV	Sets up data port so a client can connect to server port.
LIST	Returns a directory listing of the files stored on the enclosure
SIZE	Returns the size of the file in bytes.
DELE	Deletes the file.
NOOP	No operation. Mostly used by the client as an “are you still there” command.
TYPE	[A, B or I] accepts the command, but only TYPE A is supported
PORT	Set active FTP data port
NLST	Same as LIST
PWD	Returns the current working directory
XPWD	Same as PWD
CWD	Changes working directory NOTE: This command changes the directory that is returned in PWD, but no actual directory is changed. Sub directories are not supported.
XCWD	Same as CWD

Only ASCII type of transfer is supported. Passive and Active data connections are supported. This allows data to be transferred without the server initiating a connection to the client. This will minimize problems from firewalls.

Boot Loader and Application File System

Filenames are limited to the 8.3 format with no spaces allowed. Only one drive is supported. Because the Enclosure does not have a time and date clock, all files created by the enclosure will have a date of Aug 8, 2008, unless NTP is enabled. No subdirectories are supported, however, if a file path is included in the file specification only the file name portion is used. The file will be written in the root directory of the drive. The disk drive will hold a maximum of 1024 files, or 2GB of data.

Boot Loader Commands and Configuration Variables

When a command is complete, the prompt character, the greater than character “>”, is output proceeded by a carriage return and line feed.
The commands listed below are supported by the boot loader and the executable program. Unless otherwise noted, they may be viewed and modified in the RAD40004000 executable program. Commands and variables noted as boot loader only will not be documented in this manual.

NOTE: Under normal operation, a user will not have access to the Boot Loader Program

VER	Returns the version of the Boot Loader **NOTE**: This command is available in the boot loader only. It should not be confused with the VER command in the application.
FORMAT	Formats the SD Flash to all 0’s **NOTE**: This command is available in the boot loader only.
LIST IP	Returns the settings of the IP group. This command and the configuration variables in this group are described in detail in another section of this manual.
SET <parameter>	Sets the indicated parameter
IPADD <IP address>	Sets the IP address of the enclosure. If the IPADD is changed, the power must be cycled to take effect.
SUBNET <mask>	Sets the subnet address of the enclosure. If the SUBNET is changed, the power must be cycled to take effect.
MAC <MAC address>	Sets the MAC address for the enclosure. If the MAC is changed, the power must be cycled to take effect. **NOTE**: This command **MUST NOT** be modified
LOGIN <user name>	Sets the user name for FTP login.
PASSWORD <password>	Sets the password associated for LOGIN
LOGIN1 <user name>	Sets the user name 1 for FTP login.
PASSWORD1 <password>	Sets the password associated for LOGIN name1
APP <application file name>	Sets the file name of the application to run. This is the file name that is used when automatically running the application from the boot loader. It is also the file name used when using the RUN command. If this file is not found an error is returned.
GW <IP Address>	This IP address will be used to access the NTP Server if the IPNTP address setting is an IP address outside the RAD Subnet.
SAVE [<file name>]	Saves the configuration variables to the working directory. When an optional file name is entered, it saves the IP group settings to that file name.
TYPE <file name>	Lists the contents of the named file.
LOAD <file name>	Loads the named file into the LIST IP configuration variables.
DIR	Lists the files on the Micro SD card.
DEL<file name>	Deletes the named name from the Micro SD card
DIP	Reads and shows the settings of the DIP switch. The following is returned: DIPsettings Auto Run Application 0 Debug 0 No Serial Host 0 Spare 0 1 indicates on. 0 indicates off **NOTE:** This command is available in the boot loader only.
RUN	Runs the application named in the APP variable. **NOTE:** This command is available in the boot loader only.

RAD4000 COMMAND LIST

COMMAND **A/D CALIBRATION**

SYNTAX **A2DTCAL <*module*> <*t index*> <*point index*> <*voltage*> <CR>**

ARGUMENTS

module	-	The A/D module being calibrated. 0 is the RADBASE, 1 to 8 indicate pressure A/D's.
t index	-	The temperature index, 0 through 7
point index	-	the Calibration point, 0 through 15, for a t index
voltage	-	the applied calibration voltage

DESCRIPTION

This command is used to produce the voltage correction table for a temperature compensated A/D. Although 16 points may be applied at each temperature index, a user may use as few as three points.

RETURNS

<*nl*>

nl	-	end of line

EXAMPLE

To calibrate a temperature compensated A/D module installed in position 1, apply a series of voltages. The entries may be as follows:

```
A2DTCAL 1 1 0 0.0000
A2DTCAL 1 1 1 0.5000
A2DTCAL 1 1 2 1.0000
A2DTCAL 1 1 3 1.5000
A2DTCAL 1 1 4 2.0000
A2DTCAL 1 1 5 2.5000
```

NOTE

This command will only generate the correction table. It does not convert the table to a set of coefficients. Coefficients are generated by the A2DTCALC command and written to the A/D module using the IDPWRITE command.

COMMAND **A/D COEFFICIENT CALCULATION**

SYNTAX **A2DTCALC <*module*> <*number of temp planes*> <*number of points* <CR>**

ARGUMENTS

module - The A/D module being calibrated. 0 is the RADBASE, 1 to 8 indicate pressure A/D's.

index - the Calibration point, 0 through 15

voltage - the applied calibration voltage

DESCRIPTION This command is used to produce the voltage correction coefficients for a temperature compensated A/D. Although 16 points may be applied, a user may use as few as three points.

RETURNS <mod> <ac> <bc> <cc><*nl*>

mod - The A/D module, 0 to 8, where 0 is the RADBase and 1 to 8 corresponds to the A/D modules

ac - The A coefficient in the polynomial

bc - The B coefficient in the polynomial

cc - The C coefficient in the polynomial

nl - end of line

EXAMPLE A series of voltages have been applied using the A2DCAL command. To generate the third order polynomial for the A/D correction for module 1,

Type: A2DTCALC 1 6

The RAD software will calculate the polynomial coefficients and return them. They will not be written to the ID chip until IDPWRITE and IDPCONFIRM commands have been executed.

NOTE This command will only generate the correction coefficients. Coefficients are written to the A/D module ID chip using the IDPWRITE command.

COMMAND **BANK A MODE**
SYNTAX **BANKA <CR>**

ARGUMENTS None

DESCRIPTION Commands the RAD4000 to switch the DOUTs set in the configuration variable: BANKA. This command is intended for use with ZOC22, 23, and 33 modules but could be used in any situation where DOUT settings must be changed quickly.

RETURNS <*nl*>
nl - end of line

EXAMPLE To switch the valves in a ZOC 22, 23, or 33 to measure the pressures applied to the Bank A inputs:
Enter the command:

BANKA

The RAD4000 will switch the outputs based on the setting of the configuration variable: BANKA. This command assumes that the configuration variable is set correctly.

COMMAND **BANK B MODE**
SYNTAX **BANKB <CR>**

ARGUMENTS None

DESCRIPTION Commands the RAD4000 to switch the DOUTs set in the configuration variable: BANKB. This command is intended for use with ZOC22, 23, and 33 modules but could be used in any situation where DOUT settings must be changed quickly.

RETURNS <*nl*>
nl - end of line

EXAMPLE To switch the valves in a ZOC 22, 23, or 33 to measure the pressures applied to the Bank B inputs:
Enter the command:

BANKB

The RAD4000 will switch the outputs based on the setting of the configuration variable: BANKB. This command assumes that the configuration variable is set correctly.

COMMAND **BANK USER MODE**
SYNTAX **BANKUSR <CR>**

ARGUMENTS None

DESCRIPTION Commands the RAD4000 to switch the DOUTs set in the configuration variable: BANKUSR. This command is intended for use with ZOC22, 23, and 33 modules but could be used in any situation where DOUT settings must be changed quickly.

RETURNS <*nl*>
nl - end of line

EXAMPLE To switch the valves in a ZOC 22, 23, or 33 to a special mode of operation as defined in the configuration variable BANKUSR:
Enter the command:

BANKUSR

The RAD4000 will switch the outputs based on the setting of the configuration variable: BANKUSR. This command assumes that the configuration variable is set correctly.

COMMAND **BOOTLOADER VERSION**
SYNTAX **BLVER** <CR>

ARGUMENTS none

DESCRIPTION Requests the version number of the Rad4000 Bootloader.

RETURNS Bootloader Version: <*version string*> <*nl*>

EXAMPLE To determine the version of Rad4000 Bootloader software in use:
Type: BLVER<CR>

The RAD4000 will return:
Bootloader Version: 2.02

NOTES **This command will not return a version string for Bootloader versions 2.01 or older.**

This command is not active in RAD4000 software versions 2.01 or older.

COMMAND **CALIBRATE INSERT**
SYNTAX **CALINS <*press*> <*channels*>**<CR>

ARGUMENTS <*press*> - a real number that represents the calibration pressure for this point.
<*channels*> - combination of: module-port for one channel; or:
module-port,module-port for multiple modules; or
module-port...module-port for a range of modules.
Module is the physical location of the module in the system
Port is a single pressure sample point within a module.

DESCRIPTION This command reads one averaged frame of pressure and temperature counts and stores the information in memory in the INSERT format shown in the CALIBRATE Command. **NOTE:** The RAD4000 does not control the calibration. It will only read the information when commanded.

RETURNS <*nl*> - end of line

When this command returns the prompt, a SAVE command must be issued. The RAD4000 will insert the stored data in the Module Profile Files.

EXAMPLE If a user wanted to calibrate a module connected to A/D position 3 at 15 psi:

Apply CTL1 and CTL2 Control pressures
Connect a pressure standard to the CAL input.
Enter the command:

CALINS 15 3-1..3-32<CR>

The RAD4000 will measure the counts for each channel and write the new master plane information into memory.

COMMAND **CALIBRATE ZERO**
SYNTAX **CALZ <CR>**

ARGUMENTS None

DESCRIPTION Commands the RAD4000 to perform a zero calibration. This operation produces A/D count values for each pressure channel that is subtracted from the raw pressure counts before conversion to the engineering units. The data are stored in a Zero Array and a Delta Array. These values may be read by executing a ZERO or DELTA command. This command places the RAD4000 in the CALZ Mode until the command is completed or a STOP command is issued. CALZ requires approximately 15 seconds to complete.

RETURNS <*nl*>
nl - end of line

EXAMPLE To update the current ZERO file and correct for any zero drift of the transducers:
Enter the command:

CALZ

The RAD4000 will measure the zero counts for each channel and update the Zero and Delta Arrays. The RAD4000 will write the information into the file, ZERO.CFG when a SAVE Command is executed.

NOTE It is very important that a user execute a CALZ after the RAD4000 and ZOC modules have been allowed to stabilize after power up. Also a CALZ should be executed if power is cycled, or if a RESTART command is executed.

COMMAND **CHANNEL**
SYNTAX **CHAN <*scan group*>** <CR>

ARGUMENTS <*scan group*> - the number 1, the only active scan group number.

DESCRIPTION This command outputs the channel configuration for the scan group entered in the argument.

RETURNS CHAN: <group><sequence><mod><*port*><lpress> <hpress><numchan><eu><*nll*>

group	- the scan group, 1
sequence	- the scan port number
mod	- the module number
port	- the port number in the module
lpress	- the minimum pressure value
hpress	- the maximum pressure value
numchan	- the number of channels in the module
eu	- the eu conversion setting, 0 = raw counts, 1 = EU
nl	- end of line

EXAMPLE To verify the which channels have been assigned to SCAN GROUP 1:

Type:
CHAN 1 <CR>
The RAD4000 will return:

```
CHAN: 1 1 1 1 -6.100000 6.100000 32 1
CHAN: 1 2 1 2 -6.100000 6.100000 32 1
CHAN: 1 3 1 3 -6.100000 6.100000 32 1
CHAN: 1 4 1 4 -6.100000 6.100000 32 1
CHAN: 1 5 1 5 -6.100000 6.100000 32 1
CHAN: 1 6 1 6 -6.100000 6.100000 32 1
CHAN: 1 7 1 7 -6.100000 6.100000 32 1
CHAN: 1 8 1 8 -6.100000 6.100000 32 1
CHAN: 1 9 1 9 -6.100000 6.100000 32 1
CHAN: 1 10 1 10 -6.100000 6.100000 32 1
 :: ::  : : : : : :: :: :: ::  : :
CHAN: 1 31 1 31 -6.100000 6.100000 32 1
CHAN: 1 32 1 32 -6.100000 6.100000 32 1
>
```

This shows that all 32 ports of a 32 channel module have been assigned in sequence to Scan Group 1. The module is connected to input one. The minimum full scale pressure value is -6.1 engineering units. The maximum pressure value is 6.1 engineering units. The output data will be in engineering units

COMMAND **CLEAR**
SYNTAX **CLEAR**<CR>

ARGUMENTS None

DESCRIPTION Commands the RAD4000 to clear any errors that have occurred. The errors are sent to the client in response to a ERROR command.

RETURNS <*nl*>
nl - end of line.

EXAMPLE To clear any errors listed in the ERROR Buffer, the following command would be issued:

CLEAR <CR>

The ERROR buffer will be cleared

NOTE **Errors are not stored in Versions 1.00 through 1.03**

COMMAND **CLEAR ACCUMULATED ERROR BUFFER**
SYNTAX **CLEARERROR**<CR>

ARGUMENTS None

DESCRIPTION Commands the RAD4000 to clear the Accumulated Error Buffer. This buffer is not the same as the standard error buffer. Refer to the description of the Accumulated Error Buffer for more information.

RETURNS <*nl*>
nl - end of line.

EXAMPLE To clear any errors listed in the ACCUMULATED ERROR Buffer, the following command would be issued:

CLEARERROR <CR>

The ACCUMULATED ERROR buffer will be cleared

NOTES **This command is not active in RAD4000 software versions 2.01 or older**.

COMMAND **CONTROL PRESSURE RESET**
SYNTAX **DOUTPU**<CR>

ARGUMENTS *none*.

DESCRIPTION Resets the control pressures to the power up condition. This will reset control pressures if the BANKA, BANKB, and BANKUSR commands are used to modify control pressure settings from the power up condition. This also will reset DOUTS that have manually set. Scanivalve Corp recommends that all ZOC22, ZOC23, and ZOC33 modules have all control pressures removed if the modules will be powered on for a long time.

RETURNS <*nl*>
nl - end of line.

EXAMPLE To reset the control pressures to the power up mode after several operations of the BANK(x) commands, Type:

DOUTPU<Enter>

COMMAND **DELETE**
SYNTAX **DELETE <*start temp*><*end temp*>[<*channels*>]**<CR>

ARGUMENTS
<*start temp*> - an integer from 0 to 69 that represents the low point of the temperature planes to be deleted.
<end temp> - an integer from 0 to 69 that represents the high point of the temperature planes to be deleted.
[<channels>] - optional, a channel to be deleted. This may be in the format:
module-port or *serial number-port* for a single module.
module-port..module-port or *serial number-port..serial number-port* for a range of channels

DESCRIPTION Converts all pressure points within temperature planes between the low and high temperature range, inclusive, to "calculated". This allows new MASTER points to be entered via the INSERT command.

RETURNS <*nl*>
nl - end of line.

EXAMPLE To delete the master points for all modules in a system using eight 32 channel modules, the following command would be issued:

DELETE 0 69 1-1..8-32<CR>

To delete the master points for channels 49 through 56 in a ZOC33 connected to input six, the following command would be issued:

DELETE 0 69 6-49..6-56<CR>

To delete the master points for channel 3 in a ZOC17 connected to input four, the following command would be issued:

DELETE 0 69 4-3<CR>

COMMAND **DELTA**
SYNTAX **DELTA <*module*>**<CR>

ARGUMENTS <*module*> - the module position 1 through 8.

DESCRIPTION Lists the active delta zero correction values that resulted from a CALIBRATE ZERO. These values are used in the conversion of raw counts to Engineering Units (EU). These variables can only be set by executing a CALIBRATE ZERO command. If a module number is not entered, the DELTA values for all active modules are listed.

RETURNS DELTA: <*channel*> <*value*> <*nl*>
DELTA: <*channel*> <*value*> <*nl*>
: : : :
DELTA: <*channel*> <*value*> <*nl*>

channel - the channel in module-port format
value - the zero correction values
nl - end of line.

EXAMPLE To view the DELTA values for the module connected to input one:
Type: DELTA 1<CR>
The RAD4000 will return the current delta values

```
DELTA: 1-1 40
DELTA: 1-2 38
DELTA: 1-3 29
DELTA: 1-4 31
 ::  ::   ::  ::
DELTA: 1-10 34
DELTA: 1-11 35
DELTA: 1-12 27
 ::  ::   ::  ::
DELTA: 1-29 30
DELTA: 1-30 29
DELTA: 1-31 20
DELTA: 1-32 29
>
```

NOTES Delta values are the difference between the current CALZ zero value and the zero value stored in the calibration coefficients. The values tend to be low when a module has been recently calibrated and increase slowly over time as the sensors drift.

It is very important that a user execute a CALZ after the RAD4000 and ZOC modules have been allowed to stabilize after power up. Also a CALZ should be executed if power is cycled, or if a RESTART command is executed.

The Zero and Delta Arrays are cleared when the RAD4000 is powered down or when a RESTART command is executed. The data in the ZERO.cfg file is intended to be historical data. The Zero and Delta values are not reloaded at power up or restart because it is impossible to determine how long the power has been off. This also is designed to insure that a new set of zeros is acquired if modules have been switched.

COMMAND **DOUT**
SYNTAX **DOUT *<discrete channel>*<*status*>**<CR>

ARGUMENTS *<discrete channel>* - a Digital Output channel 1 through 64.
<status> - 1 = On
0 = Off

DESCRIPTION Commands the Discrete Output channel on or off.

RETURNS *<nl>*
nl - end of line.

NOTE The DOUT channels correspond to a channel in an RDS3200 module. If the corresponding RDS module is not installed, an error will be reported. For more information on the operation of the RDS module, please refer to the hardware manual.

EXAMPLE In this example, digital output channel 1(RDS number 1, channel 1 in address location 9) will be energized:

DOUT 1 1 <CR>

In this example, digital output channel 11 (RDS number 2 channel 3 in address location 10)will be de-energized.

DOUT 11 0 <CR>

DOUT Channel Assignments

Position	Channels
9	1 - 8
10	9 - 16
11	17 - 24
12	25 - 32
13	33 - 40
14	41 - 48
15	49 - 56
16	57 - 64

COMMAND **ERROR**
SYNTAX **ERROR** <CR>

ARGUMENTS None

DESCRIPTION Lists the errors that have occurred since the last CLEAR. Only the first 80 errors will be listed. If more than 80 errors have occurred, the message: “ERROR: Max errors exceeded" will appear at the end of the list.

RETURNS ERROR: <*error message*><*nl*>
ERROR: <*error message*><*nl*>
: : : :
ERROR: <*error message*><*nl*>

error message - an error message shown in the error list.
nl - end of line.

EXAMPLE To read the contents of the Error Buffer:
Type: ERROR

The RAD4000 will return the last 30 errors in the format::
ERROR: Module or Port not found
ERROR: List MI no group number
ERROR: Group not between 1 and 8

If no errors have been logged, the RAD4000 will return:
ERROR: No errors

NOTE The Error Buffer is only updated if the configuration variable: IFUSER , is set to 0. When IFUSER is set to 1, errors will be displayed as they occur.

NOTE2 This is not supported in Versions 1.00 through 1.03

COMMAND **FILE**
SYNTAX **FILE *<filename>*** <CR>

ARGUMENTS <*filename*> - The file to be opened. The file must be on the MicroSD card.

DESCRIPTION Opens the named file. It is assumed that this file will be a series of SET commands. This command will not support commands such as CALZ unless it is the only command in the file. The FILE command is not a Macro function, that is, it will execute each command in the file in order without waiting for each command to be completed.

RETURNS <*nl*>
nl - end of line.

EXAMPLE A startup command list may be sent to the ERAD4000. A file: scan.cmd may contain the commands:

```
SET FPS1 1
SCAN
```

The file: scan.cmd is located in the DSM folder. To execute the file,
Type: FILE scan.cmd<CR>

NOTES **This command is not active in RAD4000 software versions 2.01 or older**.

The file naming format must conform to the DOS standard format:
xxxxxxxx.yyy

COMMAND **FILL**
SYNTAX **FILL** <CR>

ARGUMENTS None

DESCRIPTION Sorts Fills the Conversion Table temperature planes in ascending order.
The method used to FILL the conversion tables is determined by the setting of the variable: FILLONE. This variable is in the Conversion Group.

If FILLONE is set to zero, the FILL command will fill the conversion tables by calculating the temperature planes between Master Planes.

If FILLONE is set to one, the FILL command will copy the data in the first Master Plane encountered to all other planes. If a second Master Plane is encountered, the FILL will be terminated, and an error will be logged.

RETURNS <*nl*>
nl end of line.

EXAMPLE In this example, new MASTER points have been loaded and the coefficient table must be completed.

Type: FILL<CR>

The FILL command only needs to be used if MASTER points are added to, or deleted from the coefficients and the program is not restarted. When the program is started, restarted, or reloaded, The MASTER points are loaded into memory from the Module Profile Files and a FILL is executed by the program.

COMMAND **GET ACCUMULATED ERRORS**
SYNTAX **GETERROR** [file name on FTP server]<CR>

ARGUMENTS None

DESCRIPTION Lists the accumulated errors that have occurred since the last CLEARERROR and the number of occurances for each of these errors. Accumulated errors are a limited number of errors that might have an effect on the data. The Errors are:
Module M temperature below 0 degrees C
Module M temperature above 69 degrees C
A/D temperature above 69 degrees C
A/D temperature below 0 degrees C
FTP Server Connection Retries

File name on the FTP server is the file where the errors will be written.
If file name on FTP server is left blank, the errors will be written to the host screen.

The error count will accumulate until the accumulated buffer is cleared with the CLEARERROR command.

RETURNS ERROR: <Error Message> occurrences <*count*><*nl*>
ERROR: <Error Message> occurrences <*count*><*nl*>
ERROR: <Error Message> occurrences <*count*><*nl*>
ERROR: <Error Message> occurrences <*count*><*nl*>

Error message - an error message shown in the description above.
Count - The number of occurrences
nl - end of line.

EXAMPLE1 To read the contents of the Accumulated Error Buffer:
Type: GETERROR

The RAD4000 will return any of the errors listed above that might have occurred.
ERROR: Module 1 temperature below 0 degrees C occurrences 9
ERROR: A/D temperature below 0 degrees C occurrences 5

If no errors have been logged, the RAD4000 will return:
>

EXAMPLE2 To write the contents of the Accumulated Error Buffer to a file on the FTP server:
Type: GETERROR error.log

The RAD4000 will write the contents of the Accumulated Error buffer to the file:
Error.log
on the FTP Server.

COMMAND **INSERT**

SYNTAX **INSERT *<temp><channel><press><press counts>* M**<CR>

ARGUMENTS

<temp> - an integer from 0 to 69 that represents the temperature in degrees Celsius.

<*channel*> a combination of *module* and *port*. Syntax is:
module-port or *serial number-port* for one channel.

<press> a real number that represents the calibration pressure point.

<press counts> a signed integer from 32767 to -32768 that represents the current pressure counts from the sensor.

DESCRIPTION

Inserts one pressure-pressure counts entry into the Correction Table. Only master points are accepted.

The LIST MASTER and LIST ALL commands download the contents of the conversion table in the format required by this INSERT command.

If a MASTER plane is overwritten, an error will be generated.

RETURNS

<*nl*>

nl - End of line.

EXAMPLE

Although INSERT commands are most often entered from a Module Profile File, they may be entered from a keyboard.

The following command will insert a master point at 30.5°C for channel 1 of the module installed in position 3. The applied pressure is 11.9998 psi, the measured counts are 26376.

INSERT 30.50 3-1 11.9998 26376 M

The following command will insert a master point at 48.75°C for channel 59 of the module installed in position 3. The applied pressure is 10.9998 psi, the measured counts are 20254.

INSERT 48.75 3-59 10.9998 20254 M

The following command will insert a master point at 43.75°C for channel 26 of module serial number 209. The applied pressure is -2.4864 psi, the measured counts are -6651.

INSERT 43.75 209-26 -2.4864 -6651 M

COMMAND **LIST A/D CORRECTION TABLE**
SYNTAX **LIST A2DTCOR *<module>* *<temp>*** <CR>

ARGUMENTS
<module> - The A/D location, 0 to 8. Where 0 is the temperature A/D and 1 to 8 are the module locations.
<t index> - The temperature index, 0 to 7

DESCRIPTION Lists the correction coefficients for the A/D in the specified location.

RETURNS A2DTCOR <module> <t index> <temp><p index> <voltage> <counts><ideal counts>

module	-	0 to 8, Where 0 is the temperature A/D in the RADBASE and 1 to 8 are the module A/D's.
t index	-	the calibration point, each module may have up to 8 points. Each of these points may have up to 16 correction points.
temp	-	The actual temperature of the index point, read from the ID chip.
p index	-	Index point, 0 through 16 where the applied voltage, measured counts and ideal counts are read.
voltage	-	the voltage applied at the p index calibration point.
counts	-	the A/D counts measured at the p index calibration point
ideal counts	-	the ideal counts at the p index point at the applied voltage, based on the formula:

$$\frac{AppliedVolts \times 2.852}{10} \times 32767$$

EXAMPLE To list the coefficients for the A/D converter in A/D module 1:

Type: LIST A2DTCOR 1 1<CR>

The RAD will return:

```
A2DTCOR 1 25 0.000000 0 0.000000 0 0
A2DTCOR 1 25 0.000000 1 0.000000 0 0
A2DTCOR 1 25 0.000000 2 0.000000 0 0
A2DTCOR 1 25 0.000000 3 0.000000 0 0
A2DTCOR 1 25 0.000000 4 0.000000 0 0
A2DTCOR 1 25 0.000000 5 0.000000 0 0
A2DTCOR 1 25 0.000000 6 0.000000 0 0
A2DTCOR 1 25 0.000000 7 0.000000 0 0
A2DTCOR 1 25 0.000000 8 0.000000 0 0
A2DTCOR 1 25 0.000000 9 0.000000 0 0
A2DTCOR 1 25 0.000000 10 0.000000 0 0
A2DTCOR 1 25 0.000000 11 0.000000 0 0
A2DTCOR 1 25 0.000000 12 0.000000 0 0
A2DTCOR 1 25 0.000000 13 0.000000 0 0
A2DTCOR 1 25 0.000000 14 0.000000 0 0
A2DTCOR 1 25 0.000000 15 0.000000 0 0
```

COMMAND **LIST ALL CONVERSION COEFFICIENTS**

SYNTAX **LIST A <*start temp*> <*end temp*> <*channels*>**<CR>

ARGUMENTS
<*start temp*> - The lowest temp plane to be returned.
<*end temp*> - The highest temp plane to be returned.
<*channels*> - a combination of *module* and a *port*. Syntax is:
module-port or *Serial number-port* for one channel

DESCRIPTION Lists all of the master and calculated points in the temperature-pressure correction matrix. This command places the RAD4000 in the LIST mode until the command is completed or a STOP command is issued.

RETURNS
INSERT <*temp*><*channel*><*press*><*press counts*><M or C><*nl*>
INSERT <*temp*><*channel*><*press*><*press counts*><M or C><*nl*>
: : : :
INSERT <*temp*><*channel*><*press*><*press counts*><M or C><*nl*>

temp - the temperature plane
channel - the channel in module-port notation
press - the pressure in EU
press counts - the A/D counts of pressure
M - a Master Plane generated from a calibration
C - a Calculated Plane generated by the software
nl - end of line.

NOTE **The LIST A and LIST M commands are identical in RAD4000 firmware**

EXAMPLE To list all of the coefficients from 16°C to 20°C for channel 1 in a module calibrated from 17°C to 40°C

Type: LIST a 16 20 1-1<CR>

The RAD4000 will return a list of INSERT commands showing the temperature, channel, applied pressure, and counts

.

```
INSERT 16.00 1-1 0.000000 0 C
INSERT 16.00 1-1 19.000000 0 C
INSERT 16.00 1-1 25.000000 0 C
:: :: :: :: :: :: :: : :
INSERT 17.00 1-1 -45.949100 -26184 M
INSERT 17.00 1-1 -31.250000 -17763 C
INSERT 17.00 1-1 -19.969601 -11302 M
INSERT 17.00 1-1 -6.250000 -3425 C
INSERT 17.00 1-1 0.000000 162 M
INSERT 17.00 1-1 19.984600 11636 M
INSERT 17.00 1-1 25.000000 14523 C
INSERT 17.00 1-1 35.000000 20281 C
INSERT 17.00 1-1 45.949100 26586 M
:: :: :: :: :: :: :: :: :: ::
INSERT 20.00 1-1 -45.949100 -26166 C
INSERT 20.00 1-1 -31.250000 -17750 C
INSERT 20.00 1-1 -19.969601 -11292 C
INSERT 20.00 1-1 -6.250000 -3424 C
INSERT 20.00 1-1 0.000000 160 C
INSERT 20.00 1-1 19.984600 11629 C
INSERT 20.00 1-1 25.000000 14514 C
INSERT 20.00 1-1 35.000000 20267 C
```

COMMAND **LIST BOOT LOADER GROUP VARIABLES**
SYNTAX **LIST IP** <CR>

ARGUMENTS None

DESCRIPTION Lists the Identification configuration variables from Group IP.

RETURNS SET <*variable*> <*value*> <*nl*>
SET <*variable*> <*value*> <*nl*>
: : : :
SET <*variable*> <*value*> <*nl*>
variable the configuration variable name
value the current setting
nl end of line.

EXAMPLE To view the current Boot Loader Group Variables settings:

Type: LIST IP<CR>

The RAD4000 will return the current boot loader variable settings. They could appear as follows.

SET IPADD 191.30.140.104
SET SUBNET 255.255.0.0
SET MAC 000.096.093.400.000.103
SET LOGIN Scanivalve
SET PASSWORD Scanner
SET LOGIN1 Scanivalve1
SET PASSWORD1 Scanner1
SET ALLOWANON 1
SET APP Rad4000.hex
SET GW 10.0.0.1

NOTE1: Modifications to the variables in this group may result in one or more of the following conditions:

1. Unstable network operation.
2. Problems completing FTP file transfers.
3. Enclosure operational problems

NOTE2: The variables in this group are not saved when a SAVE command is issued. They may only be saved by using the SAVEIP command.

COMMAND **LIST CALIBRATION VARIABLES**
SYNTAX **LIST C** <CR>

ARGUMENTS None

DESCRIPTION Lists the Conversion configuration variables from Group C.

RETURNS SET <*variable*> <*value*> <*nl*>
: : : :
SET <*variable*> <*value*> <*nl*>
variable - the configuration variable name
value - the current setting
nl> - end of line.

EXAMPLE To view the current conversion variable settings:

Type: LIST C<CR>

The RAD4000 will return the current conversion settings. They could appear as follows.

```
SET ZC 1
SET UNITSCAN psi
SET CVTUNIT 1.000000
SET BIN 0
SET EU 1
SET CALZDLY 5
SET MPBS 0
SET CALPER 500
SET CALAVG 32
SET MAXEU 9999.00
SET MINEU -9999.00
SET STARTCALZ 0
SET FILLONE 0
SET A2DCOR 1
>
```

For more information, refer to the Conversion Variable information in this manual.

COMMAND **LIST DIGITAL VARIABLES**
SYNTAX **LIST D** <CR>

ARGUMENTS None

DESCRIPTION Lists the Digital Configuration variables from Group D.

RETURNS SET <*variable*> <*value*> <*nl*>
SET <*variable*> <*value*> <*nl*>
: : : :
SET <*variable*> <*value*> <*nl*>

variable - the configuration variable name
value - the current setting
nl - end of line.

EXAMPLE To view the current digital variable settings:

Type: LIST D<CR>

The RAD4000 will return the current digital settings. They could appear as follows.

SET DOUTPU 5
SET DOUTCALZ e
SET DOUTPGSEQ 0
SET DOUTPG 0
SET DOUTSCAN 20
SET DLYPGSEQ 1
SET DLYPG 10
SET DOUTREADY 40
SET BANKA 0
SET BANKB 0
SET BANKUSR 0

COMMAND **LIST FILES**
SYNTAX **DIRFILE** <CR>

ARGUMENTS None

DESCRIPTION Lists the data files stored In the RAD4000 folder on the RAD4000 system computer hard disk drive.

RETURNS <*filename*> <*nl*>
: : : :
<*filename*> <*nl*>
<*nl*>

filename - The data file name
nl - end of line.

EXAMPLE To list all data files stored on the RAD4000 system computer hard disk drive:

Type: DIRFILE<CR>

The RAD4000 will return a file list

lp.cfg	221
Rad4000.hex	525008
M351.MPF	177912
Sn.gpf	105
CV.GPF	870
Zero.cfg	2022
Nas.cfg	172
SSN.CFG	3

COMMAND **LIST GAIN VARIABLES**
SYNTAX **LIST G <*module*>** <CR>

ARGUMENTS None

DESCRIPTION Lists the active temperature gain set for the module from the Temperature Gain Group, Group G. Module may be the position or the serial number. These data are used to convert temperature counts to degrees Celsius. This is the "M" term in the temperature characterization equation. The value of this term will vary based on the module type. Refer to the section on Temperature Gain Values in the Configuration Variable Section of this manual for more information on the values for the “M” terms.

RETURNS SET TEMPMn <*value*><*nl*>
n - The module position or the serial number
value - The temperature gain value for module n
nl - end of line.

EXAMPLE To verify the temperature gain setting for the module serial number 253,

Type: LIST g 253<CR>

The RAD4000 will return:

SET TEMPM253 0.0228

The gain settings may also be verified by module location. To verify the temperature gain setting of the module connected to input 6,

Type: LIST g 6<CR>

The RAD4000 will return:

SET TEMPM6 0.0228

The temperature gain settings may be verified for all modules connected to the RAD4000.

Type: LIST g<CR>

The RAD4000 may return:

SET TEMPM1 0.037058
SET TEMPM2 0.037058
SET TEMPM3 0.037058
SET TEMPM4 0.037058
SET TEMPM5 0.037058
SET TEMPM6 0.037058
SET TEMPM7 0.037058
SET TEMPM8 0.037058
>

COMMAND **LIST ID CHIP IDENTIFICATION**

SYNTAX **LIST ID [<loc> <site> <device>]** <CR>

ARGUMENTS

<loc>	the ID chip location, 0 to 16	
<site>	the location type, Where:	A = A/D module
		M = ZOC module
		D = Digital Module (RDS)
<device>	must be E for EPROM	

DESCRIPTION Lists the ID chip identification information. DSA3016 modules may only be site 1 through 8. A/D modules may be sites 0 through 8 where the Temperature A/D module can only be site 0. Digital modules are site 9.

RETURNS <index> <loc> <site> <device> <ID> <error>

index	Line number, used for reference only	
loc	the ID chip location, 0 to 16	
site	the location type, Where:	A = A/D module
		M = ZOC module
		D = Digital Module
device	E = EPROM	
	T = Temp	
	S = Switch	
ID	the chip ID number - This number is unique for each ID chip.	
error	any error that may have occurred	

EXAMPLE 1 To view all of the ID information of a RAD4000 with 2 A/D modules, an RDS, and a ZOC module installed in position 1:

Type: LIST ID<CR>

The DSAENCL may return:

```
0 1 A T 28644c340000008f None
1 0 A T 286e4c3400000040 None
2 0 A T 28cddb460000000c None
3 1 A E 14ca251e010000f3 None
4 0 A E 142e8e1e01000045 None
5 1 M E 147524ef00000048 None
6 2 A T 28b1de460000003b None
7 2 A E 14e9251e0100001c None
8 9 D E 14ee241e01000054 None
```

EXAMPLE 2 To view the ID information of the ZOC module in location 1

Type: LIST ID 1 M E

The RAD4000 may return:

```
5 1 M E 147524ef00000048 None
```

EXAMPLE 3 To view the ID information of the A/D module in location 2

Type: LIST ID 2 A E

The RAD4000 may return:

```
7 2 A E 14e9251e0100001c None
```

EXAMPLE 4 To View the ID information of a typical RAD4000

Type: LIST ID

The Enclosure may return:

```
0 1 A T 28644c340000008f None
1 0 A T 286e4c3400000040 None
2 0 A T 28cddb460000000c None
3 1 A E 14ca251e010000f3 None
4 0 A E 142e8e1e01000045 None
5 2 A T 28b1de460000003b None
6 2 A E 14e9251e0100001c None
7 9 D E 14ee241e01000054 None
```

COMMAND **LIST ID CHIP SETTINGS**

SYNTAX **LIST IDP [<loc> <site> <device> <mem>]** <CR>

ARGUMENTS

<loc>	the ID chip location, 1 to 8
<site>	the location type, Where: A = A/D module , M = ZOC module
<device>	the device type, always E for EPROM
<mem>	the memory type, Where: E = EPROM, P = PROM

DESCRIPTION Lists the ID chip settings. DSA3016 modules may only be site 1 through 8. A/D modules may be sites 1 through 8. If the location, site, and device are not specified, the settings for all chips will be returned.

RETURNS SET IDP <loc> <site> <device> <mem> <name> <value>

loc	the ID chip location, 1 to 8
site	the location type, Where: A = A/D module, M = ZOC module
device	the device type, always E for EPROM
mem	the memory type, Where: P = PROM, E = EPROM
name	the parameter name
value	the parameter value

EXAMPLE 1 To view all of the ID chip information of the chip in A/D module in position 1:

Type: LIST IDP 1 A<CR>

The RAD may return:

```
SET IDP 1 A E P DFC 1
SET IDP 1 A E P DMC 0
SET IDP 1 A E P SN 111
SET IDP 1 A E P REV A
SET IDP 1 A E P MDATE 7/1/2002
SET IDP 1 A E E ADCA 0.000000
SET IDP 1 A E E ADCB 0.996481
SET IDP 1 A E E ADCC 2.070793
SET IDP 1 A E E ECC 0.001499
SET IDP 1 A E E GAIN 0
SET IDP 1 A E E ACDATE 7/1/2002
SET IDP 1 A E E ADCD 6.50000
```

EXAMPLE 2 To view all of the ID chip information of the chip in the ZOC module in position 1:

Type: LIST IDP 1 M<CR>

The RAD may return:

```
SET IDP 1 M E P DFC 2
SET IDP 1 M E P DMC 4
SET IDP 1 M E P SN 301
SET IDP 1 M E P REV A
SET IDP 1 M E P MDATE 1/27/2000
SET IDP 1 M E E RTYPE 0
SET IDP 1 M E E RVALUE 1
SET IDP 1 M E E RCORA 0.000000
SET IDP 1 M E E RCORB 0.000000
SET IDP 1 M E E RCDATE 1/27/2000
SET IDP 1 M E E PCDATE 8/16/2002
SET IDP 1 M E E NPR1 15.000000
SET IDP 1 M E E NPR2 15.000000
SET IDP 1 M E E VALVE 1
SET IDP 1 M E E XDUCER 0
```

EXAMPLE 2

To view all of the ID chip information of the chip in the RADBASE A/D module(position 0):

Type: LIST IDP 0 A<CR>

The RAD may return:

SET IDP 0 A E P DFC 0
SET IDP 0 A E P DMC 0
SET IDP 0 A E P SN 25
SET IDP 0 A E P REV A
SET IDP 0 A E P MDATE 10/24/2003
SET IDP 0 A E E ADCA 0.000000
SET IDP 0 A E E ADCB 1.002526
SET IDP 0 A E E ADCC 14.007034
SET IDP 0 A E E RV 5.002700
SET IDP 0 A E E ACDATE 10/24/2003
SET IDP 0 A E E SN 126
SET IDP 0 A E E APPTYPE 0

COMMAND **LIST IDENTIFICATION VARIABLES**
SYNTAX **LIST I** <CR>

ARGUMENTS None

DESCRIPTION Lists the Identification configuration variables from Group I.

RETURNS SET <*variable*> <*value*> <*nl*>
SET <*variable*> <*value*> <*nl*>
: : : :
SET <*variable*> <*value*> <*nl*>
variable - the configuration variable name
value - the current setting
nl - end of line.

EXAMPLE To verify the general module configuration settings:

Type: LIST i<CR>

The RAD4000 may return:

SET NL 0
SET DISPIN 0*
SET HAVENET 1*
SET HAVEARINC 0*
SET CONOUT 2*
SET NETOUT 2*
SET FORMAT 0
SET NETIN 1*
SET IFUSER 1*
SET ECHO 0
SET CAL 0 9600*
SET CALSCHED 0 rp 0*
SET AUX 0 9600 1*
SET AUXSCHED 0 rp 0*
SET RESCAN 0 0*
SET TWOAD 1*

NOTE **Variables marked with an asterisk are not used in RAD4000 firmware. They have been left in the software as place holders. They cannot be modified, but setup software that attempts to modify these parameters will not be affected.**

COMMAND **LIST MASTER CONVERSION COEFFICIENTS**

SYNTAX **LIST M *<start temp><end temp> [<channels>]***<CR>

ARGUMENTS

<start temp> - The lowest temp plane to be returned.

<end temp> - The highest temp plane to be returned.

[<*channels*>] - *channels* is a the combination of *module* and a *port*. Syntax is: *module-port* or *Serial Number-port* for one channel

DESCRIPTION Lists all of the Master Points in the temperature-pressure correction matrix. This command places the RAD4000 in the LIST mode until the command is completed or a STOP command is issued.

RETURNS INSERT <*temp*><*channel*><*press*><*press counts*>M<*nl*>

: : : :

INSERT <*temp*><*channel*><*press*><*press counts*> M<*nl*>

temp - the temperature plane

channel - the channel in module-port or serial number-port notation

press - the pressure in EU

press counts - the A/D counts of pressure

M - indicates this is a Master Plane

nl - end of line

NOTE **The LIST A and LIST M commands are identical in RAD4000 firmware**

EXAMPLE To view the Master Points between 10°C and 40°C for channel 1 of the module connected to input 1:

Type: List m 10 40 1-1<CR>

The RAD4000 may return:

```
INSERT 14.00 1-1 -5.958100 -21594 M
INSERT 14.00 1-1 -4.476100 -15127 M
INSERT 14.00 1-1 -2.994200 -8646 M
INSERT 14.00 1-1 -1.470100 -1973 M
INSERT 14.00 1-1 0.000000 4467 M
INSERT 14.00 1-1 1.470100 10917 M
INSERT 14.00 1-1 2.994200 17594 M
INSERT 14.00 1-1 4.476100 24098 M
INSERT 14.00 1-1 5.958100 30603 M
INSERT 23.25 1-1 -5.958100 -21601 M
INSERT 23.25 1-1 -4.476100 -15161 M
INSERT 23.25 1-1 -2.994300 -8714 M
INSERT 23.25 1-1 -1.470100 -2077 M
INSERT 23.25 1-1 0.000000 4332 M
INSERT 23.25 1-1 1.470100 10746 M
INSERT 23.25 1-1 2.994200 17397 M
INSERT 23.25 1-1 4.476100 23863 M
INSERT 23.25 1-1 5.958100 30333 M
INSERT 32.75 1-1 -5.958100 -21636 M
INSERT 32.75 1-1 -4.476100 -15214 M
INSERT 32.75 1-1 -2.994200 -8784 M
INSERT 32.75 1-1 -1.470100 -2162 M
INSERT 32.75 1-1 0.000000 4228 M
INSERT 32.75 1-1 1.470100 10615 M
INSERT 32.75 1-1 2.994200 17246 M
```

COMMAND **LIST MODULE INFORMATION VARIABLES**
SYNTAX **LIST MI <*module*>**<CR>

ARGUMENTS <*module*> - module group 1 through 8 or module serial number.

DESCRIPTION Lists the configuration variables from Groups M1 through M8. If the module is not identified, all modules are listed. Each Module Information Group has provisions for up to four comment lines. These lines may be used to aid in the identification of the module group.

RETURNS REM<*module*> *1* <*comment*> <*nl*>
REM<*module*> *2* <*comment*> <*nl*>
REM<*module*> *3* <*comment*> <*nl*>
REM<*module*> *4* <*comment*> <*nl*>
SET <*variable*> <*value*> <*nl*>
SET <*variable*> <*value*> <*nl*>
: : : :
SET <*variable*> <*value*> <*nl*>
variable - the configuration variable name
value - the current setting
nl - end of line.

EXAMPLE 1 To view the configuration of the module connected to RAD4000 A/D 1,
Type: LIST mi 1<CR>
The RAD4000 may return:

```
REM1 1 Comment line 1
REM1 2 Comment line 2
REM1 3 Comment line 3
REM1 4 Comment line 4
SET TYPE1 0
SET ENABLE1 1
SET NUMPORTS1 32
SET NPR1 5
SET LPRESS1 1..32 -6.100000
SET HPRESS1 1..32 6.100000
SET NEGPTS1 1..32 4
SET MODTEMP1 0 1.000000
>
```

COMMAND **LIST NETWORK ATTACHED STORAGE VARIABLES**
SYNTAX **LIST NAS** <CR>

ARGUMENTS None

DESCRIPTION Lists the Network Attached Storage Variables from Group NAS.

RETURNS SET <*variable*> <*value*> <*nl*>
SET <*variable*> <*value*> <*nl*>
: : : :
SET <*variable*> <*value*> <*nl*>

variable - the configuration variable name
value - the current setting
nl - end of line.

EXAMPLE To view the current digital variable settings:

Type: LIST NAS<CR>

The RAD4000 will return the current digital settings. They could appear as follows.

SET USERNAS scanconas
SET PASSNAS scanco
SET ENNAS 0
SET PATHNAS /rad4000
SET IPNAS 191.30.130.105
SET FILENAS Scan 0
SET ENNTP scanco
SET ITPNTP 10.0.0.1
SET UTCCOFFSET -8
>

COMMAND **LIST OFFSET VARIABLES**
SYNTAX **LIST O <*module*>**<CR>

ARGUMENTS None

DESCRIPTION Lists the active temperature offsets set for the module from the Temperature Offset Group, Group O. These data are used to convert temperature counts to degrees Celsius. This is the "B" term in the temperature characterization equation. The value of this term will vary based on the module type. Refer to the section on Temperature Gain Values in the Configuration Variable Section of this manual for more information on the values for the “B” terms.

RETURNS SET TEMPBn <*value*> <*nl*>

n - the module position or serial number
value - the current setting
nl - end of line.

EXAMPLE To verify the the temperature offset setting for the module serial number 253,

Type: LIST o 253<CR>

The RAD4000 will return:

SET TEMPB253 -259.7403

The offset settings may also be verified by module location. To verify the temperature offset setting of the module connected to input 6,

Type: LIST o 6<CR>

The RAD4000 will return:

SET TEMPB6 -259.7403

The temperature offset settings may be verified for all modules connected to the RAD4000.

Type: LIST o<CR>

The RAD4000 may return:

SET TEMPB1 -259.740234
SET TEMPB2 -259.7403
SET TEMPB3 -259.7403
SET TEMPB4 -259.7403
SET TEMPB5 -259.7403
SET TEMPB6 -259.7403
SET TEMPB7 -259.7403
SET TEMPB8 -259.7403
>

COMMAND **LIST PROFILE LIST SETTINGS**
SYNTAX **LIST P** <CR>

ARGUMENTS None

DESCRIPTION Lists the Installed module serial numbers from the Serial Number Profile Group, Group P. These data are used to create Module Profile Files that will hold module specific configuration variables.

RETURNS SET RAD4000SN <*value*> <*nl*>
SET SN1 <*value*> <*nl*>
SET SN2 <*value*> <*nl*>
: : : :
SET SN8 <*value*> <*nl*>

value - the serial number of the module installed at that location
nl - end of line.

EXAMPLE To Verify the module input configuration

Type: LIST p<CR>

The RAD4000 may return:

SET RADSN 104
SET SN1 253
SET SN2 0
SET SN3 0
SET SN4 0
SET SN5 0
SET SN6 0
SET SN7 0
SET SN8 0
>

NOTE: If a module is not detected at boot up, during a RESTART, or after a LIST SYS U command, the software will use the last known configuration.

COMMAND SYNTAX **LIST REAL TIME DATA ANALYSIS SETTINGS**
LIST SA <CR>

ARGUMENTS None

DESCRIPTION Lists the Statistical Average Calculation configuration variables from Group SA. For more information on these calculations, please refer to the Goupe SA Section in this manual.

RETURNS SET <*variable*> <*value*> <*nl*>
SET <*variable*> <*value*> <*nl*>
: : : :
SET <*variable*> <*value*> <*nl*>
variable - the configuration variable name
value - the current setting
nl - end of line.

EXAMPLE To verify the Statistical Average Calculation Configuration Variable settings of the RAD.

Type: LIST SA<CR>

The RAD will return:

SET SA 1
SET SAACCUM 16
SET SAROLLAVG 1
SET SAMAX 1
SET SAMIN 1
SET SARMS 1
SET SASDEV 1
SET SAAVGXO 1
SET SAOL 1

In this example,
1. The Statistical Average calculations have been enabled.
2. The Cumulative Average is 16 samples, Each calculated value will be the rolling average of 16 samples.
3. All of the calculation outputs have been enabled.

COMMAND **LIST SCAN VARIABLES**
SYNTAX **LIST S** <CR>

ARGUMENTS None

DESCRIPTION Lists the General Scan configuration variables from Group S.

RETURNS SET <*variable*> <*value*> <*nl*>
SET <*variable*> <*value*> <*nl*>
: : : :
SET <*variable*> <*value*> <*nl*>
variable - the configuration variable name
value - the current setting
nl - end of line.

EXAMPLE This command is used to verify the general scan settings of the RAD4000

Type: LIST s<CR>

The RAD4000 will return:

SET PERIOD 500
SET ADTRIG 0
SET SCANTRIG 0
SET PAGE 0
SET QPKTS 0
SET BINADDR 0 0.0.0.0
SET IFC 62 0
SET TIMESTAMP 1
SET FM 1
SET TEMPPOLL 1
>

COMMAND **LIST SCAN GROUP VARIABLES**
SYNTAX **LIST SG *<group>***<CR>

ARGUMENTS <*group*> - The number 1 for the only active scan group

DESCRIPTION Lists the Scan Group configuration variables from Group G1.

RETURNS SET <*variable*> <*value*> <*nl*>
SET <*variable*> <*value*> <*nl*>
: : : :
SET <*variable*> <*value*> <*nl*>
variable - the configuration variable name
value - the current setting
nl - end of line.

If no channels are assigned to a scan group, the following will be returned for a channel variable:
SET CHAN< *scan group* >0<*nl*>
For more information, refer to the CHAN Scan Variable in the SG Group

EXAMPLE To verify or modify the configuration settings of Scan Group 1,
Type: LIST SG 1<CR>
A typical RAD4000 with a 32 channel module will return:
SET AVG1 100
SET FPS1 0
SET SGENABLE1 1
SET CHAN1 1-1..1-32
>

NOTE When the SET CHANn parameter is modified, it must be set to 0 before the new channel configuration is entered. If not, the new configuration will be appended to the existing configuration.
For example: if a 64 channel module is assigned to Scan Group 1, the SET CHAN variable will be:1-1..1-64, If the module is changed to a 32 channel module and the channel assignment is not set to 0 before the new assignment: 1-1..1-32 is added, the channel assignment will appear as follows:
SET CHAN1 1-1..1-64
SET CHAN1 1-1..1-32
This also applies in cases where a user has software to configure the scan groups prior to a test. If a scan group has channels defined and the channels are defined again without setting the channels to 0 first, the channel assignment will appear twice. If Scan Group 1 has a 32 channel module assigned and it is re-assigned by an initialization program, the channel assignments will appear as follows:
SET CHAN1 1-1..1-32
SET CHAN1 1-1..1-32

COMMAND **LIST SYSTEM COMPONENTS**
SYNTAX **LIST SYS [<U>]** <CR>

ARGUMENTS
blank - the existing system information, as determined at power up, will be displayed. No data will be updated.
<U> - the system information will be updated and displayed.

DESCRIPTION Lists the system information. This is the same information displayed at power up. This command must be run when system changes are made after power up.

RETURNS
RAD4000 Serial Number N

LOC	A2DSN	-MODEL-	-SN-	CHAN	VALVE	-NPR1-	-NPR2-	XDUCER	-CAL-DATE-
1									
2									
3									
4									
5									
6									
7									
8									

LOC	-MODEL-	-SN-	CHAN	DESCRIPTION
9				
10				
11				
12				
13				
14				
15				
16				

NOTE Positions 1 through 8 are reserved for A/D modules. Positions 9 through 16 are reserved for RDS modules. All positions do not have to be filled. The positions are identified by the setting of the dip switches on the A/D and RDS modules. The first RDS module must always be identified as position 9. If the first RDS is installed in a position other than 9, the DOUT commands will not function. Also, an error will be returned at bootup and after a LIST SYS command.

EXAMPLE 1 To view the current System Information as determined at power up:

Type: LIST SYS<CR>

The RAD4000 will return:

RAD4000 Serial Number 103

LOC	A2DSN	-MODEL-	-SN-	CHAN	VALVE	-NPR1-	-NPR2-	XDUCER	-CAL-DATE-
1	111	ZOC33	300	64	X1	15.00	15.00	DIF	8/16/2009
2	110								
3									
4									
5									
6									
7									
8									

LOC	-MODEL-	-SN-	CHAN	DESCRIPTION
9	RDS	103	8	REMOTE DIGITAL SWITCH [DOUT 1-8]
10				
11				
12				
13				
14				
15				
16				

The RADBASE4000 is Serial number 103. It has two RAD A/D 3200 modules connected.

RAD A/D3200 Sn 111 is installed in Location 1, ZOC33 Sn 300 is connected to this A/D module. The ZOC33 has 64 channels. It is not duplexed. The Full Scale pressure range of the module is 15.00 psi. The module is set up as a normal Differential Pressure Module. It was last calibrated August 16, 2009.

RAD A/D3200 Sn 110 is installed in location 2. If a ZOC module is connected to this A/D, it does not have an ID Chip installed, or the ID Chip is not responding.

RDS3200 Sn 103 is installed in location 9. The DOUT commands will function correctly.

EXAMPLE 2 If the first RDS module is not installed in position 9, the data return will appear as follows:

```
RAD4000 Serial Number 103
LOC  A2DSN  -MODEL-  -SN-  CHAN VALVE  -NPR1-  -NPR2- XDUCER -CAL-DATE-
  1     111   ZOC33     300   64      X1    15.00   15.00     DIF     8/16/2009
  2     110
  3
  4
  5
  6
  7
  8
LOC  -MODEL-  -SN- CHAN    DESCRIPTION
  9
  10    RDS    103    8      REMOTE DIGITAL SWITCH [DOUT 9-16]
  11
  12
  13
  14
  15
  16

  WARNING: No RDS present at location 9
```

COMMAND **PURGE**
SYNTAX **PURGE** <CR>

ARGUMENTS None

DESCRIPTION Commands the RAD4000 to initiate a purge sequence. This command may be initiated by entering the command from the local system computer or a host computer. The RAD4000 must be in the READY mode. The purge sequence is:

1. The digital output are set according to the DOUTPGSEQ variable.
2. The output remain set for a delay time set by the DLYPGSEQ variable.
3. When DLYPGSEQ times out, the digital output are set according to the DOUTPG variable.
4. The digital output will remain set until the DLYPG variable is met or until a STOP command is issued.
5. When DLYPG times out or when a STOP command is received the digital output are set according to the DOUTPGSEQ variable.
6. The output remain set for a delay time set by the DLYPGSEQ variable.
7. When DLYPGSEQ times out, the RAD4000 returns to the READY mode.

When a purge is initiated by a digital input, the RAD4000 may be in the READY mode or in the SCAN mode. The purge sequence is the same as above unless the RAD4000 is in the SCAN mode. If the RAD4000 is in the SCAN mode, the scanning will be suspended until the purge sequence is completed. At that time scanning will be resumed.

RETURNS <*nl*>
nl - End of line.

EXAMPLE To initiate a PURGE sequence:
Type: PURGE<CR>

COMMAND **READ**

SYNTAX **READ** <CR> or **?** <CR>

ARGUMENTS None

DESCRIPTION This command will only function when the Real Time Data Analysis (RTDA) function is enabled. When RTDA is enabled and a SCAN command is issued, the system will commence scanning and collect data for the RTDA function. No data are output until a READ command is issued. When a READ command is issued, the system will collect and output one “snapshot” frame of data.

A READ command may be issued as **READ** or a **?** Symbol.

RETURNS One frame of data will be output to the host computer or the NAS device depending on the setup of the NAS configuration variables.

<*nl*>

nl End of line.

COMMAND	**REBOOT**
SYNTAX	**REBOOT** <CR>
ARGUMENTS	None
DESCRIPTION	Commands the software to restart the RAD4000.hex program.
RETURNS	<*nl*> nl End of line.
EXAMPLE	To initiate a Reboot sequence, Type: REBOOT<CR>

COMMAND SYNTAX **RESET SEQUENCE NUMBER**
RSTSEQ [<Sequence Start>] <CR>

ARGUMENTS

blank	-	the sequence number will be reset to 0000.
<Sequence Start>	-	the sequence number will be reset to the number entered.

DESCRIPTION Resets the sequence number used to complete the file name when network Attached Storage (NAS) is enabled.

RETURNS <*nl*>
nl - End of line.

EXAMPLE To reset the Sequence Number to 0000, Enter:
RSTSEQ <CR>

To reset the Sequence Number to 0100, Enter
RSTSEQ 100 <CR>

NOTE This command is only active when NAS is enabled

COMMAND	**RESTART**
SYNTAX	**RESTART** <CR>
ARGUMENTS	None
DESCRIPTION	Commands the software to restart the RAD4000.exe program.
RETURNS	<*nl*> nl - End of line.
EXAMPLE	To initiate a Restart sequence, Type: RESTART<CR>

COMMAND **SAVE**

SYNTAX **SAVE** [<file name>]<CR>

ARGUMENTS file name - Optional - All configuration parameters will be saved to this file.

DESCRIPTION Commands the RAD4000 to save the configuration variables, and correction tables to disk.
If the optional file is not specified, data are saved to a file named cv.gpf on the RAD4000 Hard Disk Drive.
If the optional file is specified, data are saved to that file in the current RAD4000 folder unless a different path is specified.

RETURNS <*nl*>
nl - End of line.

EXAMPLES To save the current configuration variable settings and conversion coefficients without specifying a file,

Type: SAVE<CR>

To save the current configuration variable settings and conversion coefficients to a specific file,

Type: SAVE config.txt<CR>

NOTE A SAVE command may require several minutes to complete its execution depending on the number of MPF files on the disk. It is recommended that the SAVE CV command be used to save configuration changes.

COMMAND **SAVE BOOT LOADER VARIABLES**

SYNTAX **SAVEIP**<CR>

ARGUMENTS None

DESCRIPTION Commands the RAD4000 to save the boot loader configuration variables to the Micro SD Card. Boot loader configuration variables are saved to the ip.cfg file.

The SAVEIP write process requires two commands to complete.

1, The SAVEIP command stages the IP configuration variables and prepares the software to write to the Micro SD Card. This command does not actually perform the write.

2. The write process does not occur until a SAVEIPCONFIRM command is issued. The SAVEIPCONFIRM command is considered to be part of the SAVEIP command.

EXAMPLE To save the current bootloader configuration variable settings

Type: SAVEIP<CR>

The software will return the following message:

WARNING: This action could cause network communication problems. Type SAVEIPCONFIRM confirm SAVEIP or STOP to cancel the operation.

Type SAVEIPCONFIRM to complete the SAVE.

NOTE 1 Changes to the bootloader configuration variables will not take effect until power is cycled, or a REBOOT command is issued.

NOTE 2 The SAVEIP command requires approximately 60 seconds to complete. Normally, commands entered during this time would be ignored, but it is possible on rare occasions to cause the enclosure firmware to freeze..

COMMAND SYNTAX **SAVE CONFIGURATION VARIABLES**
SAVE CV<CR>

ARGUMENTS None

DESCRIPTION Commands the RAD4000 to save only the configuration variables to disk. The variables will be written to the file: CV.GPF

RETURNS <*nl*>
nl - End of line.

EXAMPLES To save the current configuration variable settings,
Type: SAVE CV<CR>

NOTE A SAVE CV command may require 20 seconds to complete its execution

COMMAND SYNTAX **SAVE NETWORK ATTACHED STORAGE VARIABLES**
SAVENAS<CR>

ARGUMENTS None

DESCRIPTION Commands the RAD4000 to save the Network Attached Storage (NAS) configuration variables to the Micro SD Card. NAS configuration variables are saved to the nas.cfg file.

EXAMPLE To save the current NAS configuration variable settings
Type: SAVENAS<CR>

NOTE Changes to the NAS configuration variables are not saved during a execution SAVE or SAVEIP command.

COMMAND **SCAN**
SYNTAX **SCAN** <CR>

ARGUMENTS None

DESCRIPTION Commands the RAD4000 to scan the pressure sensors and output scan data. The SCAN function operation depends on the setting of ADTRIG and SCANTRIG.

The SCAN function is only active in the Network mode.

ADTRIG = 0
SCANTRIG = 0
The SCAN function will be initiated immediately when the SCAN command is received. Data will be acquired at the rate determined by the settings of PERIOD, AVGn and the Number of Channels in the modules being scanned. Data will be output in Averaged Frames as the Frames are ready until FPS is satisfied or a STOP Command is received.

ADTRIG = 0
SCANTRIG = 1
In this case, a hardware trigger will initiate the SCAN function. The Software trigger will not initiate the SCAN function. Data will be acquired at the rate determined by the settings of PERIOD, AVGn and the Number of Channels in the modules being scanned. Scanning will continue until FPS is satisfied or a STOP command is received. Multiple trigger pulses received during a scan will be ignored.

ADTRIG = 1
SCANTRIG = 0
In this case, the SCAN command only enables the scan function. The RAD4000 will enter the WTRIG mode and wait for a hardware or software trigger. When a trigger is received, the RAD4000 will acquire and output one averaged frame of data and re-enter the WTRIG mode. Data will be acquired at the rate determined by the settings of PERIOD, AVGn and the Number of Channels in the modules being scanned. Multiple trigger pulses received during a scan will be ignored. When a Frame has been output, the next trigger will repeat the process. This will continue until the Frames per Scan Variable has been satisfied or a STOP command is received.

RETURNS The format of the returned data is based on the setting of the BIN configuration variable and FORMAT. If BIN is set to 1 the Scan Packets are returned in Binary Format(Refer to the section on Binary Data Packets for more information). If BIN is set to 0, the scan packets are returned in ASCII Format as follows:

If FORMAT is set to 1:

<group> <frame> <channel> <pressure> <nl>
<group> <frame> <channel> <pressure> <nl>
:: :: :: :: ::
<group> <frame> <channel> <pressure> <nl>

group	-	the scan group number from 1 to 8
frame	-	the current frame number
channel	-	the channel in module-port format
pressure	-	the pressure in either counts or real number format based on the setting of the EU configuration variable.
nl	-	end of line.

If FORMAT is set to 0:

Group=<*group*> Frame=<*frame*>
<*channel1*><*pressure*> <*channel2*><*pressure*> <*channel3*><*pressure*> <*channel4*><*pressure*>
<*channel5*><*pressure*> <*channel6*><*pressure*> <*channel7*><*pressure*> <*channel8*><*pressure*>
<*channel9*><*pressure*> <*channel10*><*pressure*> <*channel11*><*pressure*> <*channel12*><*pressure*>
<*channel13*><*pressure*>.....<*channelxx*><*pressure*>

NOTES

1. Only channels that are listed with the LIST SGn command are returned.
   The field length is not fixed. Scan Groups are returned as they are ready.
2. All frames are separate parsable frames.
3. HyperTerminal or ScanTel will disp[lay up to 512 channels if FORMAT is set to 1
4. If ADTRIG is set to 1, SCANTRIG must be set to 0. If SCANTRIG is set to 1, ADTRIG must be set to 0.

COMMAND **SET**
SYNTAX **SET <*name*> <*value*>**<CR>

ARGUMENTS <*name*> - the Configuration Variable to be set or modified.
<*value*> - the value to be assigned to that Configuration Variable.

DESCRIPTION Commands the RAD4000 to set one of the Configuration Variables.

When Configuration Variables are listed with the LIST command, the variables are output in the format required by the SET command. This enables the user to upload the data from a file that has been created by a LIST download.

RETURNS <*nl*>
nl - end of line.

EXAMPLE This command will change configuration variable settings.

To set zero correction on
Type: SET ZC 1<CR>

To change the pressure units to Pascals
Type: SET UNITSCAN PA<CR>

To change the scan channels in Scan Group 2 from module 2, channels 1 through 64, to module 1, channels 1 through 16:
Type: SET CHAN2 0<CR>
SET CHAN2 1-1..1-16<CR>

COMMAND **SLOTS**
SYNTAX **SLOTS <channel>**<CR>

ARGUMENTS <channel> - The channel in module-port format

DESCRIPTION Queries the RAD4000 to return the 10 boundary pressures for the 9 pressure slots defined for a given channel.

RETURNS
Press 9 <*pressure*> <*nl*>
Press 8 <*pressure*> <*nl*>
Press 7 <*pressure*> <*nl*>
Press 6 <*pressure*> <*nl*>
Press 5 <*pressure*> <*nl*>
Press 4 <*pressure*> <*nl*>
Press 3 <*pressure*> <*nl*>
Press 2 <*pressure*> <*nl*>
Press 1 <*pressure*> <*nl*>
Press 0 <*pressure*> <*nl*>

EXAMPLE To determine the boundary pressures for channel 1 of the 5 psi module s/n 253

Type: SLOTS 253-1<CR>

The RAD4000 will return:

Press 9 6.10000
Press 8 4.88000
Press 7 3.66000
Press 6 2.44000
Press 5 1.22000
Press 4 0.00000
Press 3 -1.52500
Press 2 -3.05000
Press 1 -4.57500
Press 0 -6.10000

The pressures applied during a calibration must be selected so that there are not two or more applied pressures in any slot. The module in the example above has been set up with 4 negative points. By default, it will have 4 positive points as a calibration must always include a zero point.

In this example, the slots for channel 1 of a 15 psi module in input 2 is configured for 2 negative points

Type SLOTS 2-1<CR>

The RAD4000 will return:

Press 9 15.00000
Press 8 12.85714
Press 7 10.71429
Press 6 8.57143
Press 5 6.42857
Press 4 4.28572
Press 3 2.14286
Press 2 0.00000
Press 1 -7.50000
Press 0 -15.00000

COMMAND **STATUS**
SYNTAX **STATUS** <CR>

ARGUMENTS None

DESCRIPTION Commands the RAD4000 to return the current status.

RETURNS STATUS: <*current status*><nl>
Current status: one of the following:

READY	The RAD4000 is ready to accept any command.
SCAN	The RAD4000 is in the SCAN mode. The only commands that will be accepted are STATUS or STOP.
CALZ	The RAD4000 is executing a CALIBRATE ZERO command. The only commands that will be accepted are STATUS or STOP.
IDPWRITE	The RAD4000 is writing to the ID chip. The only commands that will be accepted are IDPCONFIRM and STOP. No other commands will be accepted.
INVALID	The command entered is not a valid command for the current mode of operation.
FDISK	The RAD4000 is re-formatting the Micro SD Card.
SAVE	The RAD4000 is saving the application configuration variables and MPF files.
SAVEIP	The RAD4000 is saving the Boot Loader IP configuration variables.
PURGE	The RAD4000 is in the PURGE mode
CAL	The RAD4000 is acquiring data for calibration
nl	end of line.

EXAMPLE The STATUS command may be entered at any time. This is one of the commands that will not generate an error if entered while the RAD4000 is not READY.

If the STATUS command is entered while the RAD4000 is on, but inactive, the RAD4000 will return:

STATUS: READY

If the STATUS command is entered while the RAD4000 is executing a Calibrate Zero command, the RAD4000 will return:

STATUS: CALZ

COMMAND **STOP**
SYNTAX **STOP** <CR>

ARGUMENTS None

DESCRIPTION Commands the RAD4000 to abort the current operation and return to the READY mode.

RETURNS <*nl*>
nl - end of line.

EXAMPLE To abort any function or operation:
Type: STOP<CR>

COMMAND **TEMPERATURE**
SYNTAX **TEMP *<units>***<CR>

ARGUMENTS *units* - May be one of the following:
RAW - Returns the temperature in raw counts.
EU - Returns the temperature in Engineering Units

DESCRIPTION Lists the current temperatures of all 8 modules. If a module is not connected, the returned temperature will be 0

RETURNS TEMP: 1 <*temp*> <*nl*>
TEMP: 2 <*temp*> <*nl*>
: : :
TEMP: 8 <*temp*> <*nl*>
temp - The module temperature in raw counts or engineering units
nl> - End of line.

EXAMPLE To view the current temperatures of the modules connected to the RAD4000
Type: TEMP EU<CR>

The RAD4000 will return:
TEMP: 1 28.00
TEMP: 2 105.75
TEMP: 3 00.00
TEMP: 4 00.00
TEMP: 5 00.00
TEMP: 6 00.00
TEMP: 7 00.00
TEMP: 8 00.00

To view the A/D counts of the temperature inputs
Type: TEMP RAW<CR>

The RAD4000 will return:
TEMP: 1 12551
TEMP: 2 32767
TEMP: 3 0
TEMP: 4 0
TEMP: 5 0
TEMP: 6 0
TEMP: 7 0
TEMP: 8 0

NOTE A counts reading of 32767 indicates an open input. A counts reading of 0 with an engineering unit reading of 0 indicates that the module is not enabled.

COMMAND **TEMPERATURE GRAD4000IENT COMPENSATION**
SYNTAX **TGRAD**<CR>

ARGUMENTS none

DESCRIPTION This command reads the temperature of the A/D modules and stores this information in a table. This table is then used to estimate the A/D module temperatures during a scan based on the temperature of the RAD4000BASE.

RETURNS <Location> <RAD4000Base Temp> <A/D Temp> <Delta Temp> <*nl*>

Location	-	A/D Location, 1 through 8
RAD4000Base Temp	-	Measured Temperature of the RAD4000Base in degrees C
A/D Temp	-	Measured Temperature of the RAD4000 A/D Module in this location.
Delta Temp	-	The calculated Temperature differential for the A/D Module in this location.
nl	-	End of line.

NOTE The RAD4000 software can only read the temperature of the RAD4000BASE when in the scan mode. The temperature of the A/D modules connected to the RAD4000BASE can be estimated based on the gRAD4000ient calculation derived from the table generated by this command.

EXAMPLE A RAD4000Base has two A/D modules connected. To calculate and store the temperature differential for these modules, Type:

TGRAD4000<enter>

The RAD4000 software will calculate the differential temperatures and return:

Loc 1 Base 33.187500 Temp 28.562500 Delta -4.625000
Loc 2 Base 33.187500 Temp 27.750000 Delta -5.437500
Loc 3 Base 33.187500 Temp 0.000000 Delta -33.187500
Loc 4 Base 33.187500 Temp 0.000000 Delta -33.187500
Loc 5 Base 33.187500 Temp 0.000000 Delta -33.187500
Loc 6 Base 33.187500 Temp 0.000000 Delta -33.187500
Loc 7 Base 33.187500 Temp 0.000000 Delta -33.187500
Loc 8 Base 33.187500 Temp 0.000000 Delta -33.187500

COMMAND **TIME AVAILABILITY TEST**
SYNTAX **TIME** <CR>

ARGUMENTS None

DESCRIPTION This command tests the Network Time Protocol (NTP) Server specified in the IPNTP configuration variable. If a Time can be retrieved, it will be returned.. If the Time Server cannot be found, an error is returned

RETURNS The Time, if The Time Server can be found,or an Error, if the Time Server cannot be found
Time in the format: YYYYMMDD_HHMMSS
Where: YYYY is the year
MM is the month (1 to 12)
DD is the day (1 to 7)
HH is the hour in 24 hour format
MM is the minute
SS is the seconds
Error The message:
ERROR: Time Server cannot be found
<*nl*> nl - End of line.

NOTE The time will be derived from either the NAS device or a NTP server. This will be determined by the setting of GW in the IP Group.
If a valid NTP IP address is set for GW, the time will be derived from the NTP server at that address.
If the address set in GW is the default setting, or an invalid NTP server address, the date and time will be derived from an attached NAS device.
If a NAS is not attached, an ERROR will be generated.

COMMAND **VERSION**
SYNTAX **VER** <CR>

ARGUMENTS none

DESCRIPTION Requests the version number of the Rad4000.hex file.

RETURNS VERSION: <*version string*> <*nl*>

EXAMPLE To determine the version of Rad4000.hex software in use:
Type: VER<CR>

The RAD4000 will return:
VERSION: 2.04

COMMAND **WRITE ID CHIP VARIABLES**

SYNTAX **IDPWRITE *<address> <site> <device> <mtype>*** <CR>

ARGUMENTS

address	The location of the device. Valid values are 0 through 8, Where 0 can only be the Temperature A/D.
site	A for an A/D, or M for a Module
device	The memory device in the A/D or module. This must always be E for EPROM. The software will select the Device family based on the Name to be modified.
mtype	E for EPROM, or P for PROM. Data stored in PROM may only be set once. If PROM data are set at the Scanivalve Factory, they may not be modified in the field. Data stored in EPROM may be modified by a user.

DESCRIPTION The ID Chip write process requires two commands to complete. The IDPWRITE command stages the ID chip identification variables and prepares the software to write to the ID Chip PROM or EPROM. This command does not actually perform the write. The write process does not occur until a IDPCONFIRM command is issued. The IDPCONFIRM command is considered to be part of the IDPWRITE command

RETURNS SET IDP <*address*> <*site*> <*device*> <*mtype*> <*name*> <*value*>

address	The location of the device. Valid values are 0 through 8, Where 0 can only be the RAD4000 Temperature A/D.
site	A for an A/D, or M for a Module
device	The memory device in the A/D or module. This must always be E for EPROM. The software will select the Device family based on the Name to be modified.
mtype	E for EPROM, or P for PROM. Data stored in PROM may only be set once. If PROM data are set at the Scanivalve Factory, they may not be modified in the field. Data stored in EPROM may be modified by a user.
name	The name of the variable
value	The value of the variable

EXAMPLE The IDP variables for the EPROM in a ZOC module have been programmed using the SET IDP Variable commands. When all of the variables have been set, the DSAENCL software must be set up to write to the EPROM. The following command is entered:

IDPWRITE 1 M E E

The DSAENCL returns the following:

SET IDP 1 M E E RTYPE 0
SET IDP 1 M E E RVALUE 1
SET IDP 1 M E E RCORA 0.000000
SET IDP 1 M E E RCORB 0.000000
SET IDP 1 M E E RCDATE 1/26/2004
SET IDP 1 M E E PCDATE 1/1/2000
SET IDP 1 M E E NPR1 1.000000
SET IDP 1 M E E NPR2 1.000000
SET IDP 1 M E E VALVE 2
SET IDP 1 M E E XDUCER 0
Type IDPCONFIRM to confirm IDP write or STOP to escape

If the data is correct, issue the IDPCONFIRM command to write the variables to the EEPROM. If the data are not correct, type STOP and repeat the process to correct the errors.

COMMAND **ZERO**
SYNTAX **ZERO <*module*>**<CR>

ARGUMENTS <*module*> -the module position 1 through 8 or the serial number.

DESCRIPTION Lists the active zero correction values obtained from a CALIBRATE ZERO command. These data are used in the conversion of raw counts to Engineering Units (EU). These values may only be set by executing a CALIBRATE ZERO. If a module number is not entered, the ZERO values for all modules are listed.

RETURNS ZERO: <*channel*> <*value*> <*nl*>
ZERO: <*channel*> <*value*> <*nl*>
: : : :
ZERO: <*channel*> <*value*> <*nl*>

channel	-	the channel in module-port or serial number-port format
value	-	the zero correction values
nl	-	end of line.

EXAMPLE To view the current zeros for module 1
Type: ZERO 1<CR>

The RAD4000 will return:

```
ZERO: 1-1 160
ZERO: 1-2 165
ZERO: 1-3 68
ZERO: 1-4 131
ZERO: 1-5 41
ZERO: 1-6 162
ZERO: 1-7 145
ZERO: 1-8 233
ZERO: 1-9 158
:: :: :: ::
:: :: :: ::
ZERO: 1-28 96
ZERO: 1-29 19
ZERO: 1-30 134
ZERO: 1-31 132
ZERO: 1-32 238
```

NOTE If a module number is not entered, the zero values for all enabled modules will be returned.

RAD4000 CONFIGURATION VARIABLES

GENERAL SCAN VARIABLES (Group S)

VARIABLE **ADTRIG *<code>***
VALID VALUES 0 or 1
DEFAULT VALUE 0
DATA TYPE integer
DESCRIPTION This variable determines the method for a Frame Trigger.
0 - Frame timing is controlled by an internal timer set by PERIOD.
1 - Frame timing is controlled by a external hardware or a software trigger. When ADTRIG is enabled, a frame will be triggered whenever a hardware or software trigger input is received. The hardware trigger is a hard wired input to the power input connector. The Software trigger is a TAB, or Ctrl I, character. When a SCAN command is received, the RAD4000 enters a WAIT state until a trigger pulse is received. At that time, the RAD4000 will acquire and output one averaged frame of data then re-enter the WAIT state. This will continue until a STOP command is received or the FPS variable is satisfied. Multiple trigger pulses received during a scan will be ignored.
NOTE If ADTRIG is set to 1, SCANTRIG must be set to 0.

VARIABLE **BINADDR *<port> <IP address>***
VALID VALUES port - 0 to 65535
IP address - any valid IP address
DEFAULT VALUE port - 0
IP address - 0.0.0.0
DATA TYPE integer
DESCRIPTION When port is set to 0, data are NOT sent out over the binary address port, Data are sent over the standard TCP port. If port is 0 to 65535, data are sent over that port to the IP address identified in a UDP format.

VARIABLE **IFC *<char 1> <char 2>***
VALID VALUES char 1 - Any valid ASCII character
char 2 - Any valid ASCII character
DEFAULT VALUE char 1 - 62
char 2 - 0
DATA TYPE integer
DESCRIPTION This variable sets the interframe characters to be used when transmitting ASCII unformatted output. If only one character is desired, char 2 must be set to 0. If both characters are set to 0, no interframe characters will be transmitted.
EXAMPLE If a Carriage Return is desired between frames, the following command would be used:
SET IFC 13 0

VARIABLE **PERIOD <*period*>**
VALID VALUES 20 to 65535
DEFAULT VALUE 500
DATA TYPE integer
DESCRIPTION This master period variable sets the sample rate, in microseconds, of the pressure A/D converters and the one temperature A/D converter. Period is the dwell time between channels. Period is only one of the terms required to determine data rate. Data rate is determined by the equation:

$$DataRate = \frac{1}{PeriodXChannelsXAVG)}$$

Data Rate is expressed in Hertz per channel
Period is in microseconds
Channels is the number of channels in the largest module enabled
AVG is the average term for that scan group

VARIABLE **SCANTRIG <*code*>**
VALID VALUES 0, or 1
DEFAULT VALUE 0
DATA TYPE integer
DESCRIPTION Controls scan initiation.
0 - Scanning is initiated by the SCAN command.
1 - Scanning is initiated by an external hardware trigger. When SCANTRIG is enabled, a scan will be initiated whenever a hardware trigger input is received. The hardware trigger is a hard wired input to the power cable. The scan function will continue until the Frames per Scan variable is satisfied or a STOP command is received. Multiple trigger pulses received during a scan will be ignored.
NOTES If SCANTRIG is set to 1, ADTRIG must be set to 0.
A Software Trigger will not initiate the SCAN function.

VARIABLE **FM <*code*>**
DEFAULT VALUE 1
DATA TYPE integer
NOTE This variable is not used in RAD4000 firmware. It is a place holder only.

VARIABLE **PAGE <*code*>**
DEFAULT VALUE 1
DATA TYPE integer
NOTE This variable is not used in RAD4000 firmware. It is a place holder only.

VARIABLE **QPKTS <*code*>**
DEFAULT VALUE 1
DATA TYPE integer
NOTE This variable is not used in RAD4000 firmware. It is a place holder only.

VARIABLE **TEMPPOLL <*code*>**
DEFAULT VALUE 1
DATA TYPE integer
NOTE This variable is not used in RAD4000 firmware. It is a place holder only.

VARIABLE **TIMESTAMP <*code*>**

VALID VALUES 0 or 1

DEFAULT VALUE 1

DATA TYPE integer

DESCRIPTION This variable sets the time stamp units. The Time Stamp is the elapsed time from the start of the scan function. The first time stamp will always be zero. TIMESTAMP data are only output to a file when BIN is set to 1. TIMESTAMP data are never output when the data format is ASCII.

0 - Time is in microseconds

1 - Time is in milliseconds

CONVERSION VARIABLES (Group C)

VARIABLE **BIN <*code*>**
VALID VALUES 0, 1, or 4
DEFAULT VALUE 0
DATA TYPE integer
DESCRIPTION Sets the format of the output data: (Refer to the packet definitions for more information)

0 Output is in ASCII
1 Output is in binary format
2 Not Implemented in version 2.01
3. Not implemented in version 2.01
4 Output is in binary format with a scan header

When BIN is set to 4, an information header is added to the file.

Bytes		Description
2	-	Header Size, including the header size (136)
10	-	ASCII encoded date of data sample
8	-	ASCII encoded time of data sample
32	-	FPS(x) – One for each scan group (4 byte integer per group)
16	-	AVG(x) – One for each scan group (2 byte integer per group)
16	-	Number of channels for each Scan Group (2 byte integer per group)
4	-	PERIOD (4 byte float)
2	-	ADTRIG (2 byte integer)
2	-	A2DCOR (2 byte integer)
4	-	CVTUNITS (4 byte float)
4	-	MAXEU (4 byte float)
4	-	MINEU (4 byte float)
16	-	Module Serial Number (x) (2 byte integer per module)
16	-	Number of channels per module(x) (2 byte integer per module)

<Frame scan data starts here>

NOTE: The RAD4000 does not support multiple scan groups. When BIN is set to 4, the value of FPS, AVG and Number of channels for scan groups 2 through 8 will be 0.

VARIABLE **CALAVG <*sample average*>**
VALID VALUES 2 to 256
DEFAULT VALUE 64
DATA TYPE integer
DESCRIPTION Sets the calibration sample average. This value should be set to insure that a sufficient number of samples will be acquired to insure a stable, noise free calibration.

VARIABLE **CALPER <*period*>**
VALID VALUES 50 to 5000
DEFAULT VALUE 500
DATA TYPE integer
DESCRIPTION Sets the period, in microseconds, of the RAD4000 calibration data acquisition. This is the same as PERIOD in the SCAN Group This value should be set to insure that a sufficient settling time exists so that the channel samples are stable.

NOTE: **For versions 1.00 through 1.03**
This variable is fixed at 500 microseconds
For all versions 1.04 and higher
CALPER will be set automatically to the value set in PERIOD, if PERIOD is 500 microseconds or less. If PERIOD is set to a value greater than 500 microseconds, the value of CALPER will be fixed at 500 microseconds.
Users will not be able to modify this variable.

VARIABLE **CALZDLY <*delay*>**
VALID VALUES 1 to 128
DEFAULT VALUE 15
DATA TYPE integer
DESCRIPTION Sets the delay time, in seconds, before the RAD4000 executes a CALZ Command. This value should be set to insure that a sufficient delay exists so that the Zero Offset data are not biased by residual pressure in the module calibration valves.

VARIABLE **CVTUNIT <*value*>**
VALID VALUES any real number
DEFAULT VALUE 1.0
DATA TYPE float
DESCRIPTION This is the conversion factor to convert from PSI units to the desired scanning units. This value may be set directly or by setting the UNITSCAN variable.

VARIABLE **EU <*code*>**
VALID VALUES 0, 1
DEFAULT VALUE 1
DATA TYPE integer
DESCRIPTION Sets the units of the output data:
0 - Output is in raw counts
1 - Output is in selected engineering units

When the A/D counts reach 32767 or -32768, and EU is set to 1, the RAD4000 will output the values set in **MAXEU** and **MINEU** to indicate that a conversion error may exist. The RAD4000 will also output these values when the maximum or minimum master conversion planes are exceeded.

VARIABLE **FILLONE <*code*>**
VALID VALUES 0, 1
DEFAULT VALUE 0
DATA TYPE integer
NOTE **This variable is not used in RAD4000 firmware. It is a place holder only.**

VARIABLE **MAXEU <*value*>**
VALID VALUES Any valid floating point number
DEFAULT VALUE 9999
DATA TYPE Floating point
DESCRIPTION Sets the maximum Engineering Unit Value. This is the number that will be displayed when an overflow condition occurs

When the A/D counts reach 32767, and EU is set to 1, the RAD4000 will output 9999 or whatever has been entered as the MAXEU value to indicate that a conversion error may exist. The RAD4000 will also output these values when the maximum or minimum master conversion planes are exceeded.

VARIABLE **MINEU <*value*>**
VALID VALUES Any valid floating point number
DEFAULT VALUE -9999
DATA TYPE Floating point
DESCRIPTION Sets the minimum Engineering Unit Value. This is the number that will be displayed when an overflow condition occurs

When the A/D counts reach -32768, and EU is set to 1, the RAD4000 will output -9999 or whatever has been entered as the MINEU value to indicate that a conversion error may exist. The RAD4000 will also output these values when the maximum or minimum master conversion planes are exceeded.

VARIABLE **MPBS <*number of planes*>**
VALID VALUES 0 to 140
DEFAULT VALUE 0
DATA TYPE integer
DESCRIPTION When an INSERT command is issued and a master point is overwritten, a configurable number of temperature planes on either side of the new MASTER plane are converted to calculated. These points will be recalculated when a FILL command is executed. The number of planes to be entered in this variable may be calculated by the formula:

Planes = TEMP * 4 Where: TEMP is the number of degrees to be changed. For example, if it is desired to have points ± 4° of the new master plane modified, then MPBS would be set to 16.

VARIABLE **STARTCALZ <*code*>**
VALID VALUES 0, 1
DEFAULT VALUE 0
DATA TYPE integer
DESCRIPTION When set to 1, causes the RAD4000 to execute a CALZ at startup. The RAD4000 does not save zeros at power down. If the RAD4000 is set to start scanning immediately or if it is difficult to input commands to the RAD4000 once it is powered up, then this variable should be set to 1. The RAD4000 will then execute a CALZ at the end of the initialization sequence.

VARIABLE **UNITSCAN <*units*>**
VALID VALUES see list below
DEFAULT VALUE PSI
DATA TYPE string
DESCRIPTION This sets the output engineering units for the RAD4000. Setting this value will also set CVTUNITS. CVTUNITS may be set to a different value, however UNITSCAN must be set first. The following are the list of units supported:

ATM	FTH2O	KGM2		MH2O	OZFT2
BAR	GCM2	KIPIN2		MMHG	OZIN2
CMHG	INHG	KNM2		MPA	PA
CMH2O	INH2O	KPA	NCM2	PSF	
DECIBAR	KGCM2	MBAR		NM2	PSI
			TORR		

NOTE If a value other than those listed is entered, The RAD4000 will default to PSI.

VARIABLE **ZC <*code*>**
VALID VALUES 0, 1
DEFAULT VALUE 1
DATA TYPE integer
DESCRIPTION Enables or disables zero correction of the pressure data
0 - No zero correction is performed.
1 - Zero correction is performed.

DIGITAL OUTPUT CONFIGURATION VARIABLES (Group D)

VARIABLE **DLYPG <*value*>**
VALID VALUES 0 to 3600
DEFAULT VALUE 10
DATA TYPE integer
DESCRIPTION Sets the time, in seconds, that the module inputs will be purged. This is only a part of the total purge sequence time. This timer can be interrupted by a STOP command. When set to 0, the time is infinite and the PURGE sequence can only be terminated by a STOP command.

When a STOP command interrupts the PURGE sequence, only the DLYPG timer will be interrupted. The software will exit the PURGE sequence by stepping through the DLYPGSEQ settings and timing to prevent possible overpressure of the sensors

VARIABLE **DLYPGSEQ <*value*>**
VALID VALUES 0 to 60
DEFAULT VALUE 1
DATA TYPE integer
DESCRIPTION Sets the time delay, in seconds, before purge air is applied to the modules. If 0 is entered, no delay will occur.

VARIABLE **DOUTCALZ <*value*>**
VALID VALUES 0 to FF Hexadecimal
DEFAULT VALUE 0
DATA TYPE integer
DESCRIPTION Enables digital outputs for a **CALZ** operation. Output 1 is the least significant binary bit. Output 8 is the most significant binary bit. The variable is entered as 2 hexadecimal digits.

VARIABLE **DOUTPG <*value*>**
VALID VALUES 0 to FF Hexadecimal
DEFAULT VALUE 0
DATA TYPE integer
DESCRIPTION Enables digital outputs for a **PURGE** sequence. Output 1 is the least significant binary bit. Output 8 is the most significant binary bit. The variable is entered in hexadecimal digits.

VARIABLE **DOUTPGSEQ <*value*>**
VALID VALUES 0 to FF Hexadecimal
DEFAULT VALUE 0
DATA TYPE integer
DESCRIPTION Enables digital outputs to transition from normal operation to **PURGE** operation. Output 1 is the least significant binary bit. Output 8 is the most significant binary bit. The variable is entered in hexadecimal digits.

VARIABLE **DOUTPU <*value*>**
VALID VALUES 0 to FF Hexadecimal
DEFAULT VALUE 0
DATA TYPE integer
DESCRIPTION Enables the digital outputs for normal power up configuration. Output 1 is the least significant binary bit. Output 8 is the most significant binary bit. The variable is entered in hexadecimal digits.

VARIABLE **DOUTSCAN <*value*>**
VALID VALUES 0 to FF Hexadecimal
DEFAULT VALUES 40
DATA TYPE integer
DESCRIPTION Enables the digital outputs to indicate that the RAD4000 is in the **SCAN** mode. This variable **ONLY** affects the **DOUT** bit that is enabled. All other outputs are masked. Output 1 is the least significant binary bit. Output 8 is the most significant binary bit. The variable is entered in hexadecimal digits.

VARIABLE **DOUTREADY <*value*>**
VALID VALUES 0 to FF Hexadecimal
DEFAULT VALUE 80
DATA TYPE integer
DESCRIPTION Enables the digital outputs to indicate that the RAD4000 is in the **READY** mode. This variable **ONLY** affects the **DOUT** bit that is enabled. All other outputs are masked. Output 1 is the least significant binary bit. Output 8 is the most significant binary bit. The variable is entered in hexadecimal digits.

VARIABLE **BANKA <*value*>**
VALID VALUES 0 to FF Hexadecimal
DEFAULT VALUE 0
DATA TYPE integer
DESCRIPTION Enables the digital outputs to switch the control pressures in a ZOC22, 23, or 33 to measure the pressures in the Bank A inputs. Output 1 is the least significant binary bit. Output 8 is the most significant binary bit. The variable is entered in hexadecimal digits.

VARIABLE **BANKB <*value*>**
VALID VALUES 0 to FF Hexadecimal
DEFAULT VALUE 0
DATA TYPE integer
DESCRIPTION Enables the digital outputs to switch the control pressures in a ZOC22, 23, or 33 to measure the pressures in the Bank B inputs in a duplex module. Output 1 is the least significant binary bit. Output 8 is the most significant binary bit. The variable is entered in hexadecimal digits.

VARIABLE	**BANKUSR <*value*>**
VALID VALUES	0 to FF Hexadecimal
DEFAULT VALUE	0
DATA TYPE	integer
DESCRIPTION	Enables the digital outputs to switch the control pressures in a ZOC22, 23, or 33 to a user defined mode. Output 1 is the least significant binary bit. Output 8 is the most significant binary bit. The variable is entered in hexadecimal digits.

SCAN GROUP CONFIGURATION VARIABLES (Group G1 through G8)

VARIABLE **AVG1 <*sample average*>** Where n = the scan group number
VALID VALUES 1 - 256
DEFAULT VALUE 16
DATA TYPE integer
DESCRIPTION Sets the minimum number of samples to average for Scan Group 1. Refer to the CHANn variable for information on averaging of modules with a dissimilar number of channels.

VARIABLE **CHAN1 <*channels*>**
VALID VALUES <*channels*> - *channels* is a combination of a *module* and a *port*. Syntax is:
module-port for one channel
module-port,module-port for many channels
module-port..module-port for a range of channels
Module is the physical location of the module in the rack or the connector supporting the module.
Port is a single pressure sample point within a module.
When 0 is entered, no channels are assigned to a scan group.
DEFAULT VALUE 0
DATA TYPE string
DESCRIPTION Sets the channel assignments in scan group 1. Duplicate *module-port* entries are not permitted in the same module group. For example:
the notation: CHAN 1-1,1-1 is not valid.

If a scan group contains ports from dissimilar modules, for example: a 64 port module and a 16 port module, the smaller module will be sampled more often in order to keep the larger module synchronized with the smaller module. The additional samples from the smaller module are averaged. In the previous example the 16 port module will be sampled 4 times for every one sample of the 64 port module.

The order of the channels in the output frame is determined by the order of entry. Use the LIST SG1 command to verify the output frame order.

Setting the channel variable does not automatically erase old channels. The user is responsible to insure that unwanted channels are cleared before new channels are set.

The command :

SET CHAN1 0<enter>

will clear the scan group.

VARIABLE **FPSn <*frames*>** Where n = the scan group number
VALID VALUES 0 - 2147483648
DEFAULT VALUE 0
DATA TYPE long integer
DESCRIPTION Frames per Scan. Sets the number of averaged frames for Scan Group n to be output after a SCAN command is issued. Data will be output at a rate set by the formula below. Averaged frames will be output until the setting of FPS is met. Each Scan group may have a different value of FPS. When set to 0, the scan will continue until a stop command is received.

$$DataRate = \frac{1}{PeriodXChannelsXAVG)}$$

Data Rate is expressed in Hertz per channel
Period is in microseconds
Channels is the number of channels in the largest module enabled
AVG is the average term for that scan group

VARIABLE **SGENABLE1 <*code*>**
VALID VALUES 0, 1, 8, 16, 32
DEFAULT VALUE 1
DATA TYPE integer
DESCRIPTION Enables the Scan Group output:
0 - Disabled
1 - Normal Scan Mode Enabled
8 - Fast Scan mode, 8 channels enabled
16 - Fast Scan mode, 16 channels enabled
32 - Fast Scan mode, 32 channel enabled
NOTE The RAD4000 may be set up for “Fast Scan” mode. In this mode of operations, the system will scan only the first 8, 16, or 32 channels in a module, or group of modules. This will effectively increase the sampling rate. For more information, refer to “RAD4000 Fast Scan Mode” in the back of the manual.

VARIABLE **SGENABLEn <*code*>** Where n = 2- 8
VALID VALUES 0 or 1
DEFAULT VALUE 0
DATA TYPE integer
NOTE **This variable is not used in RAD4000 firmware. It is a place holder only.**

MODULEn CONFIGURATION VARIABLES (M1 through M8)

VARIABLE **ENABLEn <*enable*>** Where n = the module position number
VALID VALUES 0, 1
DEFAULT VALUE 0
DATA TYPE integer
DESCRIPTION Defines if the module n is enabled:
0 - Disabled
1 - Enabled

VARIABLE **HPRESSn <*ports*> <*pressure*>** Where n = the module position number
VALID VALUES <*port*> <*pressure*> - *port* - one port
port,port - many ports
port..port - a range of ports
pressure - a real number representing the pressure.
DEFAULT VALUE 1..64 15.0
DATA TYPE string
DESCRIPTION Defines the maximum pressure for port or ports of the module n.

VARIABLE **LPRESSn <*ports*> <*pressure*>** Where n = the module position number
VALID VALUES <*port*> <*pressure*> - *port* - one port
port,port - many ports
port..port - a range of ports
pressure - a real number representing the pressure..
DEFAULT VALUE 1..64 15.0
DATA TYPE string
DESCRIPTION Defines the minimum pressure for port or ports for the module n.

VARIABLE **MODTEMPn <*port number*> <*scale factor*>** Where n = the module position
VALID VALUES <*port number*> - *port number* - the port position to display the module temperature.
<*scale factor*> *scale factor* - the temperature scaling factor
DEFAULT VALUE 0 1.0
DATA TYPE string
DESCRIPTION Defines the module port number to display the module temperature and the temperature scaling factor. If EU is set to 1, the temperature output will be °C times the scale factor. If EU is set to 0, the temperature will be the displayed value divided by 4.

VARIABLE **NEGPTSn <*ports*> <*negpts*>** Where n = the module position number
VALID VALUES <*port*> - *may be defined as:*
port - one port
port,port - many ports
port..port - a range of ports
<*negpts*> - an integer that defines the number of master negative points. The maximum number of master negative points is 8.
DEFAULT VALUE 1..64 4
DATA TYPE string
DESCRIPTION Defines the number of master negative points for port or ports of the module n.

VARIABLE **NPRn <*pressure*>** Where n = the module position number
VALID VALUES any valid integer up to 4 digits
DEFAULT VALUE 15
DATA TYPE integer
DESCRIPTION Defines the nominal pressure range for the module installed in position n.

VARIABLE **NUMPORTSn <*ports*>** Where n = the module position number
VALID VALUES 16,32, or 64
DEFAULT VALUE 64
DATA TYPE integer
DESCRIPTION Defines the number of ports for the module n.

VARIABLE **TYPEn <*code*>** Where n = the module position number
VALID VALUES 0, 1, 2, 3, or 4
DEFAULT VALUE 0
DATA TYPE integer
DESCRIPTION This variable defines the module n type:
0 - Standard
1 - Absolute
2 - Gauge
3 - True Differential
4 - Electrical Input Module

MODULE PROFILE VARIABLES (Group P)

VARIABLE **RAD4000SN <*serial number*>**
VALID VALUES Any valid integer up to 4 digits
DEFAULT VALUE 0000
DATA TYPE Integer
DESCRIPTION The serial number of the RAD4000.
NOTE This is a read only variable

VARIABLE **SNn <*serial number*>** Where n = the module position number
VALID VALUES Any valid integer up to 4 digits
DEFAULT VALUE 0000
DATA TYPE Integer
DESCRIPTION The serial number of the module installed in slot n.
NOTE This is a read only variable

IDENTIFICATION CONFIGURATION VARIABLES (Group I)

VARIABLE **AUX <*code*>**
DEFAULT VALUE 1
DATA TYPE integer
NOTE This variable is not used in RAD4000 firmware. It is a place holder only.

VARIABLE **AUXSCHED <*code*>**
DEFAULT VALUE 1
DATA TYPE integer
NOTE This variable is not used in RAD4000 firmware. It is a place holder only.

VARIABLE **CAL <*code*>**
DEFAULT VALUE 0
DATA TYPE integer
NOTE This variable is not used in RAD4000 firmware. It is a place holder only.

VARIABLE **CALSCHED <*code*>**
DEFAULT VALUE 1
DATA TYPE integer
NOTE This variable is not used in RAD4000 firmware. It is a place holder only.

VARIABLE **CONOUT <*code*>**
DEFAULT VALUE 2
DATA TYPE integer
NOTE This variable is not used in RAD4000 firmware. It is a place holder only.

VARIABLE **DISPIN <*code*>**
DEFAULT VALUE 1
DATA TYPE integer
NOTE This variable is not used in RAD4000 firmware. It is a place holder only.

VARIABLE **ECHO <*enable*>**
VALID VALUES 0 or 1
DEFAULT VALUE 0
DATA TYPE Integer
DESCRIPTION Determines if characters received from the network or the serial host will be echoed back to the host.
0 - Echo is disabled
1 - Echo is enabled

VARIABLE **FORMAT <*code*>**
VALID VALUES 0, or 1
DEFAULT VALUE 0
DATA TYPE Integer
DESCRIPTION Determines if data are to be scrolled on the display.
0 - data are scrolled
1 - data are displayed in place, formatted for a VT100 terminal.

VARIABLE **HAVEARINC <*code*>**
DEFAULT VALUE 0
DATA TYPE integer
NOTE This variable is not used in RAD4000 firmware. It is a place holder only.

VARIABLE **HAVENET <*code*>**
DEFAULT VALUE 1
DATA TYPE integer
NOTE This variable is not used in RAD4000 firmware. It is a place holder only.

VARIABLE **IFUSER <*code*>**
VALID VALUES 0 or 1
DEFAULT VALUE 1
DATA TYPE integer
DESCRIPTION Determines the method of logging errors.
0 - All errors will be logged. Errors may only be accessed by issuing an ERROR command and cleared by issuing a CLEAR command.
1 - All errors will be displayed as they occur.

VARIABLE **NETIN <*code*>**
DEFAULT VALUE 1
DATA TYPE integer
NOTE This variable is not used in RAD4000 firmware. It is a place holder only.

VARIABLE **NETOUT <*code*>**
DEFAULT VALUE 2
DATA TYPE integer
NOTE This variable is not used in RAD4000 firmware. It is a place holder only.

VARIABLE **NL <*code*>**
VALID VALUES 0 or 1
DEFAULT VALUE 0
DATA TYPE integer
DESCRIPTION Determines the new line character(s) for all output.
0 - <CR><LF>
1 - <CR>

VARIABLE **RESCAN <*code*>**
DEFAULT VALUE 1
DATA TYPE integer
NOTE This variable is not used in RAD4000 firmware. It is a place holder only.

VARIABLE **TWOAD <*code*>**
DEFAULT VALUE 0
DATA TYPE integer
NOTE This variable is not used in RAD4000 firmware. It is a place holder only.

ID CHIP CONFIGURATION VARIABLES (Group ID)

VARIABLE **IDP *<loc> <site> <device> <mem> <name> <value>***
VALID VALUES See Below
DEFAULT VALUE Varies
DATA TYPE Integer
DESCRIPTION Sets the values in an ID Chip. This variable will be used rarely by a user. The ID chips are pre-programmed at the time of manufacture. It is recommended that a customer understand the information in the Section defining the DSAENCL ID Chip Data Format before attempting to modify a setting using this configuration variable.

- Loc — The location of the device. Valid values are 0 through 8, Where 0 can only be the Temperature A/D.
- Site — A for an A/D, M for a Module, or D for a Digital Module.
- Device — The memory device in the A/D or module. This must always be E for EPROM. The software will select the Device family based on the Name to be modified.
- Mem — The memory device type. P for PROM or E for EPROM. The Identification data stored in PROM cannot be modified by a user.
- Name — The name of the EEPROM data to be modified. Refer to the following lists of parameter names that may be modified.
- Value — The new value.

Memory Device Type P (PROM) - All Family Codes - Values may not be modified by a user

- DFC — Device Family Code
  - 0 = DSAENCL Temperature A/D Board
  - 1 = DSAENCL Pressure A/D Board
  - 2 = Pressure Scanner Module
  - 3 = DSAENCL Digital I/O Device
  - 4 = Test Fixture (BASM3200)
  - 5 = Voltage Scanner Module (EIM)
- DMC — Device Model Code
  - Family Code = 0
    - 0 = 16 Bit 100 KHz, 5V Ref.
  - Family Code = 1
    - 0 = 16 Bit 100 KHz
  - Family Code = 2
    - 0 = ZOC 3016
    - 1 = ZOC 17
    - 2 = ZOC 22
    - 3 = ZOC 23
    - 4 = ZOC 33
  - Family Code = 3
    - 0 = Remote Digital Switch, 8 channels
  - Family Code = 4
    - 0 = BASM3200
  - Family Code = 5
    - 0 = ZOC16EIM
    - 1 = ZOCEIM16
    - 2 = ZOCEIM32
- SN — Serial Number — Number 0 – 4096
- REV — Revision — Letter Code A – P
- MDATE — Manufacture Date — MM/DD/YYYY

Memory Device Type E (EEPROM) - Family Code 0

- ADCA — A/D Correction Coefficient A The A coefficient of A x^2 + Bx + C.

ADCB	A/D Correction Coefficient B	The B coefficient of A x^2 + Bx + C.
ADCC	A/D Correction Coefficient C	The C coefficient of A x^2 + Bx + C.
ADCD	A/D Correction Coefficient D	The D coefficient used in the Temperature correction algorithm.
RV	Reference Voltage	The measured voltage reference value used in the temperature calibration.
ACDATE	A/D Calibration Date	MM/DD/YYYY
SN	DSAENCL Serial Number	Number 0 – 4096
APPTYPE	DSAENCL Application Type	0 = Standalone 1 = Enclosure

Memory Device Type E (EEPROM) - Family Code 1

ADCA	A/D Correction Coefficient A	The A coefficient of A x^2 + Bx + C.
ADCB	A/D Correction Coefficient B	The B coefficient of A x^2 + Bx + C.
ADCC	A/D Correction Coefficient C	The C coefficient of A x^2 + Bx + C.
ECC	Excitation Current Correction	Actual measured excitation current (1.5 mA ideal with exact 5 V reference).
GAIN	Gain Code	0 = 2.852 Gain (Standard)
ACDATE	A/D Calibration Date	MM/DD/YYYY

Memory Device Type E (EEPROM) - Family Code 2

RTYPE	RTD Type Code	0 = Platinum 385 1= Nickel-Iron
RVALUE	RTD Value Code	RTD Type Code = 0 0 = 100 Ohm 1 = 500 Ohm 2 = 1000 Ohm RTD Type Code = 1 0 = 604 Ohm
RCORA	RTD Correction A	A term for Callendar-Van Dusen equation.
RCORB	RTD Correction B	B term for Callendar-Van Dusen equation.
RCDATE	RTD Calibration Date	MM/DD/YYYY
PCDATE	Pressure Sensor Cal Date	MM/DD/YYYY
NPR1	Nominal Pressure Range 1	Value must be in PSI
NPR2	Nominal Pressure Range 2	Value must be in PSI
VALVE	Pressure Valve Arrangement	0 – No Valve 1 – X1 2 – X2 3 – NPx (Normal Px Mode) 4 – NO (Normal Open) 5 – IP
XDUCER	Transducer Type	0 – Differential 1 – Delta 2 – Absolute

Memory Device Type E (EEPROM) - Family Codes 3, 4, and 5

No programmable Values

TEMPERATURE OFFSET VARIABLES (Group O)

VARIABLE **TEMPBn <*value*>** Where n = the module position number
VALID VALUES any real number
DEFAULT VALUE -259.7403
DATA TYPE float
DESCRIPTION The "B" term in the conversion equation used to convert temperature counts to degrees Celsius. If a module number is not specified, all modules will be displayed. This value is for a Platinum RTD(500Ω at 0°). The conversion formula is:

$$°C = TempM \times (Counts) - TempB$$

TEMPERATURE GAIN VARIABLES (Group G)

VARIABLE **TEMPMn <*value*>** Where n = the module position number
VALID VALUES any real number
DEFAULT VALUE 0.037058
DATA TYPE float
DESCRIPTION The "M" term in the conversion equation used to convert temperature counts to degrees Celsius. If a module number is not specified, all modules will be displayed. This value is for a Platinum RTD(500Ω at 0°). The conversion formula is:

$$°C = TempM \times (Counts) - TempB$$

Some ZOC modules use different RTD's for temperature measurement. The values of TEMPBx and TEMPMx may have to be modified by the user when a different RTD is used. The following table lists the other RTD's that could be installed and the values of TEMPB and TEMPM for each one.

RTD	TEMPB	TEMPM	MODULES
Nickel- Iron 604 Ω at 0°C	-198.514371	0.023559	ZOC16TC (Std.) ZOC22B (Standard) ZOC23B (Standard) DSA3016 (Std.) DSA3216 (Std.)
Platinum 100 Ω at 0°C	-259.740234	0.185290	ZOC22B (Special) ZOC23B (Special) ZOC33 (Special)
Platinum 500 Ω at 0°C	-259.740234	0.037058	ZOC33 (Standard)
Platinum 1000 Ω at 0°C	-259.740234	0.018529	ZOC22B (Special) ZOC23B (Special) ZOC33 (Special)

BOOT LOADER IP CONFIGURATION VARIABLES (Group IP)

This group contains all of the network setup variables. All of these variables may be modified using the boot loader program, the serial connection, or the ethernet connection. Changes to the variables in this group do not take effect until the AC power has been cycled.

Modifications to the variables in this group may result in one or more of the following conditions:

1. Unstable network operation.
2. Problems completing FTP file transfers.
3. Enclosure operational problems

The variables in this group are not saved when a SAVE command is issued. They may only be saved by using the SAVEIP command.

VARIABLE **IPADDR *<IP address>***
VALID VALUES IP address any valid IP address
DEFAULT VALUE 191.30.40.xxx Where xxx is the serial number of the RAD4000
DATA TYPE integer
DESCRIPTION The IP Address of the module

VARIABLE **SUBNET *<Subnet Mask>***
VALID VALUES Subnet Mask any valid Subnet Mask
DEFAULT VALUE 255.255.0.0
DATA TYPE integer
DESCRIPTION The Subnet mask for the module. The subnet mask must be configured for the network where the enclosure will be connected.

VARIABLE **MAC *<MAC Address>***
VALID VALUES MAC 000.096.093.xxx.yyy.zzz
DEFAULT VALUE 000.096.093.040.000.xxx Where xxx is the serial number of the enclosure
DATA TYPE integer
DESCRIPTION The MAC address of the module. The last three octets may be modified by a user, but it is recommended that they not be modified. The first three octets **MUST NOT** be modified. These octets represent a setting registered to Scanivalve Corp.

VARIABLE **LOGIN *<User Name>***
VALID VALUES User Name any valid character string
DEFAULT VALUE Scanivalve
DATA TYPE string
DESCRIPTION The User name for the FTP login

VARIABLE **PASSWORD *<Password>***
VALID VALUES Password any valid character string
DEFAULT VALUE Scanner
DATA TYPE string
DESCRIPTION The password associated with the user name for the FTP login

VARIABLE **LOGIN1 *<User Name>***
VALID VALUES User Name any valid character string
DEFAULT VALUE Scanivalve1
DATA TYPE string
DESCRIPTION The User name for a second FTP login. The RAD4000 will support two FTP logins.

VARIABLE **PASSWORD1 *<Password>***
VALID VALUES Password any valid character string
DEFAULT VALUE Scanner1
DATA TYPE string
DESCRIPTION The password associated with the user name for the second FTP login

VARIABLE **ALLOWANON *<code>***
VALID VALUES 0 or 1
DEFAULT VALUE 1
DATA TYPE integer
DESCRIPTION Determines the new line character(s) for all output.
0 Do not allow anonymous FTP logins
1 Allow anonymous FTP logins

VARIABLE **APP *<Application>***
VALID VALUES Application any valid Application Name
DEFAULT VALUE Rad4000.hex
DATA TYPE string
DESCRIPTION The file name of the application to run. This is the file name that is used when automatically running the application from the boot loader. It is also the file name used when using the RUN command. If this file is not found, an error is returned.

VARIABLE **GW *<IP address>***
VALID VALUES any valid IP address
DEFAULT VALUE 0.0.0.0
DATA TYPE integer
DESCRIPTION This IP address will be used to access the NTP Server if the IPNTP address setting is an IP address outside the RAD Subnet.

NETWORK ATTACHED STORAGE CONFIGURATION VARIABLES (Group NAS)

This group contains the network attached storage configuration variables. All of these variables may be modified using the boot loader program, the serial connection, or the ethernet connection.

Modifications to the variables in this group may result in one or more of the following conditions:

1. Unstable network storage operation
2. RAD4000 operational problems

The variables in this group are not saved when a SAVE , or SAVEIP command is issued. They may only be saved by using the SAVENAS command.

VARIABLE **ENNAS <*Code*>**
VALID VALUES 0, 1, or 2
DEFAULT VALUE 0
DATA TYPE integer
DESCRIPTION Enables data to the NAS.

- 0 - Data are not sent to the NAS
- 1 - Data are sent to the NAS. A sequence number will be used to construct the file name.
- 2 - Data are sent to the NAS. The time, gathered from Network Time Protocol (NTP), will be used to construct the file name.

EXAMPLE 1 If ENNAS is set to 1 and ENNTP is set to 0 or 1, a scan command will create a file on the NAS following format:

<filename from FILENAS>_xxx .dat

where: xxx is a sequence number from 000 to 999. The sequence number may be reset, or set using the Reset Sequence Number command (page 46).

EXAMPLE 2 If ENNAS is set to 2, and ENNTP is set to 0 or 1, a scan command will create a file on the NAS with the following format:

<filename from FILENAS>_yyyymmdd_hhmmss.dat

where: yyyymmdd_hhmmss is date and time the file was created. The format is <year><month><day>_<hours><minutes><seconds>.

NOTE The time will be derived from either the NAS device or a NTP server. This will be determined by the setting of GW in the IP Group. If a valid NTP IP address is set for GW, and ENNAS is set to 2, and ENNTP is set to 1, a file created on the NAS will get the time and date for the file from the NTP server at this address. If this address is set to the default setting, or an invalid NTP server address, the date and time will be derived from the NAS device.

VARIABLE **ENNTP <*Code*>**
VALID VALUES 0 or 1
DEFAULT VALUE 0
DATA TYPE Integer
DESCRIPTION Enables the Network Time Protocol (NTP).

- 0 - Network Time Protocol is disabled.
- 1 - Network Time Protocol is enabled.

VARIABLE **FILENAS <*Filename*> [fix sequence switch]**
VALID VALUES filename - any valid character string
Fix sequence switch - 0 or 1
DEFAULT VALUE Scan 0
DATA TYPE string
DESCRIPTION File name Sets the data file prefix name. The file name will be completed with either a sequence number, or the date and time as documented in the description of ENNAS.
Fix sequence switch, when set to 1, will lock the sequence number at 0000. If set to 0, the sequence number will increment with each scan.

VARIABLE **IPNAS <*IP Address*>**
VALID VALUES any valid IP address
DEFAULT VALUE 0.0.0.0
DATA TYPE integer
DESCRIPTION The IP Address of the NAS.

VARIABLE **IPNTP <*IP Address*>**
VALID VALUES Any valid IP address
DEFAULT VALUE 0.0.0.0
DATA TYPE integer
DESCRIPTION The IP Address of the NTP Server.

VARIABLE **PASSNAS <*Password*>**
VALID VALUES Password - any valid character string
DEFAULT VALUE ScannerNas
DATA TYPE string
DESCRIPTION The password associated with the user name for the login to the NAS.

VARIABLE **PATHNAS <*/Disk/Share*>**
VALID VALUES Any valid path to the NAS disk
DEFAULT VALUE /disk1/share
DATA TYPE string
DESCRIPTION Sets the path on the NAS for the data file. This value must not include the drive designation, only the path on that drive. The FTP Server in the NAS should have the data destination defined as the root directory.

VARIABLE **USERNAS <*User Name*>**
VALID VALUES User Name any valid character string
DEFAULT VALUE ScanivalveNas
DATA TYPE string
DESCRIPTION The User name for login to the NAS.

VARIABLE **UTCCOFFSET<*Offset*>**
VALID VALUES any valid number
DEFAULT VALUE 0
DATA TYPE signed integer
DESCRIPTION The time offset from Coordinated Universal Time (UTC).

REAL TIME DATA ANALYSIS GROUP CONFIGURATION VARIABLES (Group SA)

The Real Time Data Analysis Function is a special feature of the RAD Software. This feature will:

1. Output the data from the channels defined in Scan Group One as the Last Measured Value.
2. Perform a rolling average, as determined by the setting of SAACCUM, of the scan data for each channel enabled in Scan Group One only.
3. Calculate the, Maximum Value, Minimum Value, RMS Value, and Standard Deviation for each of these channels.
4. Eliminate any "outliers" of data outside the calculated standard deviation (3 sigma) from the rolling average.
5. Output a rolling average for each channel with the "outliers" excluded.
6. Output the number of overloads measured and excluded from the rolling average

The following configuration variables MUST be set for this feature to function correctly:

SET EU 1
SET ADTRIG 0
SET AVG1 1
SET FPS1 0
If BIN is set to 0, Data will be output to the TELNET port or the NAS in ASCII.
If BIN is set to 1, Data will be output to the NAS in binary.

VARIABLE **SA <*code*>**
VALID VALUES 0, 1
DEFAULT VALUE 0
DATA TYPE integer
DESCRIPTION When set to 1, Enables the Real Time Data Analysis (RTDA) Calculations.
NOTE If SA is set to 1, EU must be set to 1. RTDA Calculations will only be performed on the channels enabled in Scan Group One.

VARIABLE **SAACCUM <*average*>**
VALID VALUES 2 to 128
DEFAULT VALUE 16
DATA TYPE integer
DESCRIPTION Sets the number of averaged data frames to be accumulated for the statistical calculations. The RAD software will add the most current value to the accumulator and drop the oldest value at each new frame of data.
NOTE The setting of this variable will affect the maximum data rate while RTDA is enabled. The maximum speeds obtained in tests at Scanivalve with 512 channels and all RTDA variables enabled are shown below. Results may vary depending on the installation.

SAACCUM	DATA Hz/Ch
2	45
4	38
8	33
16	26
32	17
64	11
128	7

VARIABLE **SAROLLAVG <*code*>**
VALID VALUES 0 or 1
DEFAULT VALUE 0
DATA TYPE integer
DESCRIPTION When set to 1, Enables the output of the rolling average value of each channel enabled in Scan Group One. These data are an average of the data in the accumulator for each channel. The output value is an average of the last number of frames set by the term: SAACCUM. These data are output as Scan Group 2 in the output data file.

VARIABLE **SAMAX <*code*>**
VALID VALUES 0 or 1
DEFAULT VALUE 0
DATA TYPE integer
DESCRIPTION When set to 1, Enables the output of the maximum value of each enabled channel measured in the current accumulated data. These data are output as Scan Group 3 in the output data file.

VARIABLE **SAMIN <*code*>**
VALID VALUES 0 or 1
DEFAULT VALUE 0
DATA TYPE integer
DESCRIPTION When set to 1, Enables the output of the minimum value of each enabled channel measured in the current accumulated data. These data are output as Scan Group 4 in the output data file.

VARIABLE **SARMS <*code*>**
VALID VALUES 0 or 1
DEFAULT VALUE 0
DATA TYPE integer
DESCRIPTION When set to 1, Enables the output of the Root Mean Square value of each enabled channel calculated from the current accumulated data. These data are output as Scan Group 5 in the output data file.

VARIABLE **SASDEV <*code*>**
VALID VALUES 0 or 1
DEFAULT VALUE 0
DATA TYPE integer
DESCRIPTION When set to 1, Enables the output of the calculated Standard Deviation of each enabled channel calculated from the current accumulated data. These data are output as Scan Group 6 in the output data file.

VARIABLE **SAAVGXO <*code*>**
VALID VALUES 0 or 1
DEFAULT VALUE 0
DATA TYPE integer
DESCRIPTION When set to 1, Enables the output of the rolling average of each enabled channel calculated in the current accumulated data with the outliers and overloads excluded. These data are output as Scan Group 7 in the output data file.

VARIABLE **SAOL <*code*>**
VALID VALUES 0 or 1
DEFAULT VALUE 0
DATA TYPE integer
DESCRIPTION When set to 1, Enables the output of the number of Overloads measured and excluded from the current accumulated data for each enabled channel. These data are output as Scan Group 8 in the output data file.

VARIABLE **READMODE <*code*>**
VALID VALUES 0 or 1
DEFAULT VALUE 0
DATA TYPE integer
DESCRIPTION When set to 1, Enables the READMODE function .READMODE will only function when the following configuration variables are set::

SET SA 1
SET EU 1
SET ADTRIG 0
SET AVG1 1
SET FPS1 0

When READMODE is enabled along with the RTDA functions, a SCAN command will initiate data collection and RTDA. No data will be output until a READ command, or ? Is issued to the ERad4000. At that time a “snapshot” frame of data will be acquired and output.

NOTE If BIN is set to 0, Data will be output to the TELNET port or the NAS in ASCII.
If BIN is set to 1, Data will be output to the NAS in binary.

RAD4000 ID Chip Data Format

The RAD4000 system uses the Dallas DS2430A EEPROM chip for storing information about various system components. The information travels with the hardware, allowing the system to configure itself after power-up. The DS2430A has two memory areas; a 64 bit permanent memory that is written once during the manufacturing, and a 256 bit area that can be written multiple times.

The permanent memory area will contain information necessary to identify the device in a format that is consistent over all of our device types. The 256 bit memory area will have a device dependent format.

Permanent Memory Data Format

The permanent memory area contains a Device Family Code, a Device Model Code, a Serial Number, a Revision Code, and a Manufacture Date.

Permanent Memory 64 Bits			
Bits	Name	Description	Assigned Values
4	DFC	Device Family Code	0 = DSAENCL Temperature A/D Board 1 = DSAENCL Pressure A/D Board 2 = Pressure Scanner Module 3 = DSAENCL Digital I/O Device 4 = Test Fixture 5 = Voltage Scanner Module
4	DMC	Device Model Code	Family Code = 0 0 = 16 Bit 100 KHz, 5V Ref., Gain = 2.852 Family Code = 1 0 = 16 Bit 100 KHz Family Code = 2 0 = ZOC 3016 1 = ZOC 17 2 = ZOC 22 3 = ZOC 23 4 = ZOC 33 Family Code = 3 0 = RDS Remote Digital Switch, 8 Channels Family Code = 4 0 = BASM3200 Family Code = 5 0 = ZOC16EIM 1 = ZOCEIM16 2 = ZOCEIM32
12	SN	Serial Number	Binary Number 0 – 4096
4	REV	Revision	Letter Code A – P
16	MDATE	Manufacture Date	DDDDDMMMMYYYYYYY DDDDD = Day (1 – 31) MMMM = Month (1 – 12) YYYYYYY = Years Past 2000 (0 – 128)
24		Spare	

EEPROM Memory Data Format

The EEPROM data format is device dependent. The five device families are listed in the following tables.

RAD4000 Temperature A/D Board (Device Family = 0) EEPROM Memory 256 Bits			
Bits	Name	Description	Assigned Values
32	ADCA	A/D Correction Coefficient A	The A coefficient of $Ax^2 + Bx + C$. 32 bit floating point coefficients.
32	ADCB	A/D Correction Coefficient B	The B coefficient of $Ax^2 + Bx + C$. 32 bit floating point coefficients.
32	ADCC	A/D Correction Coefficient C	The C coefficient of $Ax^2 + Bx + C$. 32 bit floating point coefficients.
32	RV	Reference Voltage	32 bit floating point number equals measured output of voltage reference.
16	ACDATE	A/D Calibration Date	DDDDDMMMMYYYYYYY DDDDD = Day (1 – 31) MMMM = Month (1 – 12) YYYYYYY = Years Past 2000 (0 – 128)
12	SN	RAD Serial Number	Binary Number 0 – 4096
8	APPTYPE	RAD Application	Integer, Binary Number 0 - 255 0 = Standalone, (Default) 1 = Enclosure ENCL4000
92		Spare	

RAD4000 Pressure A/D Board (Device Family = 1) EEPROM Memory 256 Bits			
Bits	Name	Description	Assigned Values
32	ADCA	A/D Correction Coefficient A	The A coefficient of $Ax^2 + Bx + C$. 32 bit floating point coefficients.
32	ADCB	A/D Correction Coefficient B	The B coefficient of $Ax^2 + Bx + C$. 32 bit floating point coefficients.
32	ADCC	A/D Correction Coefficient C	The C coefficient of $Ax^2 + Bx + C$. 32 bit floating point coefficients.
32	ECC	Excitation Current Correction	32 bit floating point number equals deviation from 1.5 mA ideal with exact 5 V reference.
16	ACDATE	A/D Calibration Date	DDDDDMMMMYYYYYYY DDDDD = Day (1 – 31) MMMM = Month (1 – 12) YYYYYYY = Years Past 2000 (0 – 128)
8	GAIN	Gain Code	0 = 2.852 Gain
104		Spare	

Pressure Scanner Module (Device Family = 2) EEPROM Memory 256 Bits			
Bits	Name	Description	Assigned Values
8	RTYPE	RTD Type Code	0 = Platinum 385 1= Nickel-Iron
8	RVALUE	RTD Value Code	RTD Type Code = 0 0 = 100 Ohm 1 = 500 Ohm 2 = 1000 Ohm RTD Type Code = 1 0 = 604 Ohm
32	RCORA	RTD Correction A	A term for Callendar-Van Dusen equation. Two 32 bit floating point numbers.
32	RCORB	RTD Correction B	A and B terms for Callendar-Van Dusen equation. Two 32 bit floating point numbers.
16	RCDATE	RTD Calibration Date	DDDDDMMMMYYYYYYY DDDDD = Day (1 – 31) MMMM = Month (1 – 12) YYYYYYY = Years Past 2000 (0 – 128)
16	PCDATE	Pressure Sensor Calibration Date	DDDDDMMMMYYYYYYY DDDDD = Day (1 – 31) MMMM = Month (1 – 12) YYYYYYY = Years Past 2000 (0 – 128)
32	NPR1	Nominal Pressure Range 1	32 Bit Floating Point Number, units of PSI
32	NPR2	Nominal Pressure Range 2	32 Bit Floating Point Number, units of PSI
8	VALVE	Pressure Valve Arrangement	0 = None 1 = X1 2 = X2 3 = NPX 4 = NO 5 = IP
8	XDUCER	Transducer Type	0 = Differential 1 = Delta 2 = Absolute 3 = True Delta P 4 = EIM
64		Spare	

RAD4000 Digital I/O Device (Device Family = 3) EEPROM Memory 256 Bits			
Bits	Name	Description	Assigned Values
256		Not Used	

Test Fixture (Device Family = 4) EEPROM Memory 256 Bits			
Bits	Name	Description	Assigned Values
256		Not Used	

Voltage Scanner (Device Family = 5) EEPROM Memory 256 Bits			
Bits	Name	Description	Assigned Values
256		Not Used	

Network Attached Storage (NAS) Operation

When the variable: ENNAS is set to 1 or 2, all ASCII or BINARY data are directed to the NAS via FTP. Binary files will have the extension: .BIN. ASCII files will have the extension: .TXT.

The setting of ENNAS will determine the construction of the file name.

When ENNAS is set to 1, a sequence number is used to construct the file name.

For Binary (BIN = 1), the file name will be the file name prefix as set by the variable: FILENAS and a sequence number set by the software. The format is:

<file name prefix>_SSSS.BIN

For ASCII (BIN = 0), the file name will be the file name prefix as set by the variable: FILENAS and a sequence number set by the software. The format is:

<file name prefix>_SSSS.TXT

The sequence number is maintained in the RAD4000 and saved to a file named: SSN,CFG. The save to SSN.CFG is automatic and not part of the SAVE command group. This file is maintained on the Micro SD. If this file is not found the sequence will start at 0000.

NAS Setup for use with a RAD4000

When a NAS is used with a RAD4000, it must be set up as a FTP Server. A user must consult the documentation for the NAS being used to insure proper operation.

Local Host Computer Setup as a NAS

A Local/Host computer, such as a Laptop, may be used as a NAS for high speed data storage. In order for the data to be transferred, the computer must be set up as a FTP Server. FTP Server software must be set up and running before a SCAN command is issued. A procedure to install and set up a typical FTP Server software is included in the Special Procedures Section of the Hardware manual.

Scanivalve DSP Boot Loader

The Scanivalve DSP Boot Loader's main function is to allow the user to easily upload the Enclosure 4000 application via FTP. The boot loader runs the FTP server. It has been tested on Fire Fox FTP and Internet Explorer drag and drop.

Any additional file transfer protocols or additional FTP client support modification will be made solely to the application.

FTP

The FTP server supports the following FTP commands prior to login:

USER	Allows the user to enter the user's name. Anonymous is allowed.
PASS	Allows the user to enter the password.
QUIT	Disconnects from the FTP server.

The FTP server supports the following FTP commands prior to login after login:

RETR	Initiates a file transfer from the enclosure to the host.
STOR	Initiates a file transfer from the host to the enclosure.
PASV	Sets up data port so client can connect to server's port.
LIST	Returns a directory listing of the files stored on the enclosure
SIZE	Returns the size in bytes of the file.
DELE	Deletes the file.
NOOP	No operation. Mostly used by the client as an "are you still there" command.

Only ASCII type of transfer is supported. Only passive data connection is supported. This allows data to be transferred without the server initiating a connection to the client. This could cause firewall problems.

Boot Loader and Application File System

Filenames are limited to the 8.3 format with no spaces allowed. Only one drive is supported.

Because the Enclosure does not have a time and date clock all files created by the enclosure will have a date of Aug 8, 2008

No subdirectories are supported, however, if a file path is included in the file specification only the file name portion is used. The file is written in the root directory of the drive.

Up to 1024 files are allowed or 2GB of data.

DIP Switch Settings

The processor board has 4 DIP switches that affect the operation of the software. These switches are only read at power up. Changes to the dip switches are not effective until the power is cycled.

SW1	When this switch is on automatically boots the application on power up.
SW2	When this switch is on the boot loader will run in the debug mode. Debug output is directed to the COM2 serial port.
SW3	When this switch is on the boot loader and application uses the COM2 serial port for communication to other devices. When this switch is off the COM2 serial port is used as host communication. COM1 is only used for device communication. COM1 is the top serial connection.
SW4	Spare

Host Communication

Commands are issued to the enclosure and response is returned from the enclosure via either the COM1 serial port or the Ethernet connector. The boot loader returns the command information to the host that it received its command. That is, when the command is received from the network it is returned to the network. When it is received from the COM1 serial port it is returned to COM1 serial port.

The network supports TCP/IP connection using Telnet or HyperTerminal

Commands

When a command is completed, the prompt character, the greater than character “>”, is output proceeded by a carriage return and line feed.
The commands listed below are supported by the boot loader and the executable program, unless otherwise noted. They may be viewed and modified in the ENCL4000 executable program.

VER	Returns the version of the Boot Loader **NOTE**: This command is available in the boot loader only. It must not be confused with the VER command in the application
FORMAT	Formats the SD Flash to all 0’s **NOTE**: This command is available in the boot loader only.
LIST IP	Returns the configuration variable settings of the IP group
SET <parameter>	Sets the indicated parameter
IPADD <IP address>	Sets the IP address of the enclosure. If IPADD is changed, the power must be cycled to take effect.
SUBNET <mask>	Sets the subnet address of the enclosure. If SUBNET is changed, the power must be cycled to take effect.
MAC <MAC address>	Sets the MAC address for the enclosure. If MAC is changed, the power must be cycled to take effect. **NOTE :** This variable should not be modified
LOGIN <user name>	Sets the user name for FTP login.

PASSWORD <password> Sets the password associated for LOGIN

LOGIN1 <user name> Sets the user name 1 for FTP login.

PASSWORD1 <password> Sets the password associated for LOGIN name1

LOGINNAS <name> Sets the name for login to the NAS. The boot loader does not access the NAS (Network Attached Storage) device. This is place in this group for compatibility with the IP group in the application.

PASSWORDNAS <password> Sets the password associated with LOGINNAS name

IPADDNAS <IP address> Sets the IP address of the NAS

APP <application file name> Sets the file name of the application to run. This is the file name that is used when automatically running the application from the boot loader. It is also the file name used when using the RUN command. When this file is not found the application does not run and an error is returned.

SAVE [<file name>] Saves the configuration variables to the working directory. When an optional file name is entered, it saves the IP group settings to that file name.

TYPE <file name> Lists the contents of the named file.

LOAD <file name> Loads the named file into the LIST IP configuration variables.
NOTE: This command is a debug command.

DIR Lists the files on the SD card.

DEL<file name> Deletes the file name

DIP Reads and shows the settings of the DIP switch. The following is returned:
DIP settings Auto Run Application 0 Debug 0 No Serial Host 0 Spare 0
1 indicates on, 0 indicates off
NOTE: This command is available in the boot loader only.

RUN Runs the application named in the SET APP setting.
NOTE: This command is available in the boot loader only.

RAD4000 Scan Function

When a SCAN function is initiated, the RAD4000 will scan all of the channels in the modules enabled in the software. All modules are scanned in parallel. Each channel in a module will be accessed at the rate set in the configuration variable, PERIOD. Data from each channel are accumulated in a buffer until the AVG term is met. The data from each channel are averaged and then output as a FRAME. This process will continue until the number of frames set in the variable, FPS, have been output, or a STOP command is received.. When FPS has been met, or a STOP command received, the Scan function will stop and the RAD4000 will return to the READY mode. If FPS is set to 0(zero), the SCAN function will continue indefinitely until a STOP command is received. A STOP Command may be entered by typing STOP from the Local or remote keyboard, or by pressing the Escape Key on either input.

Two configuration variables, ADTRIG and SCANTRIG, determine how the SCAN function will be implemented.

Internal Trigger

When these variables are set to 0 (disabled), the SCAN function will be controlled by an internal clock trigger. The SCAN function will be initiated by a SCAN command issued from the RAD4000 computer or an external Host computer. Scanning will commence approximately 5 milliseconds after the SCAN command is received. Each Frame will be acquired as soon as the previous Frame acquisition is complete. The SCAN function will remain active until FPS is met or a STOP Command is received.

External Trigger

The RAD4000 SCAN function may be controlled with external triggers. The settings of SCANTRIG and ADTRIG determine how the SCAN function will be initiated and how each Frame will be acquired. ADTRIG and SCANTRIG cannot be enabled at the same time.

When ADTRIG is set to 1(enabled), the SCAN function will be initiated by the SCAN command. The RAD4000 will enter the SCAN mode and wait for a hardware or software trigger. When a trigger is received, the RAD4000 will acquire and output one averaged Frame of data and re-enter the WTRIG mode. Multiple trigger pulses received during a Frame Scan will be ignored. When a frame has been output, the next trigger will repeat the process. This will continue until the Frames per Scan Variable has been satisfied or a STOP command is received. If ADTRIG is set to 1, SCANTRIG must be set to 0.

When SCANTRIG is set to 1(enabled), the SCAN function will be initiated by the DINSCAN digital input. When a hardware trigger is received, the RAD4000 will enter the SCAN mode, acquire and output averaged Frames of data until the Frames per Scan Variable has been satisfied or a STOP command is received. Multiple trigger pulses received after the first trigger will be ignored. When Frames per Scan has been satisfied, the RAD4000 will exit the SCAN mode and return to the READY mode. Another hardware trigger will repeat the process. A software trigger will not initiate this process. If SCANTRIG is set to 1, ADTRIG must be set to 0.

Hardware Trigger

The Hardware Trigger input is optically isolated to prevent grounding problems. It is a TTL level, edge sensing device. It requires a minimum signal of 9 Vdc @ 6.5 mA. It may accept voltages as high as 15 Vdc. The external trigger input is on pins 8 and 9 of the RAD4000 Power input connector.

Software Trigger

The Software Trigger is a <TAB> character, or Ctrl I, or the TRIG command.

RAD4000 Fast Scan Mode

The speed limitation of a RAD in “normal mode” is largely governed by the shortest time that a ZOC module can switch between channels and still provide accurate pressure data. For a ZOC33, with 64 channels, this time is nominally 25µs yielding a per-channel scan rate of 625 Hz. For a ZOC22, with 32 channels, this time is nominally 50µs yielding a per-channel scan rate of 625 Hz, but with half the channel count compared to a ZOC33.

“Fast Scan” mode can increase the per-channel scan rate by not scanning the module’s high numbered channels and re-sampling the module’s lower number channels. The split between low and high channels may be configured by the fast mode maximum port value.

The range of ports, in a module, to be sampled always starts at one. The maximum port, to be sampled, is determined by the value of SGENABLE1.

Ports greater than the fast mode maximum port, are never sampled. Once the fast mode maximum port has been sampled, the RAD resets its port address selection lines and starts sampling at port one again. This cycle continues through the scan process.

Configuring Fast Scan Mode

Fast mode scanning may only be set up for Scan Group 1. None of the other Scan Groups will function in this mode. All other scan groups MUST be disabled when fast mode scanning is enabled. The configuration variable SGENABLE1 allows the user to disable the scan group, scan in normal mode, or scan in fast mode. When the SGENABLE1 modifying parameter is 8, 16 or 32, fast scan mode is enabled. An error will be generate if a channel in the channel list would not be sampled because of the fast scan mode.

Example of Fast Scan Mode

This example shows how the frame number, sampled ports and scan rate are affected by fast scan mode. The example system consists of one ZOC22 module in position one, with the following settings:

```
PERIOD 50
CHAN1 1-1..1-32
```

The table below shows the data rate when SGENABLE1 is set to 1 or 16.

DATA RATE COMPARISON		
	Normal Mode	**Fast Scan Mode**
SGENABLE1	1	16
PERIOD	50	50
RATE CALCULATION	1/(50 x 32chan)	1/(50 x 16chan)
RATE	625Hz	1250Hz

ERAD4000 Data Selection Chart

This chart shows all valid data setups for versions 2.00 and higher

Data Destination	Data Type	RTDA	Packet Type	Trig	ENNAS	EU	SA	BIN	FORMAT	ADTRIG	BINADDR
NAS Date/Time FileName	Pressure	Yes	Binary	Int	2	1	1	1	X	0	X
			ASCII	Int	2	1	1	0	0	0	X
		No	Binary	Int	2	1	0	1	X	0	X
				Ext	2	1	0	1	X	1	X
			ASCII	Int	2	1	0	0	0	0	X
				Ext	2	1	0	0	0	1	X
	Counts	No	Binary	Int	2	0	X	1	X	0	X
				Ext	2	0	0	1	X	1	X
			ASCII	Int	2	0	X	0	0	0	X
				Ext	2	0	0	0	0	1	X
NAS Sequence FileName	Pressure	Yes	Binary	Int	1	1	1	1	X	0	X
			ASCII	Int	1	1	1	0	0	0	X
		No	Binary	Int	1	1	0	1	X	0	X
				Ext	1	1	0	1	X	1	X
			ASCII	Int	1	1	0	0	0	0	X
				Ext	1	1	0	0	0	1	X
	Counts	No	Binary	Int	1	0	X	1	X	0	X
				Ext	1	0	0	1	X	1	X
			ASCII	Int	1	0	X	0	0	0	X
				Ext	1	0	0	0	0	1	X
UDP	Pressure	Yes	Binary	Int	0	1	1	1	X	0	>0
		No	Binary	Int	0	1	0	1	X	0	>0
				Ext	0	1	0	1	X	1	>0
	Counts	No	Binary	Int	0	0	X	1	X	0	>0
				Ext	0	0	0	1	X	1	>0
TCP Telnet	Pressure	Yes	ASCII	Int	0	1	1	0	0	0	X
		No		Int	0	1	0	0	0	0	X
				Ext	0	1	0	0	0	1	X
				Int	0	1	0	0	1	0	X
				Ext	0	1	0	0	1	1	X
	Counts	No		Int	0	0	X	0	0	0	X
				Ext	0	0	0	0	0	1	X
				Int	0	0	X	0	1	0	X
				Ext	0	0	0	0	1	1	X
TCP Binary	Pressure	No	Binary	Int	X	1	0	1	0	0	0
				Ext	X	1	0	1	0	1	0
	Counts	No		Int	X	0	0	1	0	0	0
				Ext	X	0	0	1	0	1	0

Notes for the Data Selection Chart

1. An error will be issued if a combination not listed above is selected.
2. An error will be issued if NAS Date-Time is selected and a NTP server is not found.
3. The ERAD will not SCAN in a non-valid combination.
4. When RTDA is enabled, AVG1will be forced to 1 regardless of the setting.
5. An error will be issued if the channel list is empty.
6. ZC should be set to 1, except during troubleshooting
7. An error will be issued if SA is set to 1 and ADTRIG is set to 1.
8. The host computer firewall must be set to permit the NTP to work correctly.
9. An error will be issued if READMODE is set to 1, SA is set to 1, and FPS is not set to 0.
10. An X indicates that the setting may be any valid setting for that parameter.

RAD4000 Profile File

When the RAD4000.EXE program is started, including a RESTART, a RAD4000 Profile file will be generated. This file is named RAD4000nnn.DPF, where nnn is the serial number of the RAD4000. This file is an ASCII text file and contains the following information:

RAD4000 Serial Number: <serial number><CR><LF>
Module Serial Number in Position 1: <module serial number><CR><LF>
Module Serial Number in Position 2 <module serial number><CR><LF>
Module Serial Number in Position 3: <module serial number><CR><LF>
Module Serial Number in Position 4: <module serial number><CR><LF>
Module Serial Number in Position 5: <module serial number><CR><LF>
Module Serial Number in Position 6: <module serial number><CR><LF>
Module Serial Number in Position 7: <module serial number><CR><LF>
Module Serial Number in Position 8: <module serial number><CR><LF>

If a RAD4000nnn.DPF file exists when the RAD4000.EXE program starts up, it will be overwritten by the information obtained from the polling of the ID chips.

Module Profile File

Each module has a unique Module Profile File which is created during the initial calibration of the module. This file is updated each time a SAVE command is executed by the RAD4000. These files are read when the RAD4000.EXE program is started, including RESTART.

The information contained in the Module Profile File is:

REMn 1 <comment><CR><LF>
REMn 2 <comment><CR><LF>
REMn 3 <comment><CR><LF>
REMn 4 <comment><CR><LF>
SET TYPEn <module type><CR><LF>
SET NUMPORTSn <number of ports><CR><LF>
SET NPRn <Nominal Full Scale Pressure Value><CR><LF>
SET TEMPMn <temperature gain factor><CR><LF>
SET TEMPBn <temperature offset factor><CR><LF>
SET LPRESSn <channels> <pressure><CR><LF>
SET HPRESSn <channels> <pressure><CR><LF>
SET NEGPTSn <channels> <number of negative points><CR><LF>
INSERT <temperature> <channels> <pressure> <pressure counts> M<CR><LF>
INSERT <temperature> <channels> <pressure> <pressure counts> M<CR><LF>
: : : : : : : : : : : : : : : : :
INSERT <temperature> <channels> <pressure> <pressure counts> M<CR><LF>

Binary Scan Packets

Packets without Module-Port Information

Byte	Name	Value
0	Binary ID	1 = EU (EU =1) 2 = Raw (EU = 0)
1	Group ID	1 to 8 If Tag Bit is set, 80 Hex will be merged with the Scan Group Number. (81 to 88)
2 and 3	Number of Channels	0 to 512
4 through7	Frame Number	1 to 2^{32}
8 through 11	Time in milliseconds	0 to 2^{32}
12 through 15	Channel 1 Data	4 bytes per channel
16 through19	Channel 2 Data *	4 bytes per channel
: : : : : :	: : : :	: : : :
(4n + 8) through (4n + 11)	Channel n Data *	4 bytes per channel

* Optional based on Number of Channels setting.

Packets with Module-Port Information

Byte	Name	Value
0	Binary ID	3 = EU with channels (EU =1) 4 = Raw with channels (EU = 0)
1	Group ID	1 to 8 If Tag Bit is set, 80 Hex will be merged with the Scan Group Number. (81 to 88)
2 and 3	Number of Channels	0 to 512 (Byte 2 is LSB)
4 through7	Frame Number	1 to 2^{32}
8 through 11	Time in milliseconds	0 to 2^{32}
12 through 19	Channel 1 Data	Data (4 bytes), Module (2 bytes), Port (2 bytes)
20 through 27	Channel 2 Data *	Data (4 bytes), Module (2 bytes), Port (2 bytes)
: : : : : :	: : : :	: : : :
(8n + 4) through (8n + 11)	Channel n Data *	Data (4 bytes), Module (2 bytes), Port (2 bytes)

* Optional based on Number of Channels setting.

NOTE This packet is not supported in Versions 1.00 through 2.01

When BIN is set to 1 and the BINADDR is set to a value other than zero, the data from the AUX or CAL commands are converted to a BINARY format and output over the UDP binary port specified in the BINADDR variable. The data format is:

<ID byte> - 1 byte, the value will be 1 if the data are from a calibrator or 2 if the data are from an auxiliary unit.

<pressure> - 4 bytes of floating point binary pressure data

ASCII Data Transfer

FUNCTION DESCRIPTION	BYTES	DATA TYPE	VALUE
ASCII Data (The first two bytes must **NOT** be 1Hex through 9Hex). Refer to the Command Section of this manual for the proper Command return formats.	Varies	String	Unique to Packet. Each line is terminated with a CR, LF, CR-LF, or LF-CR.

EXAMPLES:

The following shows the format of the ASCII DATA portion of the List Packet in response to a LIST MASTER:

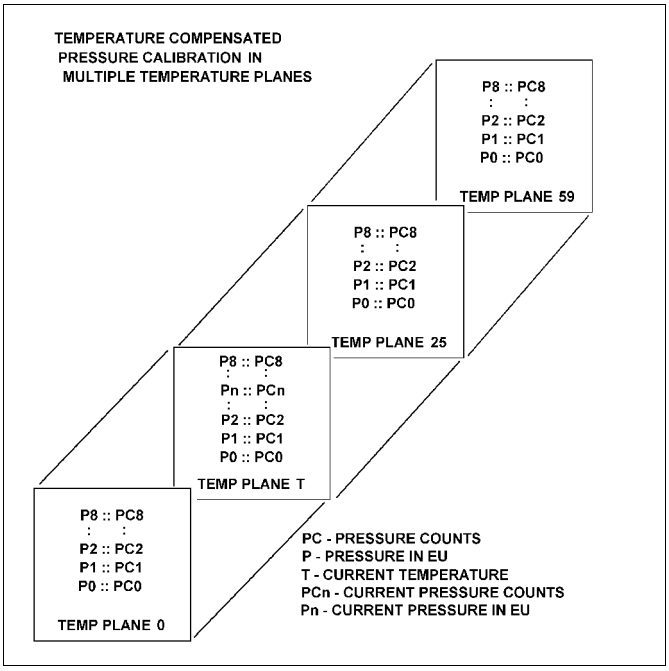
INSERT <temp> <chan> <press> <press counts> /M
INSERT <temp> <chan> <press> <press counts> /M
: : : :
INSERT <temp> <chan> <press> <press counts> /M

When a LIST ALL is commanded, Master and Calculated planes are listed. The Master items will have a /M suffix while the Calculated items will have a /C. The following is an example of a LIST ALL command:

INSERT <temp> <chan> <press> <press counts>/M
INSERT <temp> <chan> <press> <press counts>/C
: : : :
INSERT <temp> <chan> <press> <press counts>/M

For examples of the ASCII Packets returned from a SCAN Command, refer to the SCAN Command .

APPENDIX A - TEMPERATURE COMPENSATED PRESSURE CONVERSION



FORMULAS:

Pressure interpolation within current temperature plane:

$$P_{n_t} = \frac{1}{PC_{1_t} - PC_{0_t}}((PC_{1_t} - PC_{n_t})P_{0_t} - (PC_{0_t} - PC_{n_t})P_{1_t})$$

Calculation of entries in current temperature plane:

$$P_t = \frac{1}{T_{25} - T_0}((T_{25} - T)P_{0_0} - (T_0 - T)P_{0_{25}})$$

APPENDIX B - ENGINEERING UNIT CONVERSION CONSTANTS

UNITSCAN Setting	Engineering Unit	PSI to EU 1 psi =	EU to PSI 1 EU =
ATM	Atmospheres	0.068046 A	14.6960 psi
BAR	Bars	0.068947 b	14.5039 psi
CMHG	Centimeter of Mercury	5.17149 cmHg	0.193368 psi
CMH2O	Centimeter of Water	70.308 cmH_2O	0.014223 psi
DECIBAR	Decibar	0.68947 db	1.4504 psi
FTH2O	Foot of Water	2.3067 ftH_2O	0.43352 psi
GCM2	Gram per square Centimeter	70.306 g/cm^2	0.014224 psi
INHG	Inch of Mercury @ 0°C	2.0360 inHg	0.491159 psi
INH2O	Inch of Water @ 4°C	27.680 inH_2O	0.036127 psi
KGCM2	Kilogram per square Centimeter	0.0703070 kg/cm^2	14.2235 psi
KGM2	Kilogram per square Meter	703.069 kg/m^2	0.0014223 psi
KIPIN2	kips per square inch(ksi)	0.001 kip/in^2	1000.0 psi
KNM2	Kilonewton per square Meter	6.89476 kN/m^2	0.145038 psi
KPA	Kilopascal	6.89476 kPa	0.145038 psi
MBAR	Millibar	68.947 mb	0.014504 psi
MH2O	Meter of Water	0.70309 mH_2O	1.42229 psi
MMHG	Millimeter of Mercury	51.7149 mmHg	0.0193368 psi
MPA	Megapascal	0.00689476 Mpa	145.038 psi
NCM2	Newton per square Centimeter	0.689476 N/cm^2	1.45038 psi
NM2	Newton per square Meter	6894.76 N/m^2	0.000145038 psi
OZFT2	Ounce per square Foot	2304.00 oz/ft^2	0.000434028 psi
OZIN2	Ounce per square Inch	16.00 in/ft^2	0.062500 psi
PA	Pascal	6894.76 Pa	0.000145038 psi
PSF	Pound per square Foot	144.00 lb/ft^2	0.00694444 psi
TORR	Torr	51.7149 T	0.0193368 psi

APPENDIX C - CHANGE LIST

This section contains change information to assist a user in determining the differences between different versions of software.

Version 1.00 - February 2010
First release.

Version 1.01 - March 2010
Corrected minor bugs in
TGRAD
A2DCALC
IDPWRITE

Version 1.02 - Not Released

Version 1.03 - April 2010
Corrected bugs in the following variables to improve reliability and accuracy.
TGRAD
CALZ
Corrected a bug in the conversion calculation that caused errors near zero

Version 1.04 - June 2010
Corrected a bug in the external frame trigger
Corrected timing issues to insure 625 samples/channel/second
Corrected an error in the data for all channel ones in Frame 1
Added support of MODTEMP
Added support of the ERROR buffer
Added support of IFUSER
Added support of the CLEAR command
Modified the method of setting the value of CALPER

Version 2.00 - November 2010
Added Real Time Data Analysis Group
Added support of a second TCP socket. If a second socket is opened, the original socket will be dropped.

Version 2.01 - April 2011
Corrected a bug in the calculation of the MPBS variable.
Corrected a bug in the A/D temp calculation for temperatures below 0 degrees C
Corrected a bug that prevented the use of Filezilla as the FTP server for NAS operation
Added a Binary Scan Header.
Corrected several bugs in error reporting based on the setting of ENNTP and ENNAS.
Increased number of temperature planes to 22
Load CV.GPF file before MPF files to insure correct MPBS value

Version 2.02 - June 2011

Corrected several compatibility issues between RAD4000 and RAD3200

LOGIN commands will not cause errors

SET FILEOUT will not cause errors

Added Commands

BLVER

CLEARERROR

FILE

GETERROR

SAVE CV

Enabled MODTEMP

Enabled binary packets 3 and 4

Corrected a bug in the Time Stamp output

Improved the External Trigger function when data output is set to Binary

Corrected a bug in CALZ that offset the value of the first scanned channel at Periods faster than 50 microseconds.

Added Rename capability to the FTP operation. Files on the Micro SD card may now be renamed.

Improved ASCII data transfer rate.

Version 2.03 - June 2011

Corrected a bug in the LIST SYS command. The data from this command was being returned twice.

Version 2.04 - July 2011

Corrected a bug in the CALINS software module

Added a switch to the term FILENAS that, when set to 1, will lock the file sequence number at 0000. When the switch is set to 0, the sequence number will increment with each successive scan.

Added a FTP server connection retry error to the GETERROR counter.

Corrected the definition of Period in the binary scan header.

Corrected the module channel definition in the binary scan header.

Version 2.05 - May 2012

Added the A2DTCAL, A2DTCALC and LIST A2DTCOR variables to allow A/D calibration.

Version 2.06 - May 2012

Resolved a bug with temperature A/D coefficients were read from the EPROM, causing the temperature A/D to rail. Change the minimum setting for the CALZDLY variable from 5 to 1.

Version 2.07 - June 2012

Increased the ID chip programming dwell time from 3.2ms to 10ms.

Version 2.08 - July 2012

Fixed a bug that caused excessive '>' characters to be returned from a reboot command.

Version 2.09 - October 2012

Added a Wiznet FIFO fill test for binary output to increase system stability. Added fast scan mode functionality. Delayed the serial connection prompt output unit the boot processes is complete.

Fixed a bug that canceled a SAVE in progress if the ethernet connection was terminated.