DSM4000

DIGITAL SERVICE MODULE

OPERATION & SOFTWARE MANUAL

Scanivalve

PREFACE

WARNINGS, CAUTIONS AND NOTES

WARNING

The WARNING! symbol indicates that danger of injury for persons and the environment and/or considerable damage (mortal danger, danger of injury) will occur if the respective safety precautions are not taken.

CAUTION

The CAUTION ! symbol indicate danger for the system and material if the respective safety precautions are not taken.

ESD PROTECTION REQUIRED

The ESD note symbol indicates that proper precautions for handling Electrostatic Sensitive Devices needs to be taken when performing the related operation. This includes the use of grounded work surfaces and personal wrist straps to prevent damage to sensitive electronic components.

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Scanivalve Corporation, Liberty Lake, Washington, hereafter referred to as Seller, warrants to the Buyer and the first end user that its products will be free from defects in workmanship and material for a period of twelve (12) months from date of delivery. Written notice of any claimed defect must be received by Seller within thirty (30) days after such defect is first discovered. The claimed defective product must be returned by prepaid transportation to Seller within ninety (90) days after the defect is first discovered. Seller's obligations under this Warranty are limited to repairing or replacing, at its option, any product or component part thereof that is proven to be other than as herein warranted.

Surface transportation charges covering any repaired or replacement product or component part shall be at Seller's expense; however, inspection, testing and return transportation charges covering any product or component part returned and redelivered, which proves not to be defective, shall be at the expense of Buyer or the end user, whichever has returned such product or component part.

This Warranty does not extend to any Seller product or component part thereof which has been subjected to misuse, accident or improper installation, maintenance or application; or to any product or component part thereof which has been repaired or altered outside of Seller's facilities unless authorized in writing by Seller, or unless such installation, repair or alteration is performed by Seller; or to any labor charges whatsoever, whether for removal and/or reinstallation of the defective product or component part or otherwise, except for Seller's labor charges for repair or replacement in accordance with the Warranty. Any repaired or replacement product or component part thereof provided by Seller under this Warranty shall, upon redelivery to Buyer, be warranted for the unexpired portion of the original product warranty.

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OPERATION OF LAW OR OTHERWISE, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, AND IN NO EVENT SHALL SELLER BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

In the event of a failure:

1) Notify Scanivalve Corporation, Customer Service Department. Include model number and serial number. On receipt of this information, service data or shipping instructions will be forwarded. This may be transacted by telephone or e-mail.

2) On receipt of shipping instructions, forward the product, transportation prepaid. Repairs will be made and the product returned.

3) All shipments should be made via "Best Way". The product should be shipped in the original packing container or wrapped in protective material and surrounded by a minimum of four (4) inches of a shock absorbing material.

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If the product must be shipped, whether being returned to Scanivalve or relocated to another location it must be packaged properly to minimize the risk of damage. The recommended method of packing is to place the instrument in a container, surrounded on all sides with at lease four inches of shock attenuating material such as Styrofoam peanuts.

Important Notice

Please note that the product specifications and other information contained in this manual are subject to change without notice. Scanivalve Corporation makes an effort and strives to provide complete and current information for the proper use of the equipment. If there are any questions regarding this manual or the proper use of the equipment, contact Scanivalve Corporation.

Contact Information

If there are any questions or concerns regarding any Scanivalve product please do not hesitate to contact us at the following:

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Liberty Lake, WA 99019
Telephone: (800)935-5151   (509)891-9970
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www.scanivalve.com

Scanivalve Corporation is an ISO9001:2008 certified company.

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SECTION 1: SPECIFICATIONS

GENERAL SPECIFICATIONS

Size (WxHxD)	9.00" x 3.653" x 4.00"
	(228.6cm x 92.77cm x 101.6cm)
Weight	4.10 lbs
	(1.86 kg)
Module Inputs	8
Channel Inputs	512 Maximum
	(any combination of ZOC modules)

Data Acquisition Rate

Binary UPD	625 (Hz/channel)
Binary TCP/IP	500 (Hz/channel)
ASCII TCP/IP	15 (Hz/channel)
	(depending on configuration)

Interface Connectors

ZOC Interface	Cannon MDM-15SH003K
Digital Input	PT06A-12-10S
Digital Output	PTO6A-12-10P
Power	PTO6A-8-3S-SR

A/D Resolution	16 bits
Power Consumption	44 Watts
Digital Inputs Available	4
Digital Outputs Available	5
Digital Output Capacity	18 Watts per channel

Communication Protocol

Primary	Ethernet 10/100Base-T
Configuration	RS232

Communication Configurations

Ethernet	TCP/IP, UDP, IEEE1588
RS232	9600 BAUD, 8 data bits, 1 stop bit, no parity
	(used only for configuration)
ARINC429	8 channels - output only
	(optional)

ENVIRONMENT SPECIFICATIONS

Temperature

Operation	0°C to 60°C
Storage	-40°C to 85°C

Humidity

Operation	5 to 95% RH, Non-Condensing
Storage	5 to 95% RH, Non-Condensing

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DIGITAL IN

POWER INPUT:
9-36VDC 44VA

DIGITAL OUT

ZOC CONNECTOR

[120.65]
4.750

DETAIL A

[13.10]
.516

[4.76]
.188

ARINC 429

[228.60]
9.000

[190.50]
7.500

[209.55]
8.250

POWER SWITCH
PUSH-PUSH

SERIAL PORT (RS-232)
CONFIGURATION ONLY

[50.80]
2.000

[76.20]
3.000

[101.60]
4.000

READY
SCAN
POWER

DETAIL B

[92.77]
3.653

ETHERNET 10/100BASE T
RJ45 CONNECTOR
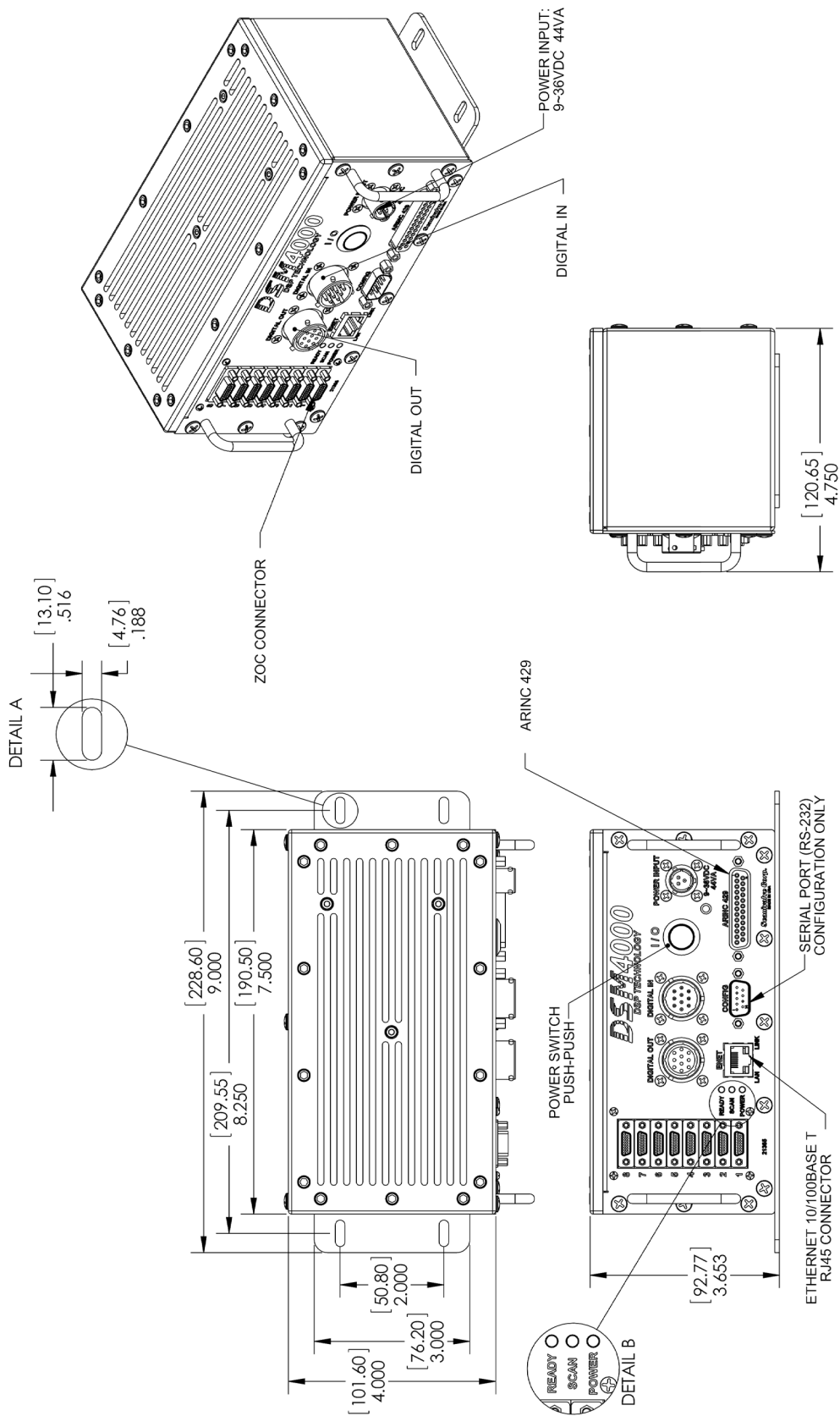
FIGURE 1.1 - PHYSICAL SPECIFICATIONS DRAWING

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SECTION 2: INTRODUCTION

GENERAL DESCRIPTION

The DSM4000 module is designed to be a complete pressure data acquisition system when used in conjunction with Scanivalve ZOC Pressure Scanning modules. The DSM4000 operates on either an Ethernet or an ARINC429 network. Each DSM4000 can accept up to 8 ZOC Electronic Pressure Scanners, each with up to 64 inputs.

The DSM4000 contains 9 A/D's, 8 to measure pressure inputs and one to measure temperature inputs. The DSM4000 also provides four digital outputs and accepts four digital inputs.

When a ZOC module is to be used with a DSM4000, it first must have an RTD installed so a three dimensional Pressure/Temperature characterization table can be generated. These coefficients can then be downloaded into the DSM4000 and used to generate Engineering Unit data.

The DSM4000 is available in two configurations. Ethernet only and ARINC429. The ARINC429 version has both connections. For more information, please contact Scanivalve Corp, Product Support Department.

ENVIRONMENTAL CONSIDERATIONS

DSM4000 modules are constructed with a rugged, corrosion resistant stainless steel case. This case is designed with withstand normal industrial, flight test, educational, wind tunnel or similar applications. The case is splash resistant, but not water proof. If any moisture gets spilled or splashed on the DSM module, wipe it dry immediately to prevent damage to the module. The DSM module should not be mounted outdoors.

The DSM4000 includes a heavy-duty mounting plate that can either be installed on the bottom of the module or on the rear face of the module. The DSM4000 and can be mounted in any orientation.

The DSM4000 module should not be mounted in a location where it may be subjected to extreme temperature shifts or ambient temperatures outside of the specified operating range of the module. Keep in mind that the internal temperature of the module will run approximately ten degrees warmer than ambient temperature.

DSM4000 FRONT PANEL

All inputs and outputs on the DSM4000 are located on the module's front panel.

DSM POWER INPUT

This is the main power input. All DSM4000 Series modules operate from +9 to 36 Vdc. See "DSM4000 Power Requirements" on page 13 for more information.

DSM POWER BUTTON

This switch controls the power to the entire DSM module. When the module is powered up, the 'Power' LED is illuminated.

DSM POWER INDICATOR

This green led that will be illuminated when the main DSM power is on.

SCAN INDICATOR

This red led will be illuminated when the DSM is in the SCAN mode.

READY INDICATOR

This green led will be illuminated when the DSM is in the READY mode.

ZOC INPUT(S)

The DSM4000 has eight (8) ZOC inputs vertically along the left side of the module.

DIGITAL INPUT

This connector is used to input up to five(5) digital inputs to the DSM4000. Reference "Digital I/O Connections" on page 15 for more information.

DIGITAL OUTPUT

This connector is used to output up to five(5) digital outputs. Reference "Digital I/O Connections" on page 15 for more information.

ETHERNET CONNECTION

This is a RJ45 connection for a 10/100 Base-T Ethernet connection. The DSM will auto select the speed based on the network. "Ethernet Connection" on page 14 for more information.

CONFIG PORT

The Configuration Port is a Serial RS-232 port used for configuring the DSM module. See "Configuration Connection" on page 14 and "Configuration Port" on page 20 for more information.

ARINC429 CONNECTION (OPTIONAL)

One ARINC capable DSM4000's a single ARINC429 connector is located on the bottom right corner of the module.
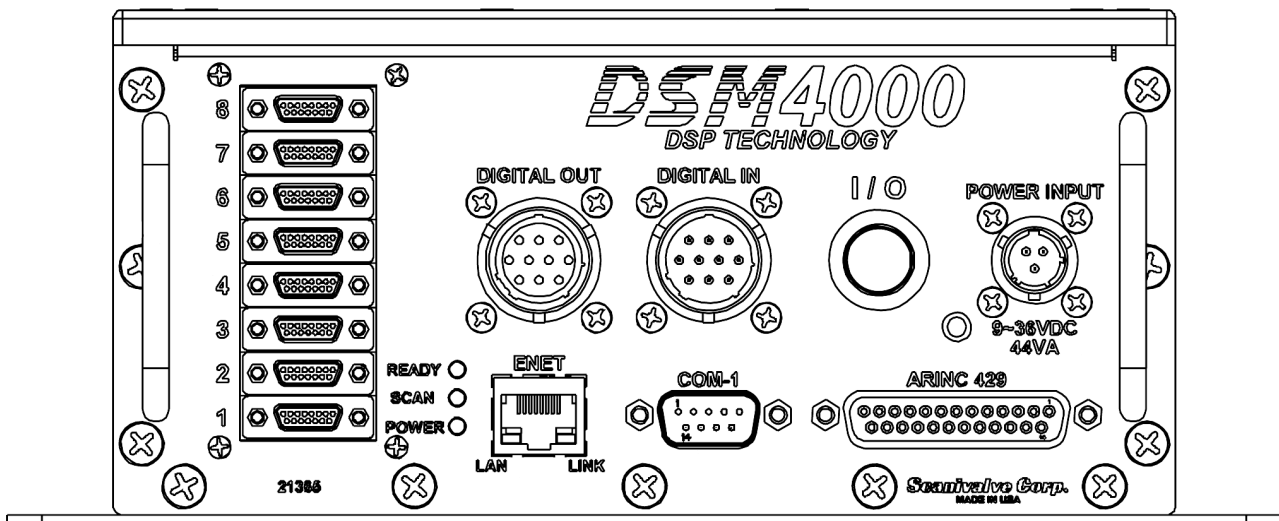
FIGURE 2.1 - DSM4000 FRONT PANEL

DSM4000 POWER REQUIREMENTS

The DSM4000 is designed to operate from 9-36Vdc. It is very important that the power input does not exceed these limits. Total power consumption, with eight ZOC modules attached and powered will not exceed 44 Watts. "Figure 2.2 - DSM4000 Power Input Wiring" shows the wiring of the DSM4000's power input.

The power connector on the DSM4000 is a Bendix PT02A-8-3P. The mating connector (cable connector) is a Bendix PT06A-8-3S-SR.

The main power input voltage is used for all digital outputs, thus the digital output voltage is equal to the main power input voltage. The main power voltage should be selected considering this. For more information on digital outputs, see "Digital I/O Connections" on page 15.

!
CAUTION

CAUTION! Main power input voltage should never exceed 36Vdc. Exceeding this limit will cause permanent damage to the DSM4000 or attached ZOC modules.

Belden 9494

#8 Spade Lugs

PT06A-8-3S-SR

①	BLK
①	RED
①	WHT

DC Voltage Return	BLK	Ⓐ
DC Voltage Input	RED	Ⓑ
Chassis Ground	WHT	Ⓒ
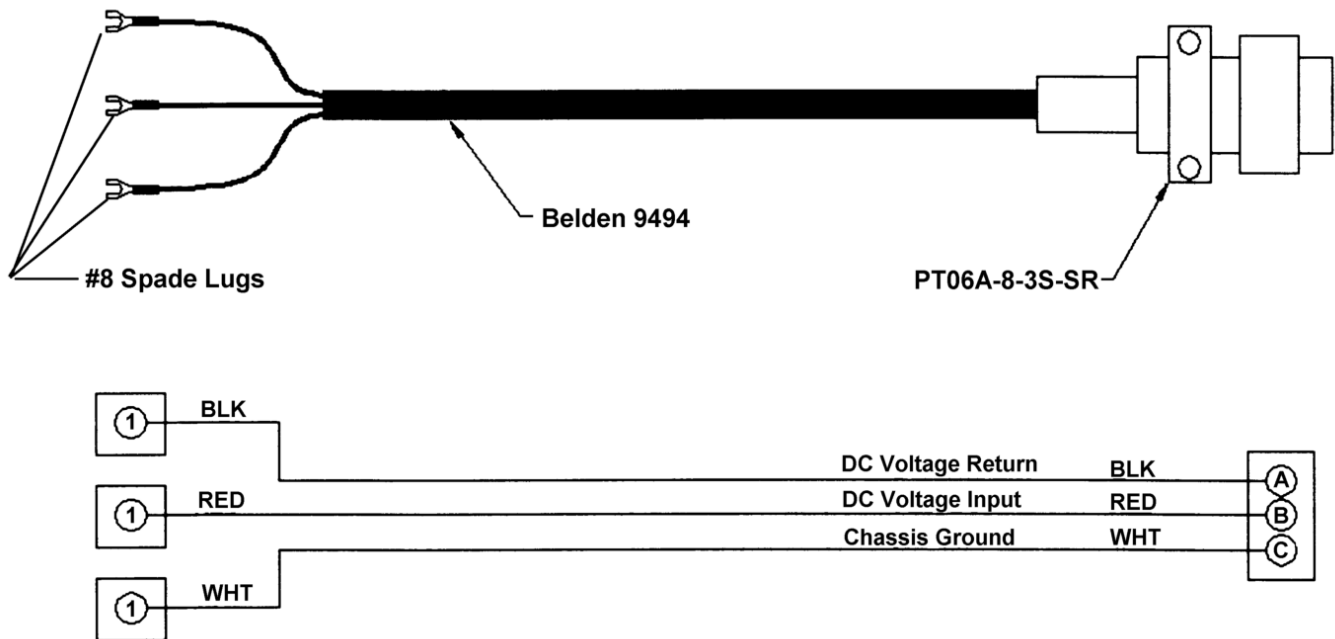
FIGURE 2.2 - DSM4000 POWER INPUT WIRING

ETHERNET CONNECTION

A DSM4000 has one Ethernet connection, 10/100Base-T with MDIX auto-crossing. The Ethernet subsystem supports IEEE 802.3 Ethernet standards for 10BaseT and 100BaseT. The subsystem will auto-negotiate the data rate. The Ethernet connection is a RJ45 jack. This subsystem also supports PC97, PC98, and Net PC standards.

The DSM4000 will not support multiple Ethernet connections. If a second Ethernet connection is made to the DSM4000, the first connection will be dropped.

For more information on the Ethernet connection including the default IP address and instructions on changing the IP address, see "IP Address" on page 20.

"Figure 2.3 - Ethernet RJ45 Plug and Jack" shows the RJ45 jack, plug and wiring. The Ethernet cable used should not be longer than 328 feet (100 meters).
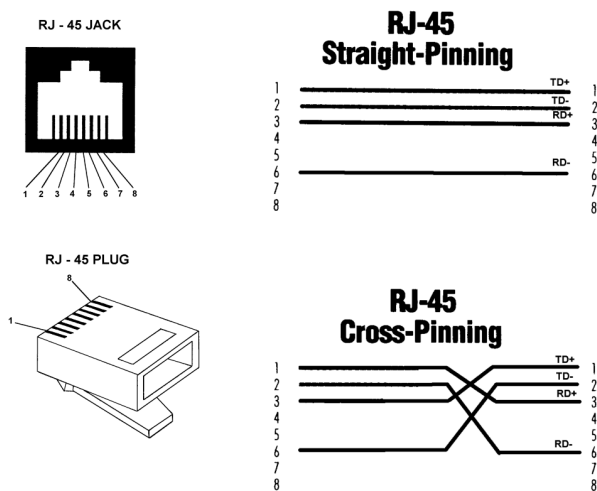
FIGURE 2.3 - ETHERNET RJ45 PLUG AND JACK

CONFIGURATION CONNECTION

The DSM4000 has a single 'Configuration' port on the front panel. This port may be used to verify IP addresses, modify configuration variables, and other setup functions. The configuration connection may not be used to scan or acquire data.

The configuration port is a serial RS-232 communications port. The communication setup is 9600 BAUD, 8 data bits, 1 stop bit, No Parity, No Flow Control.

The configuration port connector is a DB9P. The mating connector (cable connector) is a DE-9S. The Configuration cable should not be more that 12 feet (3.7 meters) long.

More information on the configuration port and its operations can be found in "Configuration Port" on page 20.

"Figure 2.4 - Configuration Cable Wiring" shows the communications cable wiring.

FIGURE 2.4 - CONFIGURATION CABLE WIRING

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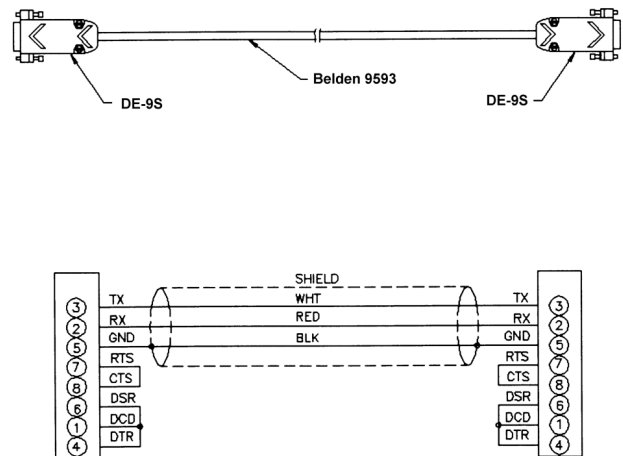
DIGITAL I/O CONNECTIONS

Each DSM4000 has a digital input and a digital output connector. A maximum of five digital inputs and five digital outputs may be configured. Configuration information may be found in the Software Section of this manual.

Digital Input 1 is reserved for the Hardware Trigger Input for Frame Triggers (also known as the "A/D Trigger".) This is controlled by the software variable "ADTRIG." More information on the ADTRIG variable can be found in "ADTRIG" on page 100. The remaining digital inputs can be used for various functions like starting or stopping a scan, performing a CALZ or performing a purge. Digital inputs 2-5 can be assigned to various tasks by the DIN variables in the LIST D group. More information on these variables can be found in "Digital I/O Configuration Variables (Group D)" on page 85.

Digital inputs are edge triggered. The input pulse should have a minimum voltage of 4.5 Vdc and a maximum voltage of 15 Vdc.

The digital outputs are powered directly by the DC input voltage input. Thus the digital output voltage is equal to the main power input voltage. The main power voltage should be selected considering this. It is recommended that the user supply be capable of providing sufficient current drive for the DSM4000 and the digital outputs. Each digital output is limited to 500 mA.

The digital input connector is a Bendix PT02A-12-10P. The mating connector (cable connector) is a Bendix PT06A-12-10S.

The digital output connector is a Bendix PT02A-12-10S. The mating connector (cable connector) is a Bendix PT06A-12-10P.

"Figure 2.5 - Digital Input Wiring" shows the wiring of the digital input connector. "Figure 2.6 - Digital Output Wiring" shows the wiring of the digital output connector.
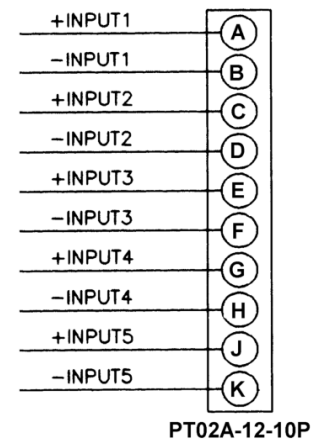
FIGURE 2.5 - DIGITAL INPUT WIRING
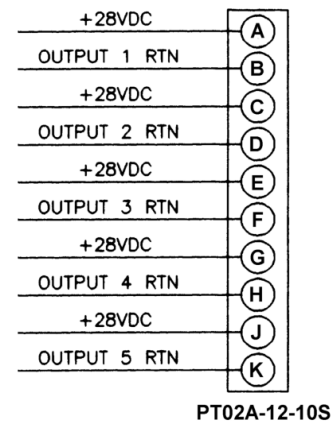
FIGURE 2.6 - DIGITAL OUTPUT WIRING

ZOC Input Connections

Each DSM4000 is designed to accept inputs from up to 8 ZOC 17, 22, or 33 modules or any combination. Each ZOC module may have up to 64 pressure inputs. The DSM4000 can scan each module at different rates. The ZOC modules must have an RTD installed so the DSM4000 can measure the temperature of the module.

The length of the DSM4000 to ZOC or DSM4000 to ZOCTCU cable is critical to the functionality of the system. This cable cannot exceed 50 feet (15 meters) for heavy-duty cables, or 15 feet (4.5 meters) for normal cables. The input connectors are Cannon MDM-15PBSP. The mating connector (cable connector) is a Cannon MDM-15SH003K.

"Figure 2.7 - DSM4000 to ZOC Cable" shows the typical input wiring for a ZOC module. "Figure 2.8 - DSM4000 to ZOCTCU Cable" shows the typical wiring for a ZOC module installed in a Thermal Control Unit.

CAUTION! Connecting or disconnecting ZOC modules with the DSM4000 is powered up will cause permanent damage to both the DSM4000 and the ZOC module(s).
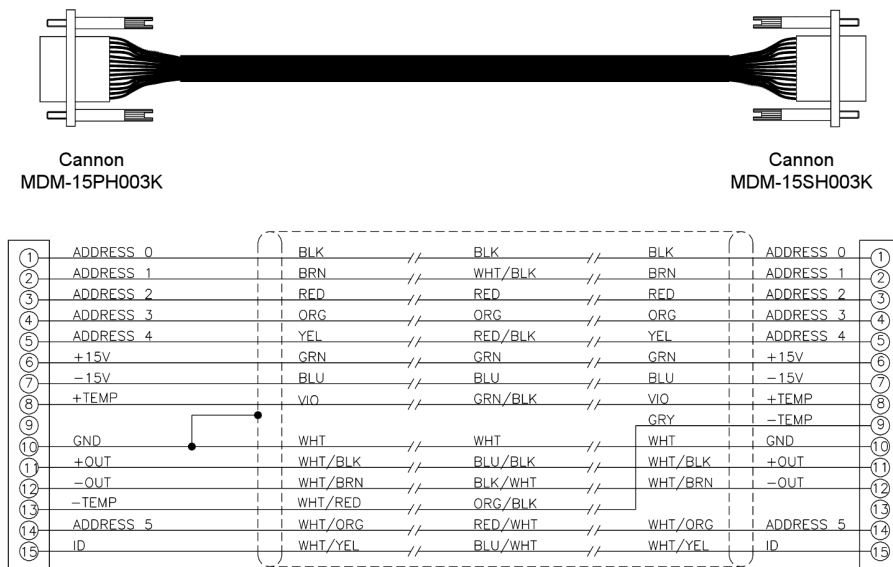
Figure 2.7 - DSM4000 to ZOC Cable

Figure 2.8 - DSM4000 to ZOCTCU Cable

Scanivalve
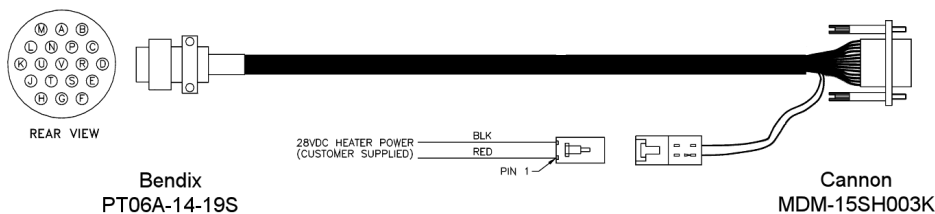
ARINC429 CONNECTION

DSM4000 modules configured for ARINC429 have 8 transmit only ARINC429 channels. Each channel can be programmed to output different scan groups. ARINC data can only be output in Engineering Units. Raw A/D counts cannot be output to ARINC channels. ARINC429 operation is enabled by the HAVEARINC configuration variable found on page 87.

The input connector is a DB-25P. The mating connector (cable connector) is a DB-25S.

DB-25P
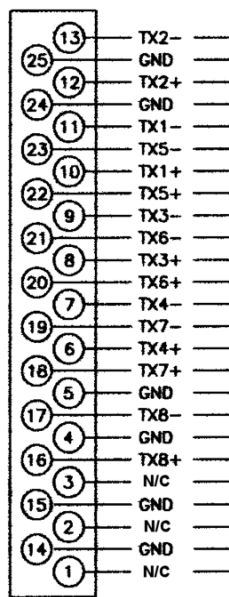
FIGURE 2.9 - ARINC429 CONNECTOR WIRING

RAD A/D 3200 - REMOTE A/D MODULES

Each DSM4000 has 8, 16-bit pressure A/D modules. Each A/D module has an ID chip installed. The ID chip identifies the module by type, location and serial number. Each module can be characterized to correct for zero and gain errors, thus minimizing system errors. This information is contained in the ID chip. When the Dsm4000.hex program is started, the software identifies each A/D and maps the correction coefficients into memory. These data are used during the conversion of the analog inputs to an engineering unit to minimize errors from the A/D's.

The A/D modules have a DIP switch used to identify the position of the A/D. This switch must be set by the user when the A/D is installed. The A/D modules DIP switches must be set for a position between 1 and 8 (binary 0 - 7). The actual physical position of the modules is not

important. A truth table showing the DIP switch settings is shown below.

Position	SW1	SW2	SW3	SW4
1	ON	ON	ON	ON
2	OFF	ON	ON	ON
3	OFF	OFF	ON	ON
4	OFF	OFF	ON	ON
5	ON	ON	OFF	ON
6	OFF	ON	OFF	ON
7	ON	OFF	OFF	ON
8	OFF	OFF	OFF	ON

FIGURE 2.10 - RAD A/D 3200

SOFTWARE

When the DSM4000 is mounted and the power require-
ments are met, the unit is ready to be configured for use.
All configuration variables must be set using Dsm4000.hex.
A user may connect a computer to the DSM4000 and com-
municate by one of several associated programs:

Ethernet
>   TelNet - A program furnished with Windows 95 and 98.
>   This permits a network connection to the DSM4000. A
>   TelNet session is described later in this manual

>   HyperTerminal - A terminal program furnished with Win-
>   dows NT, 2000 and XP. This program may be configured
>   for Ethernet or Serial Communications.

>   DSM LabVIEW VI- Drivers written by Scanivalve Corp. are
>   available for use with LabVIEW versions 5.0 and higher.

>   ScanTel - A free program created by Scanivalve similar to
>   HyperTerminal. ScanTel can be used to configure the
>   DSM4000 and acquire data in both ASCII and Binary
>   format.

RS232
>   The 'Configuration' port offers an RS232 serial connec-
>   tion to the DSM4000. This connection can be use to
>   configure the module but does not offer the ability to
>   collect data.

DSM4000.HEX

The DSM executable program controls the operation of the
DSM4000, A/D modules and RDS module. This software is
installed on a MicroSD card installed in the DSM4000. At
bootup the software is read into RAM and started.

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SECTION 3: OPERATION

This section contains information and procedures required for the proper operation of the DSM4000 series modules.

The entire boot up process requires approximately 1 minute, depending on the number of ZOC modules connected. When the DSM4000 is ready to accept commands a prompt symbol will be transmitted to the host computer.

All operation and configuration of the DSM4000 is through Ethernet connection.

Unpack & Inventory

When you first unpack the DSM4000 module, begin by inspecting and inventorying the contents of the package. If any visible damage is immediately noticed or if any contents are missing, contact Scanivalve before proceeding. As a minimum, DSM4000 modules are shipped with the following contents:

1. DSM4000 module
2. DSM4000 resource CD
3. Configuration cable connector
4. PDM1500 24Vdc power supply
5. DIN cable connector
6. DOUT cable connector
7. ARINC429 cable connector (only with DSM4000-ARINC modules)

Mounting

The DSM module comes with a 3/32" (2.4mm) mounting plate attached to the bottom. This accepts mounting hardware up to 3/16" (4.76mm) in diameter. For added flexibility, the mounting plate can be removed from the bottom of the module and mounted on the rear face of the module. The DSM4000 module can be mounted in any orientation. Ensure that the DSM module is mounted in an environment that conforms to the requirements described in "Environment Specifications" on page 8.

Warm-up

After applying power to the DSM4000 and attached ZOC modules, a minimum of 30 minutes before collecting data is required to allow the module temperature to become stable. It is recommended that if time allows, the warm-up period should be extended to one hour for most applications.

Communications

The DSM4000 module is designed primarily for Ethernet communications. This provides a means to configure the DSM4000 module as well as scan and collect data from the module.

A 'Configuration' port is also provided. The 'Configuration' port is a serial RS-232 connection designed to be used to configure the module and provide emergency communications. Several important variables can be configured through the serial port, but possibly the most important is the Ethernet IP address. The only way to communicate with the module if the IP address is not known is through the 'Configuration' port.

Configuration Port

Every DSM4000 module has an RS-232 serial output. It is available through the 'Config' connector on the front face of the module. All DSM modules are shipped with a mating connector (DE-9S) that can be used to fabricate a Configuration cable. Alternately, a Serial Configuration cable can be ordered from Scanivalve using the Scanivalve part number 155709.

The wiring diagram for the Configuration cable is shown in "Configuration Connection" on page 14.

Settings for establishing a serial connection to the DSM4000 module are as follows:
Bits per second: 9600 BAUD
Data bits: 8
Parity: none
Stop bits: 1
Flow control: none

Ethernet Communications

The primary means of communication with the DSM4000 is the 10Base-T Ethernet port. Shielded Category 5 cable or better is recommended for all Ethernet connections. The DSM4000 features MDIX auto-crossing support. No matter what the network architecture being used is, the DSM4000 can be connected with either a straight through (pin to pin) cable or a crossed cable.

The DSM4000 module does not support multiple Ethernet connections. However, if a second Ethernet connection is made to a DSM4000, the current connection will be dropped for the new connection.

IP Address

Before an Ethernet connection can be established the IP address need to be configured. In order to be compatible, the IP address of the module and host computer must

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share the first two octets. The third and fourth octets of the IP address is variable, although it is recommended that the third octet also be shared between the host computer and the module.

Example of matching the first three octets (recommended):
> Host computer: 191.30.80.100
> DSM module: 191.30.80.125

Example of matching the first two octets:
> Host computer: 191.30.1.100
> DSM module: 191.30.80.125

The IP address of a Windows host computer can be changed under:

> Control Panel -> Network Connections -> Local Area Network -> Properties -> Internet Protocol (TCP/IP) -> Properties.

All DSM4000 modules are shipped with a default IP address in the following format:
> 191.30.41.XXX
> (where XXX = the last three digits of the module serial number)

The IP Address can be modified by changing the value of IPADD. This variable is in the IP Group of configuration variables. IPADD may be set using the either the Config or Ethernet connections. The new address will not be effective until a SAVEIP command has been issued and power has been cycled. For more information on the IPADD variable, see "IP ADDRESS" on page 79.

CLIENT/HOST OPTIONS

Once the module has been connected and the IP address has been configured, communications can be established with the DSM module. Communications can be made through several software packages including:
- PC - TCP/IP
- PC - UDP
- PC - ScanTel (Scanivalve PN: 155406-01)
- PC - LabVIEW Configuration Utility (Scanivalve PN: 155384-01)
- PC - LabVIEW Development Kit (Scanivalve PN: 155385-01)
- PC - Windows HyperTerminal

PC - TCP/IP
The user may write their own TCP/IP interface using the software specification portion of this manual. This interface should allow the user to:
- Issue commands to any or all DSM modules on the network.
- Display returned information or scan data from the DSM module(s).

- Write returned information or scan data to the client/host in TCP/IP format.

PC - UDP
The user may write their own UDP interface using the software specification portion of this manual. This interface should allow the user to:
- Issue commands to any or all DSM modules on the network.
- Display returned information or scan data from the DSM module(s).
- Write returned information or scan data to the client/host in UPD format (no handshaking).

PC - SCANTEL
ScanTel a free communications utility designed by Scanivalve to communicate with Scanivalve products including DSM4000 modules. It is a text based, command line program that allows users to connect to a single DSM module and modify the configuration variables, upload or download coefficients and collect data in both TCP/IP and UDP format.

PC - LABVIEW CONFIGURATION UTILITY
The Scanivalve LabVIEW Configuration Utility is software package that offers a very intuitive and simple way to connect to and modify all of the DSM4000's configuration variables. It also allows the user the ability to upload a configuration file and scan and collect data. The scanning and data collection is limited to 5Hz due to the graphic nature of the program. The LabVIEW Configuration Utility is based on a LabVIEW 2009 runtime which is include with the installation disk.

PC - LABVIEW DEVELOPMENT KIT
The Scanivalve LabVIEW Development Kit is for users desiring to customize a LabVIEW driver for DSM4000 systems. The Development Kit is compatible with LabVIEW 8.2, 8.6 and 2009. The LabVIEW Configuration Utility is included with the Development Kit.

PC - HYPERTERMINAL
HyperTerminal is a Windows program included as part of Windows 2000, XP and Vista Operating Systems. This program permits a user to connect to a single DSM module, modify the configuration variables, upload or download coefficients and collect data. HyperTerminal provides a means for both Serial RS-232 and Ethernet connections. It is a text based command line program.

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, the application automatically boots on power up. When this switch is off, the DSM4000 remains in the bootloader mode. Default is on.

SW2 - When this switch is on, the boot loader will run in the debug mode. Debug output is directed to the serial port. Default is off.

SW3 - Spare.

SW4 - Spare.

"Figure 3.1 - DIP Switch Location" shows the DSM4000 cover removed and the location of the DIP switches on the processor board.
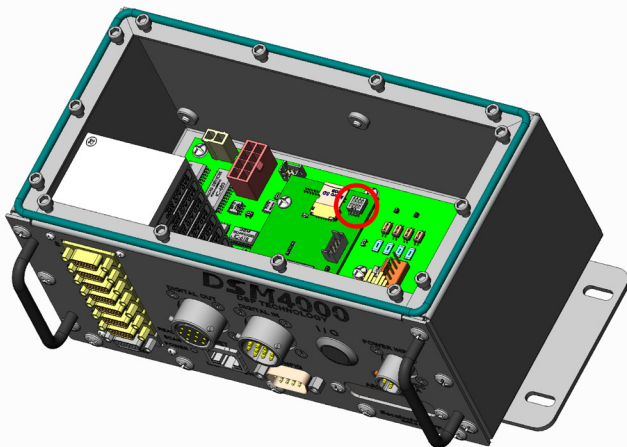
FIGURE 3.1 - DIP SWITCH LOCATION

MODULES

The DSM4000 will support up to eight modules. The DSM4000 supports any ZOC 17, 22, 23 or 33 module with an RTD. The ZOC modules must have an RTD so the DSM4000 can properly determine the temperature of the module and ultimately the coefficients to be used.

Modules should only be connected and disconnected with power removed from the DSM4000. After the modules are connected, power may be applied. Configuration of the DSM4000 may be checked during warm up. At this time, if calibration coefficients have been installed, it is very important to verify that the modules are connected to the proper inputs. Otherwise, data may be invalid.

DSP BOOT LOADER

The Scanivalve DSP Boot Loader permits a user to upload the DSM4000 application via FTP. The boot loader runs the FTP server. It has been tested on Mozilla 'FileZilla' and Windows Explorer drag and drop. Any additional file transfer protocols or additional FTP client support modification will be made solely to the application. For more information on Bootloader Operation, refer to "Operation in Bootloader Mode" on page 27.

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 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.

ASCII format transfers are the only supported transfer type. Passive data connections are the only supported connection type. 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 DSM4000 does not have a time and date clock, all files created 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 will be written in the root directory of the drive. The disk drive will hold a maximum of 1024 files, or 2GB of data.

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HOST COMMUNICATION

Commands are issued to the DSM4000 and response is returned via either the Ethernet port or the Config port. 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 serial port, it is returned to the serial port. The SCAN function is not supported in Config/Serial operation.

The network supports TCP/IP connection using Telnet or HyperTerminal

COMMANDS

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 DSM4000 executable program.

VER - Returns the version of the Boot Loader. NOTE: This command is specific to the boot loader only. It should not be confused with the VER command in the application.

FDISK - 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 is explained in detail in the software manual.

SET <parameter> - Set 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.

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 a place holder in this group for compatibility with the IP group in the application.

PASSWORDNAS <password> - Sets the password

associated with LOGINNAS name.

IPADDNAS <IP address> - Set 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. If this file is not found, 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> - Types the contents of the file name.

LOAD <file name> - Loads the file name into the LIST IP configuration variables.

DIR - Lists the file on the SD card.

DEL<file name> - Deletes the file name.

DIP - Reads and shows the settings of the DIP switches. The following is returned: "DIP settings Auto Run Application 0 Debug 0 No Serial Host 0 Spare 0" where 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.

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 DSM4000 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 DSM4000

When a NAS is used with a DSM4000, 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.

NETWORK TIME PROTOCOL

The DSM4000 can take advantage of a Network Time Protocol (NTP) server. Information on the configuration variables for the NTP setup can be found in "Network Attached Storage Device Variables (Group NAS)" on page 93.

CALIBRATION

All modules that will be used with a DSM4000 must be fitted with an RTD so the DSM4000 can determine the temperature of the module. This is critical to allow a user to achieve the best possible accuracy in a system. A module, once calibrated, may be used in any position in a DSM4000 system. It may even be moved to a different DSM4000 with no loss in accuracy.

The key to this capability is the module profile (coefficient) files and the module list. The module profile files (mpf files) contain module setup information and calibration coefficients. Each module should have its own unique MPF file, identified as xxxx.mpf: where xxxx is the serial number of the module. The module list contains a listing of module serial numbers versus the input position.

At boot up, the DSM4000 software looks for the file: sn.gpf. This file contains the module profile list. The software reads the file. If an input position has a number greater than 0 assigned to it, the software looks for the corresponding MPF file in the DSM4000 folder on the Hard Disk and maps the setup and coefficients into the DSM4000 RAM memory. If an MPF file cannot be found, default configuration information is entered into memory.

DSM4000 MODULE COEFFICIENT INSTALLATION

When a DSM4000 and modules are purchased as a system, the module coefficients will be stored on the MicroSD card. A backup CD with the MPF files will be included with the system. When new modules are added to a system, or when a coefficient file must be updated, the files may be uploaded using the "DSM4000 Calibration Coefficient Installation (Windows XP & 7)" on page 27.

EXTERNAL TRIGGER

The DSM4000 Series modules may be triggered externally by a hardware or software trigger. The settings of ADTRIG and SCANTRIG determine the function of the Digital Inputs as related to scan and frame triggers. The ADTRIG and the SCANTRIG variables are in the Scan Variables Group. More information can be found under the "Scan Variables (Group S)" on page 100.

HARDWARE TRIGGER

The external trigger input is optically isolated to prevent grounding problems. It is a TTL level, edge sensing device. It requires a minimum signal of 4.5 Vdc @ 6.5 mA. It may accept voltages as high as 15 Vdc. The external frame trigger (DIN #1) will only be active if ADTRIG is enabled. If SCANTRIG is enabled, a input to the digital input defined by the DINSCAN variable will initiate the SCAN function. If ADTRIG is enabled, when the module enters the SCAN mode it waits for a trigger (digital input). When a digital input is recieved, the module will return an averaged frame of data, repeating for each trigger pulse received. This will continue until the FPS variable(Frames Per Scan) value is met, or until a STOP command is issued. If a scan trigger (digital input) is received while the DSM4000 is collecting a frame of data, it will be ignored.

SOFTWARE TRIGGER

The software trigger will only be active if ADTRIG is set to 1. When a SCAN command is issued by the Client/host, the module will enter the SCAN mode and wait for a trigger. An averaged frame of data will be output as soon as a <TAB> character (9 HEX or Control I) or 'TRIG' command is received. Data will be output with each successive trigger command until the FPS variable (Frames per Scan) value is met, or until a STOP command is issued.

DIGITAL I/O CONTROL

A DSM4000 has five(5) Digital Inputs and five(5) Digital Outputs that may be configured to operate, control, or monitor certain external functions. Some of the more common uses are documented in this section.

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INITIATE CALZ

A Digital Input may be configured to initiate a CALZ. The input must transition from a logic zero to a logic one to be valid.

Three possible actions may occur.
> If the DSM is in the READY mode: A CALZ will be initiated.
>
> If the DSM is in the SCAN mode: The SCAN will be suspended. A CALZ will be initiated, SCAN will continue when the CALZ is complete.
>
> If the DSM is in any other mode: Nothing will occur.

SCAN START/STOP

A Digital Input may be configured to initiate or terminate a SCAN. The input must transition from a logic zero to a logic one to be valid.

Three possible actions may occur.
> If the DSM is in the READY mode: A SCAN will be initiated.
>
> If the DSM is in the SCAN mode: The SCAN will be terminated.
>
> If the DSM is in any other mode: Nothing will occur.

PURGE CONTROL

A Digital Input may be configured to initiate a Purge Sequence. The input must transition from a logic zero to a logic one to be valid.
The Purge Sequence may be initiated in two ways:
1. Issue the PURGE command when the DSM4000 is in READY mode
2. Apply a signal, to the digital input assigned to purge, when the DSM4000 is in READY or SCAN mode.

PURGE COMMAND

The following is the sequence for a purge operation when PURGE is initiated by the Purge command:
1. The DSM receives the Purge command and is in the READY mode.
2. The digital outputs are set according to the DOUTPG-SEQ configuration variable.
3. These outputs remain set until DLYPGSEQ, configurable from 0 to 5 seconds, times out. If 0 is set, No Delay occurs. Default is 1 second.
4. The digital outputs are set according to DOUTPG configuration variable.
5. These outputs remain set until DLYPG, configurable from 0 to 3600 seconds, times out or a STOP command is issued. When 0 is set, the delay is infinite. A STOP command must be used to terminate the Purge Sequence when delay is set to 0. Default is 10 seconds.

6. When the Purge Sequence is complete, the digital outputs are set according to the DOUTPGSEQ configuration variable.
7. This outputs remain set for the delay set in DLYPGSEQ.
8. When DLYPGSEQ times out the DSM returns to the READY mode.

PURGE DIGITAL I/O

The following is the sequence for a Purge operation when initiated by the purge digital input, as assigned by the DINPG configuration variable:

1. The purge signal is received by the DSM. If the DSM is in the READY mode, the Purge Sequence will be initiated. If the DSM is in the SCAN mode, the SCAN function is suspended for the duration of the purge sequence.
2. The digital outputs are set according to the DOUTPG-SEQ configuration variable.
3. These outputs remain set until DLYPGSEQ, configurable from 0 to 5 seconds, times out. If 0 is set, no delay occurs. Default is 1 second.
4. The digital output are set according to DOUTPG configuration variable.
5. These outputs remain set until DLYPG, configurable from 0 to 3600 seconds, times out or a STOP command is issued. When 0 is set, the Delay is infinite. A STOP command must be used to terminate the Purge Sequence when delay is set to 0. Default is 10 seconds.
6. When the Purge Sequence is complete, the digital output are set according to the DOUTPGSEQ configuration variable.
7. This outputs remain set for the delay set in DLYPGSEQ.
8. When DLYPGSEQ times out, the DSM returns to the mode it was in when the digital signal was received. If the DSM initiated the Purge Sequence from the READY mode, it will return to the READY mode. If the DSM initiated the Purge Sequence from the SCAN mode, the SCAN function will be resumed.

SPECIAL PROCEDURES

This section contains the procedures to update the firmware or add calibration coefficients to the Micro SD card. The DSM4000 should be in the READY mode while these changes are being made. This will have no effect on the operation. The procedures described in this section are written for use in a Windows XP operating system.

The firmware and coefficient procedures that follow may not function correctly if Windows Internet Explorer is not set up correctly. A user should verify these settings before attempting these procedures.

INTERNET EXPLORER SETUP

1. Open Internet Explorer.
2. Click on Tools
3. Select Internet Options from the drop down menu. The Internet Options window will open.
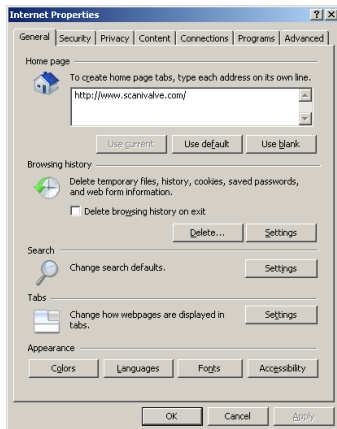
4. Click on the Advanced Tab to show the Advanced Settings.
5. Scroll down to the Heading marked "Browsing"
6. Make sure that the line " Enable FTP Folder View (Outside of Internet Explorer)" is checked. If this is not enabled, Internet Explorer will block FTP file transfers.
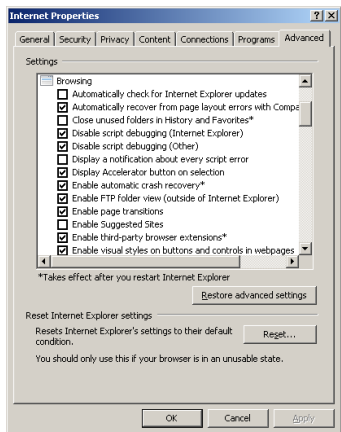
7. Click OK to accept the settings.

DSM4000 FIRMWARE INSTALLATION (WINDOWS XP & 7)

NOTE: Some firewalls may block file transfers. We recommend that firewalls be shut down for the procedures in this section.

1. Connect a host computer to the Ethernet port.
2. Install the disk with the New or updated firmware (Dsm4000.Hex) into a drive.
3. Open My Computer
4. In the Address Bar, type:
ftp://<IPAddress><Enter>
Where: <IPAddress> is the IP Address of the DSM4000.
5. The host computer should connect, If the connection is successful, the contents of the DSM4000 Micro SD Card will be displayed in a folder format.
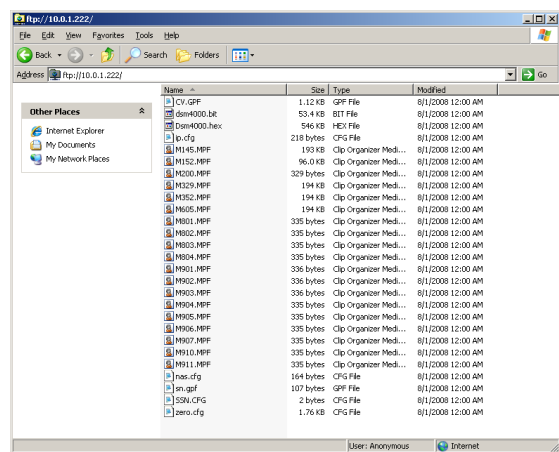
6. Highlight the existing Dsm4000.Hex file. Right Click on it and select Delete. A window will open to confirm the delete. Click Yes to delete the file.
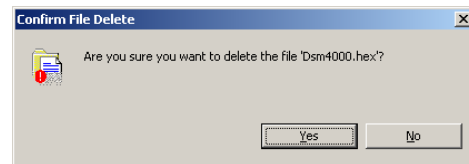
7. Open Windows Explorer in another window. Find the directory where the new Dsm4000.Hex file is stored. Highlight the file and
   Click: Edit
   Click: Copy
8. Select the DSM4000 window and,
   Click: Edit
   Click: Paste
The file will be copied to the DSM4000. A progress window will provide progress information.

9. When the copy function is complete, the DSM4000 window will show the new file. The time and date will show the Time and Date of the transfer. This is the only time this date will be shown. All files on the DSM4000 will show the same date and time after a reboot or power cycle: August 1, 2008 00:00

10. Cycle the AC power or execute a Reboot command to complete the process.

DSM4000 CALIBRATION COEFFICIENT INSTALLATION (WINDOWS XP & 7)

NOTE: Some firewalls may block file transfers. We recommend that firewalls be shut down for the procedures in this section.

1. Connect a host computer to the Ethernet port.
2. Open My Computer
3. In the Address Bar, type:
ftp://<IPAddress><Enter>
Where: <IPAddress> is the IP Address of the DSM4000.
4. The host computer should connect, If the connection is successful, the contents of the DSM4000 Micro SD Card will be displayed in a folder format.
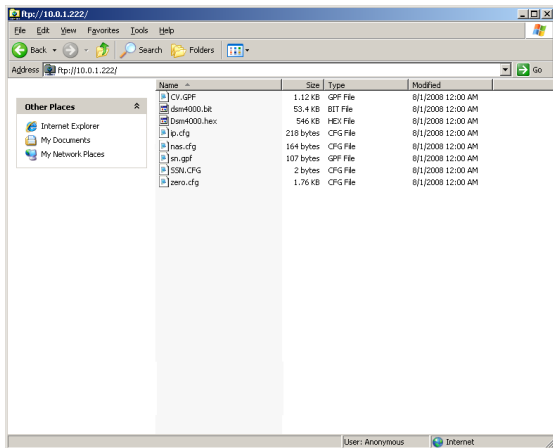
5. Open Windows Explorer in another window. Find the directory where the MPF Files are stored. Highlight the files to be copied to the DSM4000 and
Click: Edit
Click: Copy
6. Select the DSM4000 window and,
Click: Edit
Click: Paste
The files will be copied to the DSM4000. A progress window will provide progress information.

7. When the copy function is complete, the DSM4000 window will show the new files. The time and date will show the Time and Date of the transfer. This is the only time this date will be shown. All files on the DSM4000 will show the same date and time after a reboot or power cycle: August 1, 2008 00:00
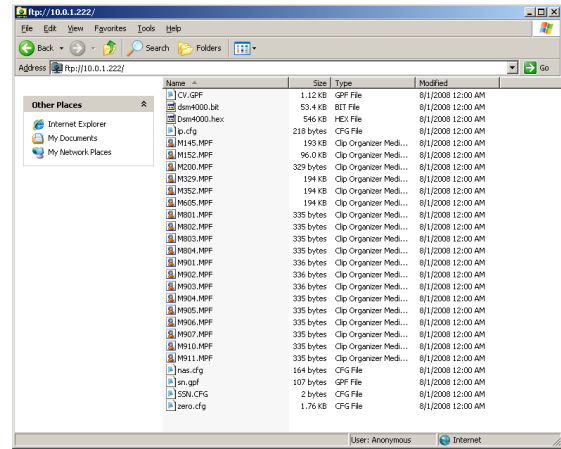
8. Cycle the AC power or execute a Reboot command to complete the process.

OPERATION IN BOOTLOADER MODE

If the DSM4000 will not boot, or appears to have lost communications with a Host, the system may be operated in the Bootloader Mode. In this mode of operation, the application will not start. All commands may be entered by the Ethernet or Configuration ports.

This mode may be set by switching Dip Switch 1 to the off position.

1. Switch the input power off, and remove the DSM4000 top cover. Only remove the 9 perimeter screws (7/64" hex) as the three screws in the center attach the power supply to the top cover.
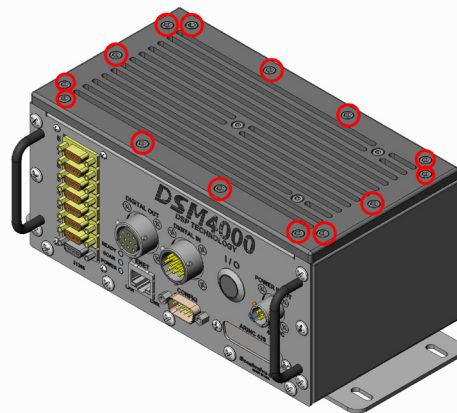
FIGURE 3.4 - DSM4000 COVER REMOVAL

2. The dip switches are on the processor board, towards the back of the unit. For reference purposes, OFF is towards the front face of the DSM4000. Slide DIP switch #1 towards the front face (connectors) to turn it off. #1 should then line up with all other switches.
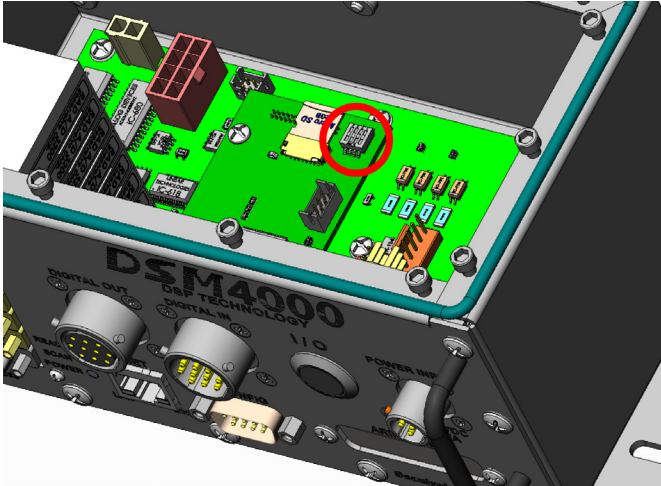
FIGURE 3.5 - DIP SWITCH LOCATION

3. Re-apply power to the DSM4000. The application will not run, but the bootloader commands can be used to trouble-shoot system problems.

4. When troubleshooting is complete, remove power and reset switch #1 to the on position. Reinstall the top cover and re-apply power.

CAUTION! ESD PROTECTION REQUIRED. The proper use of grounded work surfaces and personal wrist straps are required when coming into contact with exposed circuits to prevent static discharge from damaging sensitive electronic components.

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SECTION 4: SOFTWARE

The operation of each DSM4000 is controlled by sending commands to selected units via the network. The DSM4000 returns data or information over the same network to the requesting client/host.

DSM4000 COMMANDS

This section describes the commands used to control the DSM4000. The DSM4000 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 Local.
4. Output converted data, status, setup and calibration data over the Ethernet or Local outputs.

When a DSM4000 module is in a "not ready" mode, all commands are disabled except STATUS and STOP.

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 DSM4000 is ready to accept a command.

TCP/IP does not guarantee that packet boundaries will be maintained between a Host and a DSM4000. Therefore, ALL commands from a Host MUST be terminated properly with one of two options using the NL configuration variable. The two options are:

CR-LF (ASCII 13 - ASCII 10) or CR (ASCII 13)

The maximum string length for commands send to the DSM4000 is 79 characters. Any command received that is longer than 79 characters will be discarded and an error will be generated.

When a communications variable is modified (those in the LIST IP grou), the DSM4000 program must be restarted, preferably with the RESTART command, in order for the changes to take effect.

Command List

Bank A Mode

Command	BANK A MODE
Command Syntax	**BANKA**<CR>
Arguments	None
Description	Commands the DSM4000 to switch the DOUTS set in the configuration variable: BANKA. This command is intended for use in any situation where DOUT settings must be changed quickly.
Returns	<nl> nl - end of line
Example	To switch the DOUTS to the condition set in the Digital Variable BANKA: Enter the command: BANKA The DSM4000 will switch the outputs based on the setting of the configuration variable: BANKA. This command assumes that the configuration variable is set correctly.

Bank B Mode

Command	BANK B MODE
Command Syntax	**BANKB**<CR>
Arguments	None
Description	Commands the DSM4000 to switch the DOUTS set in the configuration variable: BANKB. This command is intended for use in any situation where DOUT settings must be changed quickly.
Returns	<nl> nl - end of line
Example	To switch the DOUTS to the condition set in the Digital Variable BANKB: Enter the command: BANKB The DSM4000 will switch the outputs based on the setting of the configuration variable: BANKB. This command assumes that the configuration variable is set correctly.

Bank User Mode

Command	BANK USER MODE
Command Syntax	**BANKUSR**<CR>
Arguments	None
Description	Commands the DSM4000 to switch the DOUTS set in the configuration variable: BANKUSR. This command is intended for use in any situation where DOUT settings must be changed quickly.
Returns	<nl> nl - end of line
Example	To switch the DOUTS to the condition set in the Digital Variable BANKUSR: Enter the command: BANKUSR The DSM4000 will switch the outputs based on the setting of the configuration variable: BANKUSR. This command assumes that the configuration variable is set correctly.

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BOOTLOADER VERSION

Command	BOOTLOADER VERSION
Command Syntax	**BLVER**<CR>
Arguments	None
Description	Requests the version number of the DSM4000 Bootloader.
Returns	Bootloader Version: <version string> <nl> version string - the version of the DSM4000 bootloader nl - end of line
Example	To determine the version of DSM4000 Bootloader software in use, type: BLVER<CR> The DSM4000 will return: Bootloader Version: 2.02

CALIBRATE

Command	CALIBRATE
Command Syntax	**CAL** *<press> <channels>*<CR>

Arguments	<press> - a real number that represents the calibration pressure for this point.
	<channels> - a 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. The data returned from this command will be lost if it is not captured in a log file or by the Host computer. NOTE: The DSM4000 does not control the calibration. It will only read the information when commanded.
Returns	INSERT <temp><channel><press><press counts> M<nl> temp - the temperature plane channels - the channel in module-port notation press - the pressure in EU press counts - the A/D pressure counts(or bits) nl - end of line

Example	If a user wanted to calibrate a module installed in position 3 at 15 psi:
	        Apply the appropriate Control pressures for the module
	        Connect a pressure standard to the CAL input.
	        Enter the command: CAL 15 3-1..3-16<CR>
	
	The DSM4000 will measure the counts for each channel and return the appropriate INSERT commands.
	
	NOTES: 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

CALIBRATE INSERT

Command	CALIBRATE INSERT
Command Syntax	**CALINS** *<press> <channels>*<CR>

Arguments	*<press>* - a real number that represents the calibration pressure for this point.
	<channels> - a 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 DSM4000 does not control the calibration. It will only read the information when commanded.
Returns	<nl> nl - end of line NOTE: When this command returns the prompt, a SAVE command must be issued. The DSM4000 software will insert the stored data in the Module Profile Files.

Example	If a user wanted to calibrate a module installed in 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..3-16<CR>
	
	The DSM4000 software will measure the counts for each channel and write the new master plane information into memory.

Command	CALIBRATE ZERO
Command Syntax	**CALZ<CR>**
Arguments	None
Description	Commands the DSM4000 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. 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 DSM4000 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	EXAMPLE: To update the current ZERO file and correct for any zero drift of the transducers: Enter the command: CALZ The DSM4000 software will measure the zero counts for each channel and update the Zero and Delta Arrays. The DSM4000 software will write the information into the file, ZERO.CFG when a SAVE Command is executed. NOTES: General rules for use of a CALZ command 1. Power Up: A CALZ should be executed after the DSM4000 and ZOC modules have stabilized. 2. Power Cycle: A CALZ should be executed if power is cycled, or if a RESTART or RELOAD command is executed. 3. RESTART: A CALZ should be executed after a RESTART command. 4. RELOAD: A CALZ should be executed after a RELOAD command. 5. Module Swap: A CALZ should be executed after a module position swap. If the module has reached stability before the swap, the CALZ may be executed immediately after a LIST SYS U command. 6. Module Change: A CALZ should be executed after a module change. The module should be allowed to stabilize before executing the CALZ command, but after a LIST SYS U command. The Zero and Delta Arrays are cleared when the DSM4000 is powered down or when a RESTART or RELOAD 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, or changed without a power cycle.

Command	CHANNEL
Command Syntax	
Arguments	<scan group> - a number, 1 to 8, that represents the 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 to 8 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 scan group 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>
	
	If 2 modules are configured in the scan group, The DSM4000 will return:
	
	    CHAN: 1 1 1 1 -15.000000 15.000000 32 1
	    CHAN: 1 2 1 2 -15.000000 15.000000 32 1
	    :: :: : : : : : :: :: :: :: : :
	    CHAN: 1 31 2 15 -15.000000 15.000000 32 1
	    CHAN: 1 32 2 16 -15.000000 15.000000 32 1
	
	This shows that all 16 ports of two 16 channel modules have been assigned in sequence to Scan Group 1 for a total of 32 channels in the scan group. The modules are installed in positions 1 and 2. The minimum full scale pressure value for both modules is -15.0 engineering units. The maximum pressure value is 15.0 engineering units. The output data will be in engineering units.

CLEAR

Command	CLEAR
Command Syntax	**CLEAR**<CR>
Arguments	None
Description	Commands the DSM4000 to clear the Accumulated Error Buffer. This buffer is not the same as the standard error buffer. Refer to "Error" on page 39 for more information.
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.

CONTROL PRESSURE RESET

Command	CONTROL PRESSURE RESET
Command 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 been manually set.
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>

DELETE

Command	DELETE
Command 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 for a range of channels serial number-port..serial number-port for a range of channels
Description	Deletes all pressure coefficients within temperature planes between the low and high temperature range, inclusive. 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 16 channel modules, the following command would be issued: DELETE 0 69 1-1..8-16<CR> To delete the master points for channels 49 through 56 in a ZOC installed in position 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 ZOC installed in position four, the following command would be issued: DELETE 0 69 4-3<CR>

Command	DELTA
Command 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 installed in position one, type: DELTA 1\<CR\>
	
	The DSM4000 will return the current delta values
	      DELTA: 1-1 40
	      DELTA: 1-2 38
	      :: :: :: ::
	      DELTA: 1-15 30
	      DELTA: 1-16 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 DSM4000 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 or RELOAD command is executed.
	
	The Zero and Delta Arrays are cleared when the DSM4000 is powered down or when a RESTART or RELOAD 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.

<u>**DIN**</u>

Command	DIN
Command Syntax	**DIN**<CR>
Arguments	None
Description	Reads the status word from the lattice chip.
Returns	A sixteen bit status word. For more information , refer to the Status Word Format Table in this document. <nl> nl - end of line
Example	When this command is entered, the value of the status word is returned in hexadecimal notation. The value returned depends upon the status of the DSM4000. Type: DIN<CR> The DSM4000 will return the value: 2, If no frames are available, there are no digital inputs, no A/D errors have occurred, and the FIFO's are empty.

<u>***DISCONNECT FROM HOST***</u>

Command	DISCONNECT FROM HOST
Command Syntax	**DISCONNECT**<CR>
Arguments	None
Description	Disconnects the DSM4000 from the Host computer. Once this command is issued the Ethernet connection between the Host and the DSM4000 will be cleanly disconnected. The Host may re-connect to the DSM4000 by a normal TCP/IP connection method.
Returns	<nl> nl - end of line
Example	To disconnect a DSM4000 from a Host, type: DISCONNECT <Enter>

<u>**DOUT**</u>

Command	DOUT
Command Syntax	**DOUT** *<discrete channel> <state>*<CR>
Arguments	*<discrete channel>* - a Digital Output channel, 1-8 *<state>* - 0 = on, 1 = off
Description	Commands the discrete output of the desired channel either on or off.
Returns	<nl> nl - end of line

Example	To energize digital output channel 1, type:
	      DOUT 1 1 <CR>
	
	To de-energize digital output channel 4, type:
	      DOUT 4 0<CR>

ERROR

Command	ERROR
Command Syntax	**ERROR** [*file name on FTP server*]<CR>
Arguments	None

Description	Lists the accumulated errors that have occurred since the last CLEAR and the number of occurrences 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 CLEAR 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 error list. count - the number of occurrences nl - end of line

Example	EXAMPLE 1:
	To read the contents of the Accumulated Error Buffer:
	                Type: ERROR
	
	The DSM4000 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 DSM4000 will return:
	                >
	
	EXAMPLE 2:
	To write the contents of the Accumulated Error Buffer to a file on the FTP server:
	                Type: ERROR error.log
	
	The DSM4000 will write the contents of the Accumulated Error buffer to the file:
	                Error.log
	on the FTP Server.

Command	FILE
Command Syntax	**FILE** *<filename>*<CR>
Arguments	<filename> - The file to be opened. The file path must be specified.
Description	Opens the named file. It is assumed that this file will be a command or a series of commands. If the file is a calibration file, the INSERT commands will be executed. It is imperative that a DELETE command be executed prior to opening a calibration coefficient file to prevent Master Point Overwrite Errors. 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 DSM4000. A file: scan.cmd may contain the commands:
	    SET FPS1 1
	    SCAN
	
	This file should be located in the DSM Folder. If not, a path must be specified.
	
	Example 1
	The file: scan.cmd is located in the DSM folder. To execute the file, type:
	    FILE scan.cmd<CR>
	
	Example 2
	The file: scan.cmd is located in the DSM4000CMD folder. To execute the file, type:
	    FILE C:\DSM4000CMD\scan.cmd<CR>

Command	INSERT
Command 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 9 of the module installed in position 3. The applied pressure is 10.9998 psi, the measured counts are 20254.
	        INSERT 48.75 3-9 10.9998 20254 M
	
	The following command will insert a master point at 43.75°C for channel 16 of module serial number 209. The applied pressure is -2.4864 psi, the measured counts are -6651.
	        INSERT 43.75 209-16 -2.4864 -6651 M

<u>**LIST ALL CONVERSION COEFFICIENTS**</u>

Command	LIST ALL CONVERSION COEFFICIENTS
Command 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, calculated and invalid points in the temperature-pressure correction matrix. This command places the DSM4000 in the LIST mode until the command is completed or a STOP command is issued.
Returns	INSERT <temp><channel><press><press counts><M, C, or I><nl> INSERT <temp><channel><press><press counts><M, C, or I><nl> : : : : INSERT <temp><channel><press><press counts><M, C, or I><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 during a FILL I - an Invalid Plane, the value cannot be accurately calculated nl - end of line

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 DSM4000 will return a list of INSERT commands showing the temperature, channel, applied pressure, counts and the type of plane.
	     INSERT 16.00 1-1 0.000000 0 I
	     INSERT 16.00 1-1 19.000000 0 I
	     INSERT 16.00 1-1 25.000000 0 I
	     :: :: :: :: :: :: :: ::
	     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

List A/D Correction Table (Non-Temperature Compensated)

Command	LIST A/D CORRECTION TABLE (NON-TEMPERATURE COMPENSATED)
Command Syntax	**LIST A2DCOR** *<module>*<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.
Description	Lists the correction coefficients for the A/D in the specified location.
Returns	A2DCOR <module> <index> <applied voltage> <counts> module - 0 to 8, Where 0 is the temperature A/D and 1 to 8 are the module A/D's index - the calibration point, up to 16 points may be entered, numbered 0 to 15 applied voltage - the voltage applied at the calibration point counts - the A/D counts measured at the calibration point
Example	To list the coefficients for the A/D converter in A/D module 1, type: LIST A2DCOR 1<CR> The DSM4000 will return: 　　　A2DCOR 1 0 0.00000 0 　　　A2DCOR 1 1 0.00000 0 　　　A2DCOR 1 2 0.00000 0 　　　A2DCOR 1 3 0.00000 0 　　　A2DCOR 1 4 0.00000 0 　　　A2DCOR 1 5 0.00000 0 　　　A2DCOR 1 6 0.00000 0 　　　A2DCOR 1 7 0.00000 0 　　　A2DCOR 1 8 0.00000 0 　　　A2DCOR 1 9 0.00000 0 　　　A2DCOR 1 10 0.00000 0 　　　A2DCOR 1 11 0.00000 0 　　　A2DCOR 1 12 0.00000 0 　　　A2DCOR 1 13 0.00000 0 　　　A2DCOR 1 14 0.00000 0 　　　A2DCOR 1 15 0.00000 0

LIST A/D CORRECTION TABLE (TEMPERATURE COMPENSATED)

Command	LIST A/D CORRECTION TABLE (TEMPERATURE COMPENSATED)
Command 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 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 DSM4000 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

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**LIST ARINC OUTPUT VARIABLES**

Command	LIST ARINC Output Variables
Command Syntax	**LIST AR** <CR>
Arguments	none
Description	Lists the ARINC outputs with their scaling factors.

Returns	SET ARINCn *<enable> <scaling factor> <nl>*
	SET ARINCn *<enable> <scaling factor> <nl>*
	   : : : :
	SET ARINCn *<enable> <scaling factor> <nl>*
	
	with:
	n - the ARINC output channel, 1 through 8
	enable - the scan group number, 0 through 8 (where 0 disables output)
	scaling factor - any valid number, default is 20 for psi engineering unit scaling, 0 can be used
	                     to enable auto-scaling.
	nl - end of line

Example	To list the ARINC output variables, type: LIST AR<CR>
	
	The DSM4000 may return:
	        SET ARINCOUT1 1 20
	        SET ARINCOUT2 1 20
	        SET ARINCOUT3 0 20
	        SET ARINCOUT4 0 20
	        SET ARINCOUT5 0 20
	        SET ARINCOUT6 0 20
	        SET ARINCOUT7 0 20
	        SET ARINCOUT8 0 20

LIST BOOTLOADER VARIABLES

Command	LIST BOOTLOADER GROUP VARIABLES
Command 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 DSM4000 will return the current boot loader variable settings. They could appear as follows.
	     SET IPADD 191.30.41.104
	     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 Dsm4000.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.

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LIST CONVERSION VARIABLES

Command	LIST CONVERSION VARIABLES
Command 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 DSM4000 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.
	
	NOTE: Variables marked with an asterisk are not used in DSM4000 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 DIGITAL VARIABLES
Command Syntax	**LIST D**<CR>
Arguments	None
Description	Lists the Digital Configuration variables from Group D.
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 digital variable settings, type: LIST D<CR>
	
	The DSM4000 will return the current digital settings. They could appear as follows.
	
	    SET DOUTPU 0
	    SET DOUTCALZ 60
	    SET DOUTPGSEQ 0
	    SET DOUTPG 0
	    SET DOUTSCAN 20
	    SET DINCALZ 0
	    SET DINSCAN 0
	    SET DINPG 0
	    SET DLYPGSEQ 1
	    SET DLYPG 10
	    SET DOUTREADY 40
	    SET BANKA 0
	    SET BANKB 0
	    SET BANKUSR 0

Command	LIST FILES
Command Syntax	**DIRFILE**<CR>
Arguments	None
Description	Lists the data files stored In the DSM4000 folder on the DSM4000 system computer hard disk drive.
Returns	<filename> <filesize(?)> <nl> : : : : <filename> <filesize(?)> <nl> <nl> filename - the data file name filesize - the size of the file in bytes nl - end of line

Example	To list all data files stored on the DSM4000 system computer hard disk drive, type:
	DIRFILE<CR>
	
	The DSM4000 will return a file list
	     Ip.cfg 221
	     Dsm4000.hex 525008
	     M351.MPF 177912
	     Sn.gpf 105
	     CV.GPF 870
	     Zero.cfg 2022
	     Nas.cfg 172
	     SSN.CFG 3

LIST GAIN VARIABLES

Command	LIST GAIN VARIABLES
Command 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 DSM4000 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 DSM4000 will return:
	    SET TEMPM6 0.0228
	
	The temperature gain settings may be verified for all modules connected to the DSM4000:
	
	    Type: LIST g<CR>
	
	The DSM4000 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

LIST ID CHIP IDENTIFICATION

Command	LIST ID CHIP IDENTIFICATION
Command 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. ZOC 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 (RDS)
	device - the device type, where:
	      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	To view all of the ID information of a DSM4000 with 2 A/D modules, an RDS, and a ZOC module installed in position 1, type: LIST ID<CR>
	      The DSM4000 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 DSM4000 may return:
	            5 1 M E 147524ef00000048 None
	EXAMPLE 3
	To View the ID information of a typical DSM4000, type: LIST ID
	      The DSM4000 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
Command 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. ZOC 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	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 DSM4000 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 DSM4000 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

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Command	LIST IDENTIFICATION VARIABLES
Command 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 DSM4000 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 DSM4000 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.

List Master Conversion Coefficients

Command	LIST MASTER CONVERSION COEFFICIENTS
Command 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 DSM4000 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

Example	To view the Master Points between 10°C and 40°C for channel 1 of the module installed in position 1, type: List m 10 40 1-1<CR>
	
	The DSM4000 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
	        INSERT 32.75 1-1 4.476100 23691 M

Command	LIST MODULE INFORMATION VARIABLES
Command 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	To view the configuration of the ZOC module installed in position 1, type:　　　LIST mi 1<CR> The DSM4000 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 64 　　　SET NPR1 5 　　　SET LPRESS1 1..16 -6.100000 　　　SET HPRESS1 1..16 6.100000 　　　SET NEGPTS1 1..16 4 　　　SET MODTEMP1 0 1.000000 NOTE: Variables marked with an asterisk are not used in DSM4000 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.

LIST NETWORK ATTACHED STORAGE VARIABLES

Command	LIST NETWORK ATTACHED STORAGE VARIABLES
Command 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 DSM4000 will return the current digital settings. They could appear as follows.
	      SET USERNAS scanconas
	      SET PASSNAS scanco
	      SET ENNAS 0
	      SET PATHNAS /dsm4000
	      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
Command Syntax	**LIST O** *<modules>*<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. This can be a module serial number, module position of omitted to return offset information for all modules. nl - End of line

Example	To verify the temperature offset setting for the module serial number 253,
	
	       Type: LIST o 253<CR>
	
	The DSM4000 will return:
	       SET TEMPB253 -259.740234
	
	The offset settings may also be verified by module location. To verify the temperature offset setting of the module installed in position 6,
	
	       Type: LIST o 6<CR>
	
	The DSM4000 will return:
	       SET TEMPB6 -259.740234
	
	The temperature offset settings may be verified for all modules installed in the DSM4000.
	
	       Type: LIST o<CR>
	
	The DSM4000 may return:
	       SET TEMPB1 -259.740234
	       SET TEMPB2 -259.740234
	       SET TEMPB3 -259.740234
	       SET TEMPB4 -259.740234
	       SET TEMPB5 -259.740234
	       SET TEMPB6 -259.740234
	       SET TEMPB7 -259.740234
	       SET TEMPB8 -259.740234

<u>*LIST PROFILE SETTINGS*</u>

Command	LIST PROFILE SETTINGS
Command 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. When the DSM4000 is first booted up, or when a RESTART, or REBOOT command is entered, The software reads the values set in this list and maps the coefficients in the respective MPF files into memory. If a MPF file is not found, default values for the module information data are used. After the initialization is complete, the software searches for ID chip information. If the ID chip information matches the Profile List, no changes are made. If the ID chip information is different from the Profile list, the Profile List is updated. ID chip information will also override module Information. NOTE: If serial numbers are not entered, the conversion coefficients will not load.
Returns	SET DSM4000 <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 DSM4000 may return:
	      SET DSM4000 43
	      SET SN1 253
	      SET SN2 0
	      SET SN3 0
	      SET SN4 0
	      SET SN5 0
	      SET SN6 0
	      SET SN7 0
	      SET SN8 0

Command	LIST REAL TIME DATA ANALYSIS SETTINGS
Command Syntax	**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 Group 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 DSM4000.
	
	      Type: LIST SA<CR>
	
	The DSM4000 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
	      SET READMODE 0
	
	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.

LIST SCAN VARIABLES

Command	LIST SCAN VARIABLES
Command 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 DSM4000, type: LIST S<CR>
	
	The DSM4000 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 0
	      SET FM 1 *
	      SET TEMPPOLL 1
	
	NOTE: Variables marked with an asterisk are not used in DSM4000 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.

**LIST SCAN GROUP VARIABLES**

Command	LIST SCAN GROUP VARIABLES
Command Syntax	**LIST SG** <_group_><CR>
Arguments	<group> - 1 through 8 for each applicable Scan Group
Description	Lists the Scan Group configuration variables.
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 or modify the configuration settings of Scan Group 1,
	        Type: LIST SG 1<CR>
	A typical DSM4000 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.

List System Components

Command	LIST SYSTEM COMPONENTS
Command 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 [optional]
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	DSM4000 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 RDS XXX 8 REMOTE DIGITAL SWITCH [DOUT 1-8] 10 11 12 13 14 15 16 NOTES: Positions 1 through 8 are reserved for A/D modules. Positions 9 is reserved for an RDS module. 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 RDS module is always identified as position 9.

Command	LIST SYSTEM COMPONENTS
Example	To view the current System Information as determined at power up, type: LIST SYS<CR> The DSM4000 could return: DSM4000 Serial Number 103 LOC A2DSN -MODEL- -SN- CHAN VALVE -NPR1-- -NPR2-- XDUCER -CAL-DATE- 1 111 ZOC33 300 64 IP 15.00 15.00 DIF 3/16/2010 2 110 ZOC33 311 64 IP 5.00 5.00 DIF 7/23/2011 3 121 4 122 5 123 6 127 7 128 8 131 LOC -MODEL- -SN- CHAN DESCRIPTION 9 RDS 103 8 REMOTE DIGITAL SWITCH [DOUT 1-8] 10 11 12 13 14 15 16 A/D 3200 Sn 111 is installed in Location 1, ZOC33 module 300 will be scanned by this A/D module. A/D 3200 Sn 110 is installed in location 2. ZOC33 module 311 will be scanned by this A/D module. RDS3200 Sn 103 is installed in location 9. ZOC33 SN300 has 64 channels The Full Scale pressure range of the module is 15 psi. The module is set up as a normal Differential Pressure Module. It was last calibrated March 16, 2010. ZOC33 SN311 has 64 channels. The Full Scale pressure range of the module is 5 psi. The module is set up as a normal Differential Pressure Module. It was last calibrated July 23, 2011.

Command	PURGE
Command Syntax	**PURGE**<CR>
Arguments	None
Description	Commands the DSM4000 to initiate a purge sequence. This command may be initiated by entering the command from the local system computer or a host computer. The DSM4000 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 DSM4000 returns to the READY mode. When a purge is initiated by a digital input, the DSM4000 may be in the READY mode or in the SCAN mode. The purge sequence is the same as above unless the DSM4000 is in the SCAN mode. If the DSM4000 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
Command 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

RESET SEQUENCE NUMBER

Command	RESET SEQUENCE NUMBER
Command Syntax	**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 use to complete the file name when a Network Attached Storage (NAS) device 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 100, enter:
	        RSTSEQ 100<CR>

RESTART

Command	RESTART
Command Syntax	**RESTART**<CR>
Arguments	None
Description	Commands the software to restart the DSM4000.hex program and re initializes a hardware reset. NOTE: The RESTART and the REBOOT command are identical and perform the same task
Returns	<nl> nl - end of line
Example	To initiate a Restart sequence, type: RESTART<CR>

SAVE

Command	SAVE
Command Syntax	**SAVE** [*modules*]<CR>

Arguments	[modules] - Module is the physical location of the module in the DSM4000. Syntax is:
	    module for one module
	    module,module,module for several modules
	    module..module for a range of modules

Description	Commands the DSM4000 to save the configuration variables, and correction tables to disk. Correction tables are saved as .MPF files for all modules specified in the command. If a module, several modules, or a range of modules is not specified, the correction tables for all enabled modules will be saved. All configuration variables will be saved by any variation of this command.
Returns	<nl> nl - end of line
Example	To save the current configuration variable settings and conversion coefficients for all enabled modules, type: SAVE<CR> To save the current configuration variable settings and conversion coefficients for module 4 only, type: SAVE 4<CR> To save the current configuration variable settings and conversion coefficients for modules 1, 3, and 7 only, type: SAVE 1,3,7<CR> To save the current configuration variable settings and conversion coefficients for modules 3, 4, 5, 6 and 7 only, type: SAVE 3..7<CR> NOTE: The SAVE command may require as much as 150 seconds to complete, depending on the configuration. DO NOT issue a RESTART command, or cycle power during this time. The SAVE operation has been completed when a caret (>) is returned.

SAVE BOOTLOADER VARIABLES

Command	SAVE BOOTLOADER VARIABLES
Command Syntax	**SAVEIP**<CR>
Arguments	None
Description	Commands the DSM4000 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.
Returns	<"WARNING: This action could cause network communication problems. Type SAVEIPCON-FIRM confirm SAVEIP or STOP to cancel the operation."> <nl>
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 may require approximately 5 seconds to complete, depending on the configuration. DO NOT issue a RESTART command, or cycle power during this time. The SAVEIP operation has been completed when a caret (>) is returned. Normally, commands entered during this time would be ignored, but it is possible on rare occasions to cause the DSM4000 firmware to freeze.

SAVE CONFIGURATION VARIABLES

Command	SAVE CONFIGURATION VARIABLES
Command Syntax	**SAVE CV**<CR>
Arguments	None
Description	Commands the DSM4000 to save only the configuration variables to disk. The variables will be written to the file: CV.GPF
Returns	<nl> nl - end of line
Example	To save the current configuration variable settings, type: SAVE CV<CR> NOTE: The SAVE CV command may require approximately 5 seconds to complete, depending on the configuration. DO NOT issue a RESTART command, or cycle power during this time. The SAVE CV operation has been completed when a caret (>) is returned.

Command	SAVE NETWORK ATTACHED STORAGE VARIABLES
Command Syntax	**SAVENAS**<CR>
Arguments	None
Description	Commands the DSM4000 to save the Network Attached Storage (NAS) configuration variables to the Micro SD Card. NAS configuration variables are saved to the nas.cfg file.
Returns	<nl> nl - end of line
Example	To save the current NAS configuration variable settings, type: SAVENAS<CR> NOTE 1: Changes to the NAS configuration variables are not saved during a execution SAVE, SAVE CV or SAVEIP command. NOTE 2: The SAVENAS command may require approximately 5 seconds to complete, depending on the configuration. DO NOT issue a RESTART command, or cycle power during this time. The SAVENAS operation has been completed when a caret (>) is returned.

SCAN

Command	SCAN
Command Syntax	**SCAN**<CR>
Arguments	None

Description	Commands the DSM4000 to scan the pressure sensors and output scan data. The SCAN function operation depends on the setting of ADTRIG and SCANTRIG.
	
	          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 a DSM4000, Number of Channels is always equal to the module with the largest number of channels (32 for a ZOC22 or ZOC23, 64 for a ZOC33). 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 (Digital Input defined by the DINSCAN variable) 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 a DSM4000, Number of Channels is always equal to the module with the largest number of channels (32 for a ZOC22 or ZOC23, 64 for a ZOC33). 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 DSM4000 will enter the SCAN mode and wait for a hardware or software trigger. When a trigger is received, the DSM4000 will acquire and output one averaged frame of data and re-enter the SCAN mode. Data will be acquired at the rate determined by the settings of PERIOD, AVGn and the Number of Channels. In a DSM4000, Number of Channels is always equal to the module with the largest number of channels (32 for a ZOC22 or ZOC23, 64 for a ZOC33). 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.
	
	          ADTRIG = 1
	          SCANTRIG = 1
	
	In this case, a hardware trigger (Digital Input defined by the DINSCAN variable) will initiate the SCAN function. The DSM4000 will enter the SCAN mode and wait for a hardware or software trigger. When a trigger is received, the DSM4000 will acquire and output one averaged frame of data and re-enter the SCAN mode. Data will be acquired at the rate determined by the settings of PERIOD, AVGn and the Number of Channels. In a DSM4000, Number of Channels is always equal to the module with the largest number of channels (32 for a ZOC22 or ZOC23, 64 for a ZOC33). 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.

Command	SCAN
Returns	The format of the returned data is based on the setting of the BIN configuration variable. If BIN is set to 1 the Scan Packets are returned in Binary Format (refer to "" on page 117 for more information). If BIN is set to 0, the scan packets are returned in ASCII Format as follows: \<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
Example	A scan group is set up to display 16 channels of module 1 with fps set to 1, type: SCAN\<CR\> The DSM4000 returns: Group=1 Frame=0000001 101= 0.0052 102= .0086 103= -0.0015 104= 0.0017 105= -0.0162 106= 0.0035 107= 0.0036 108= 0.0114 109= 0.0031 110= 0.0073 111= 0.0111 112= -0.0035 113= 0.0057 114= 0.0097 115= 0.0049 116= 0.0086 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.

Scanivalve

Command	SET
Command 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 DSM4000 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 16, to module 1, channels 1 through 16:
	     Type: SET CHAN2 0<CR>
	                  SET CHAN2 1-1..1-16<CR>

SLOTS

Command	SLOTS
Command Syntax	**SLOTS** <channel><CR>
Arguments	<channel> - the channel in module-port format
Description	Queries the DSM4000 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> pressure - boundary pressure nl - end of line

Example	To determine the boundary pressures for channel 1 of the 5 psi module s/n 253,
	    Type: SLOTS 253-1<CR>
	The DSM4000 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 one 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 DSM4000 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

STATUS

Command	STATUS
Command Syntax	**STATUS**<CR>
Arguments	None
Description	Commands the DSM4000 to return the current status.

Returns	STATUS: <current status><nl>
	
	Current status - one of the following:
	    READY -The module is ready to accept any command.
	    SCAN - The module is in the SCAN mode. The only commands that will be accepted are STATUS or STOP.
	    CALZ - The module is executing a CALIBRATE ZERO command. The only commands that will be accepted are STATUS or STOP.
	    LIST - The module is outputting a list. The only commands that will be accepted are STATUS or STOP.
	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 DSM4000 is not READY.
	
	If the STATUS command is entered while the DSM4000 is on, but inactive, the DSM4000 will return:
	    STATUS: READY
	
	If the STATUS command is entered while the DSM4000 is executing a Calibrate Zero command, the DSM4000 will return:
	    STATUS: CALZ

STOP

Command	STOP
Command Syntax	**STOP**<CR>
Arguments	None
Description	Commands the DSM4000 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>

TEMPERATURE

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

Example	To view the current temperatures of the modules connected to the DSM4000
	     Type: TEMP EU<CR>
	
	The DSM4000 will return:
	     TEMP: 1 28.75
	     TEMP: 2 29.25
	     TEMP: 3 30.00
	     TEMP: 4 29.50
	     TEMP: 5 28.25
	     TEMP: 6 29.50
	     TEMP: 7 28.50
	     TEMP: 8 27.50
	
	To view the A/D counts of the temperature inputs
	     Type: TEMP RAW<CR>
	
	The DSM4000 will return:
	     TEMP: 1 9731
	     TEMP: 2 9748
	     TEMP: 3 9783
	     TEMP: 4 9767
	     TEMP: 5 9708
	     TEMP: 6 9759
	     TEMP: 7 9723
	     TEMP: 8 9693

Scanivalve

TEMPERATURE GRADIENT COMPENSATION

Command	TEMPERATURE GRADIENT COMPENSATION
Command 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 DSM4000 Base Temperature.
Returns	<Location> <DSM4000 Temp> <A/D Temp> <Delta Temp> <nl> Location - A/D Location, 1 through 8 DSM4000 Temp - Measured Temperature of the DSM4000 in degrees C A/D Temp - Measured Temperature of the 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 DSM4000 software can only read the temperature of the base Temperature A/D when in the scan mode. The temperature of the A/D modules connected can be estimated based on the gradient calculation derived from the table generated by this command.
Example	A DSM4000 has eight A/D modules installed To calculate and store the temperature differential for these modules, type: TGRAD<enter> The DSM4000 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

Time Availability Test

Command	TIME AVAILABILITY TEST
Command 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	<time or error><nl>
	
	time - if the Time Server can 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 - if the Time Server cannot be found, the message:
	    ERROR: Time Server cannot be found
	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.

Trigger

Command	TRIGGER
Command Syntax	**TRIG**<CR>
Arguments	None
Description	With ADTRIG enabled, the 'TRIG' command acts as one A/D trigger, returning one frame of data.
Returns	One frame of averaged data.

Version

Command	VERSION
Command Syntax	**VER**<CR>
Arguments	None
Description	Requests the version number of the DSM4000.hex file.
Returns	VERSION: <version string><nl> version string - the version number of the DSM4000.hex file nl - end of line
Example	To determine the version of DSM4000.hex software in use, type: VER<CR> The DSM4000 will return: VERSION: 1.00

Scanivalve

Command	WRITE ID CHIP VARIABLES
Command Syntax	**IDPWRITE** *<location> <site> <device> <memory>*<CR>
Arguments	location - The location of the device. Valid values are 1 through 8 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. memory - 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 <location> <site> <device> <memory> <name> <value> location - The location of the device. Valid values are 1 through 8 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 memory - 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 DSM4000 software must be set up to write to the EPROM.
	      Type: IDPWRITE 1 M E E
	
	The DSM4000 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 either 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.

Zero

Command	ZERO
Command Syntax	**ZERO** [*module*]<CR>
Arguments	[module] -the module position 1 through 8 or the serial number
Description	Lists the active zero correction values that 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 DSM4000 could 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: 1-58 150
	      ZERO: 1-59 156
	      ZERO: 1-60 96
	      ZERO: 1-61 19
	      ZERO: 1-62 134
	      ZERO: 1-63 132
	      ZERO: 1-64 238
	
	NOTE: If a module number is not entered, the zero values for all enabled modules will be returned.

Scanivalve

CONFIGURATION VARIABLES

ARINC429 SCAN GROUP VARIABLES (GROUP AR)

ARINC OUTPUT

Variable	**ARINCOUTn** *<enable> <scaling>* (where n= the ARINC output channel)
Valid Values	<enable> - 0 - disables ARINC data output 1 - enables ARINC data output <scaling> - any valid number
Default Value	n - 0 enable - 0 scale - 20
Data Type	varies
Description	This group of variables enables each and sets the scaling for each of the eight ARINC output channels. If scale is set to 0, auto-scaling is enabled. Auto-scaling takes the Nominal Pressure Range (NPR) term from the module's MPF file multiplied by 1.1 to determine the ARINC channel scale.

BOOTLOADER 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.

IP ADDRESS

Variable	**IPADDR** *<IP address>*
Valid Values	any valid IP address
Default Value	191.30.41.xxx Where xxx is the serial number
Data Type	integer
Description	The IP Address of the module

SUBNET MASK

Variable	**SUBNET** *<Subnet Mask>*
Valid Values	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.

MAC Address

Variable	**MAC** *<MAC Address>*
Valid Values	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.

Login

Variable	**LOGIN** *<User Name>*
Valid Values	any valid character string
Default Value	Scanivalve
Data Type	string
Description	The User name for the FTP login

Password

Variable	**PASSWORD** *<Password>*
Valid Values	any valid character string
Default Value	Scanner
Data Type	string
Description	The password associated with the user name for the FTP login

Login 1

Variable	**LOGIN1** *<User Name>*
Valid Values	any valid character string
Default Value	Scanivalve1
Data Type	string
Description	The User name for the FTP login

Password 1

Variable	**PASSWORD1** *<Password>*
Valid Values	any valid character string
Default Value	Scanner1
Data Type	string
Description	The password associated with the user name for the FTP login

Allow Anonymous Login

Variable	**ALLOWANON** *<code>*
Valid Values	0, 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

Application

Variable	**APP** *<Application>*
Valid Values	any valid Application Name
Default Value	Dsm4000.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.

GW

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 DSM Subnet.

Conversion Variables (Group C)

A2DCOR

Variable	**A2DCOR** *<code>*
Valid Values	0, 1
Default Value	1
Data Type	integer
Description	Sets the A/D Correction ON or OFF. 0 - Sets A/D Correction OFF 1 - Sets A/D Correction ON

BIN

Variable	**BIN** *<code>*
Valid Values	0, 1, 2
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 - Output is in binary format with module-port information

CALAVG

Variable	**CALAVG** *<code>*
Valid Values	2 to 255
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.

CALZDLY

Variable	**CALZDLY** *<period>*
Valid Values	5 to 128
Default Value	15
Data Type	integer
Description	Sets the delay time, in seconds, before the DSM4000 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.

CVTUNIT

Variable	**CVTUNIT** *<code>*
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.

Scanivalve

EU

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

Notes	When the A/D counts reach 32767 or -32768, and EU is set to 1, the DSM4000 will output the values set in MAXEU and MINEU to indicate that a conversion error may exist. The DSM4000 will also output these values when the maximum or minimum master conversion planes are exceeded.

MAXEU

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 DSM4000 will output 9999 or whatever has been entered as the MAXEU value to indicate that a conversion error may exist. The DSM4000 will also output these values when the maximum or minimum master conversion planes are exceeded.

MINEU

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 DSM4000 will output -9999 or whatever has been entered as the MINEU value to indicate that a conversion error may exist. The DSM4000 will also output these values when the maximum or minimum master conversion planes are exceeded.

MPBS

Variable	MPBS *<number of planes>*
Valid Values	0 to 140
Default Value	0
Data Type	integer

Variable	**MPBS** *<number of planes>*
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.

STARTCALZ

Variable	**STARTCALZ** *<code>*
Valid Values	0, 1
Default Value	0
Data Type	integer
Description	When set to 1, causes the DSM4000 to execute a CALZ at startup. The DSM4000 does not save zeros at power down. If the DSM4000 is set to start scanning immediately or if it is difficult to input commands to the DSM4000 once it is powered up, then this variable should be set to 1. The DSM4000 will then execute a CALZ at the end of the initialization sequence.

UNITSCAN

Variable	**UNITSCAN** *<units>*				
Valid Values	see list below				
Default Value	PSI				
Data Type	string				
Description	This sets the output engineering units for the DSM4000. 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				
Notes	If a value other than those listed is entered, The DSM4000 will default to PSI. See "Appendix B - Engineering Unit Conversion Constants" on page 120 for more information.				

ZC

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.

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DIGITAL I/O CONFIGURATION VARIABLES (GROUP D)

DINCALZ

Variable	DINCALZ *<value>*
Valid Values	0, 2, 4, 8, 10, 20, 40, 80 hexadecimal
Default Value	0
Data Type	integer
Description	Determines which bit of the Digital Input word is used to initiate a CALZ. Input 1 is the least significant binary bit. Input 1 may not be used for Digital Inputs, only the external Frame or Scan Trigger. Input 8 is the most significant binary bit.

DINPG

Variable	DINPG *<value>*
Valid Values	0, 2, 4, 8, 10, 20, 40, 80 hexadecimal
Default Value	0
Data Type	integer
Description	Determines which bit of the Digital Input word is used to initiate or abort a PURGE sequence. Input 1 is the least significant binary bit. Input 1 may not be used for Digital Inputs, only the external Frame or Scan Trigger. Input 8 is the most significant binary bit.

DINSCAN

Variable	DINSCAN *<value>*
Valid Values	0, 2, 4, 8, 10, hexadecimal
Default Value	0
Data Type	integer
Description	Determines which bit of the Digital Input word is used to start or stop a SCAN. Input 1 is the least significant binary bit. Input 1 may not be used for Digital Inputs, only the external Frame Trigger (or ADTRIG input). Input 5 is the most significant binary bit.

DLYPG

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.

DLYPGSEQ

Variable	DLYPGSEQ *<value>*
Valid Values	1 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.

DOUTCALZ

Variable	**DOUTCALZ** *<value>*
Valid Values	0 to FFFF 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 command is entered as 2 hexadecimal digits.

DOUTPG

Variable	**DOUTPG** *<value>*
Valid Values	0 to FFFF 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 command is entered as 2 hexadecimal digits.

DOUTPGSEQ

Variable	**DOUTPGSEQ** *<value>*
Valid Values	0 to FFFF 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 command is entered as 2 hexadecimal digits.

DOUTPU

Variable	**DOUTPU** *<value>*
Valid Values	0 to FFFF 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 command is entered as 2 hexadecimal digits.

DOUTSCAN

Variable	**DOUTSCAN** *<value>*
Valid Values	0 to FFFF hexadecimal
Default Value	20
Data Type	integer
Description	Enables the digital outputs to indicate that the DSM4000 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 command is entered as 2 hexadecimal digits.

IDENTIFICATION CONFIGURATION VARIABLES (GROUP I)

ECHO

Variable	**ECHO** *<enable>*
Valid Values	0, 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

FORMAT

Variable	**FORMAT** *<code>*
Valid Values	0, 1, 2
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.
	    2 - data are scrolled with a prompt between frames

HAVEARINC

Variable	**HAVEARINC** *<code>*
Valid Values	0, 1. 2
Default Value	0
Data Type	integer

Description	Determines if ARINC is configured.
	    0 - No ARINC is configured
	    1 - ARINC output is enabled with no parity
	    2 - ARINC output is enabled with odd parity

Notes	

IFUSER

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.

NL

Variable	**NL** *<code>*
Valid Values	0, 1
Default Value	0
Data Type	integer

Description	Determines the new line character(s) for all output.
	        0 - <CR><LF>
	        1 - <CR>

ID Chip Configuration Variables (Group ID)

IDP

Variable	**DP** *<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 DSM4000 ID Chip Data Format before attempting to modify a setting using this configuration variable.
	        Loc - The location of the device. Valid values are 1 through 8
	        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.
	
	                - CONTINUED -

Variable	**DP** *<loc> <site> <device> <mem> <name> <value>*
Notes	Memory Device Type P (PROM) - All Family Codes - Values may not be modified by a user

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

DFC	Device Family Code	0 = DSM Temperature A/D Board
		1 = DSM Pressure A/D Board
		2 = Pressure Scanner Module
		3 = DSM 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	DSM Serial Number	Number 0 – 4096
APPTYPE	DSM Application Type	0 = Standalone
		1 = Enclosure

- CONTINUED -

Variable	**IDP** *<loc> <site> <device> <mem> <name> <value>*
Notes	Memory Device Type E (EEPROM) - Family Code 0

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	DSM Serial Number	Number 0 – 4096
APPTYPEDSM	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 Calibration 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

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MODULE*n* CONFIGURATION VARIABLES (M1 THROUGH M8)

HPRESS*n*

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 in the module n.

LPRESS*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.

MODTEMP*n*

Variable	**MODTEMPn** *<port number> <scale factor>* (where n= the module position number)
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.

NEGPTS*n*

Variable	**NEGPTSn** *<ports> <negpts>* (where n= the module position number)
Valid Values	<port> - 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.

NPRn

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.

NUMPORTSn

Variable	**NUMPORTSn** *<ports>* (where n= the module position number)
Valid Values	16, 32, 64
Default Value	64
Data Type	integer
Description	Defines the number of ports for the module n.
Notes	If the largest enabled module is 16 channels, AVG must be set to 2 or more. If AVG is set to 1, the largest module cannot be 16 channels.

TYPEn

Variable	**TYPEn** *<code>* (where n= the module position number)
Valid Values	0, 1, 2, 3, 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

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MODULE PROFILE VARIABLES (GROUP P)

DSMSN

Variable	**DSMSN** *<serial number>*
Valid Values	any valid integer up to 4 digits
Default Value	0000
Data Type	integer
Description	The serial number of the DSM4000.

SNn

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 position n.

NETWORK ATTACHED STORAGE DEVICE 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. DSM4000 operational problems

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

ENNAS

Variable	**ENNAS** *<code>*
Valid Values	0, 1, 2
Default Value	0
Data Type	integer

Description	Enables the data output to the Network Attached Storage (NAS) device.
	    0 - Data are not sent to the NAS device
	    1 - Data are sent to the NAS. A sequence number will be used to construct the file name(s).
	    2 - Data are sent to the NAS. The time, gathered from the NTP will be used to construct file name(s).

Notes	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.

ENNTP

Variable	**ENNTP** *<code>*
Valid Values	0, 1
Default Value	0
Data Type	integer

Description	Enables the use of a Network Time Protocol (NTP).
	      0 - Network Time Protocol is disabled.
	      1 - - Network Time Protocol is enabled.

FILENAS

Variable	**FILENAS** *<filename>* [*fix sequence switch*]
Valid Values	<filename> - any valid character string [fix sequence switch] - 0, 1
Default Value	Scan 0
Data Type	string
Description	File name sets the data file name prefix. The file name will be completed with either a sequence number or the date and time as documented in the description of "ENNAS" on page 93. 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.

IPNAS

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 Network Attached Storage (NAS) device.

IPNTP

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 Network Time Protocol (NTP) server.

PASSNAS

Variable	**PASSNAS** *<Password>*
Valid Values	Any valid character string
Default Value	ScannerNas
Data Type	string
Description	The password associated with the user name for the login to the Network Attached Storage (NAS) device.

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PATHNAS

Variable	**PATHNAS** </Disk/Share>
Valid Values	Any valid pat to the NAS disk
Default Value	/disk1/share
Data Type	string
Description	Sets the path on the Network Attached Storage (NAS) device for the data file(s). This value must not include the drive designation, only the pate on that drive. The FTP Server in the NAS should have the data destination defined as the root directory.

USERNAS

Variable	**USERNAS** *<user name>*
Valid Values	Any valid character string
Default Value	ScanivalveNas
Data Type	string
Description	The user name for login to the Network Attached Storage (NAS) device.

UTCCOFFSET

Variable	**UTCCOFFSET** *<offset>*
Valid Values	any valid number
Default Value	0
Data Type	signed integer
Description	The time offset from the Coordinated Universal Time (UTC).

REAL TIME DATA ANALYSIS VARIABLES (GROUP SA)

The Real Time Data Analysis Function is a special feature of the DSM4000 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 1 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.

SA

Variable	**SA** *<code>*
Valid Values	0, 1
Default Value	0
Data Type	integer

Description	Enables the Real Time Data Analysis (RTDA).
	    0 - Real Time Data Analysis (RTDA) is disabled.
	    1 - Real Time Data Analysis (RTDA) is enabled.

Notes	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 1.

SAACCUM

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 DSM4000 software will add the most current value to the accumulator and drop the oldest value at each new frame of data.
Notes	The setting of this variable will affect the maximum data rate while RTDA is enabled. Maximum data rate will vary depending on the installation.

SAROLLAVG

Variable	**SAROLLAVG** *<code>*
Valid Values	0, 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 1. 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.

SAMAX

Variable	**SAMAX** *<code>*
Valid Values	0, 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.

SAMIN

Variable	**SAMIN** *<code>*
Valid Values	0, 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.

SARMS

Variable	**SARMS** *<code>*
Valid Values	0, 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.

SADEV

Variable	**SADEV** *<code>*
Valid Values	0, 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.

SAAVGXO

Variable	SAAVGXO *<code>*
Valid Values	0, 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.

SAOL

Variable	SAOL *<code>*
Valid Values	0, 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.

READMODE

Variable	READMODE *<code>*
Valid Values	0, 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 ? (see "Read" on page 64 for more information) is issued to the DSM4000. At that time a "snapshot" frame of data will be acquired and output.
Notes	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.

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TEMPERATURE GAIN VARIABLES (GROUP G)

TEMPMn

Variable	**TEMPn** *<values>*
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 Nickel Iron RTD(604Ω at 0°). The conversion formula is: °C = TempM x (Counts) - TempB

NOTE: 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	-192.9757	0.0228	ZOC16TC (Standard) ZOC22B (Standard) ZOC23B (Standard)
Platinum 100 Ω at 0°C	-259.7403	0.1853	ZOC22B (Special) ZOC23B (Special) ZOC33 (Special)
Platinum 500 Ω at 0°C	-259.7403	0.0371	ZOC33 (Standard)
Platinum 1000 Ω at 0°C	-259.7403	0.0185	ZOC22B (Special) ZOC23B (Special) ZOC33 (Special)

TEMPERATURE OFFSET VARIABLES (GROUP O)

TEMPBn

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 Nickel Iron RTD(604Ω at). The conversion formula is: °C = TempM x (Counts) - TempB

Scan Variables (Group S)

ADTRIG

Variable	**ADTRIG** *<code>*
Valid Values	0, 1, 2
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 an 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 DSM4000 enters a WAIT state until a trigger pulse is received. At that time, the DSM4000 will acquire and output one averaged frame of data and 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. 　2 - Sets the Tag Bit Function. This function allows a user to apply a voltage to the Trigger Input and have that digital state recorded in the data stream. The status of the Tag Bit is placed in bit 7 of the enabled Scan Group(s) in the Binary Packet. Scan Groups are identified in byte 1 of the Scan Packets. The status of the Tag Bit is also shown on the formatted screen of the Console.
Notes	If ADTRIG is set to 1, the hardware trigger input must be DIN 1.

BINADDR

Variable	**BINADDR** *<port>* *<IP address>*
Valid Values	port - 1 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 1 to 65535, data are sent over that port to the IP address identified in a UDP format.

IFC

Variable	**IFC** *<code>*
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.

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PERIOD

Variable	**PERIOD** *<period>*
Valid Values	25 to 65535
Default Value	500
Data Type	integer or float
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. All Scan Groups use the this variable. Period is only one of the terms required to determine data rate. Data rate is determined by the equation: $$DataRate = \frac{1}{(Period \times NumberofChannels \times AVG)}$$
Notes	Data Rate is expressed in Hertz per channel. The Period variable in the DSM4000 is in microseconds but must be conveted to seconds for this calculation. Channels is always 64 in a standard DSM4000. AVG is the average term for that scan group. NumberofChannels will always equal the module with the greatest channel count in a DSM4000.

SCANTRIG

Variable	**SCANTRIG** *<code>*
Valid Values	0, 1, 2
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 the digital input assigned by the DINSCAN setting is received. The hardware trigger is a hard wired Digital Input. 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.
	        2 - Scanning is automatically initiated upon completion of the boot cycle. The data output, format and destination will all be determined by the standard variables set before the unit was powered down.

Notes	A Software Trigger will not initiate the SCAN function. SCANTRIG can be assigned to Digital Input 2-5 using the variable DINSCAN

TEMPPOLL

Variable	**TEMPPOLL** *<code>*
Valid Values	0, 1
Default Value	1
Data Type	integer

Description	This variable controls the Temperature Polling function. When this variable is enabled, the temperature of the A/D modules are read at a 5 second period.
	        0 - Temperature polling is disabled.
	        1 - Temperature polling is enabled.

TIMESTAMP

Variable	**TIMESTAMP** *<code>*
Valid Values	0, 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.
	        0 - Time is in microseconds.
	        1 - Time is in milliseconds.

DOUTREADY

Variable	**DOUTREADY** *<value>*
Valid Values	0 to FFFF hexadecimal
Default Value	40
Data Type	integer
Description	Enables the digital outputs to indicate that the DSM4000 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 command is entered as 2 hexadecimal digits.

BANKA

Variable	**BANKA** *<value>*
Valid Values	0 to FFFF hexadecimal
Default Value	0
Data Type	integer
Description	Enables the digital outputs to be set to mode other than defined in one of the standard DOUT variables. Output 1 is the least significant binary bit. Output 8 is the most significant binary bit. The command is entered as 2 hexadecimal digits.

BANKB

Variable	**BANKB** *<value>*
Valid Values	0 to FFFF hexadecimal
Default Value	0
Data Type	integer
Description	Enables the digital outputs to be set to mode other than defined in one of the standard DOUT variables Output 1 is the least significant binary bit. Output 8 is the most significant binary bit. The command is entered as 2 hexadecimal digits.

BANKUSR

Variable	**BANKUSR** *<value>*
Valid Values	0 to FFFF hexadecimal
Default Value	0
Data Type	integer
Description	Enables the digital outputs to be set to mode other than defined in one of the standard DOUT variables. Output 1 is the least significant binary bit. Output 8 is the most significant binary bit. The command is entered as 2 hexadecimal digits.

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SCAN GROUP CONFIGURATION VARIABLES (GROUP SG)

AVG

Variable	**AVG**[**n**] <*sample average*> (where n = the scan group number)
Valid Values	1 to 256
Default Value	16
Data Type	integer
Description	Sets the minimum number of samples to average for Scan Group 1. Refer to the CHAN variable for information on averaging of modules with a dissimilar number of channels.

Notes	For compatibility with legacy products, the syntax can either be entered as:
	     AVG 16
	or:
	     AVGn 16
	
	AVGn where n = 1-8 will always be the same for all Scan Groups. Changing AVGn changes the AVG term in every Scan Group.

FPS

Variable	**FPS**[**n**] <*frames*> (where n = the scan group number)
Valid Values	0 to 2147483648
Default Value	0
Data Type	long integer
Description	"Frames Per Scan." This variable sets the number of averaged frames 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. Once the FPS term has been met, the DSM4000 will stop scanning and return to READY mode. When FPS is set to 0, the scan will continue until a STOP command is received. $$DataRate = \frac{1}{(Period \times NumberofChannels \times AVG)}$$

Notes	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 compatibility with legacy products, the syntax can either be entered as:
	     FPS 100
	or:
	     FPSn 100
	
	FPSn where n = 1-8 will always be the same for all Scan Groups. Changing FPSn changes the FPS term in every Scan Group.
	
	Data is output beginning with frame 0. As such, when FPS is set to n the DSM4000 will output n frames of data, numbered 0 through n-1.

SGENABLE

Variable	SGENABLE[**1**] *<code>*
Valid Values	0, 1, 16, 32
Default Value	0
Data Type	integer

Description	Defines the scan mode for Scan Group 1
	     0 - Disabled
	     1 - Normal Scan Mode Enabled
	     16 - Fast Mode 16 Channel Scan Mode Enabled
	     32 - Fast Mode 32 Channel Scan Mode Enabled

Notes	A DSM4000 may be set up for "fast mode" scanning. In this mode of operation, the system will scan the first 16 or 32 channels in a module, or group of modules. This will effectively increase the sampling rate. For more information, refer to "DSM4000 Fast Mode Scanning" on page 113. SGENABLE[n], where n = 2-8 is not user configurable. SGENABLE[n] where n = 2-8 will always be set to 1.

CHAN

Variable	CHAN[**n**] *<channels>* (where n = the scan group number)

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 - the physical location of the module in the rack or the connector supporting the module.
	Port - 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.

Notes	Only RTDA and ARINC data is output for Scan Group 2-8. Channels assigned to CHAN[n] will not output to the Ethernet port unless RTDA is enabled.

LEGACY COMMAND LIST

AUXILIARY COMMAND

Command	AUXILIARY COMMAND
Syntax	**AUXCMD** <*command*><CR>

CALIBRATOR COMMAND

Command	CALIBRATOR COMMAND
Syntax	**CALCMD** <*command*><CR>

CLOSE SCAN FILE

Command	CLOSE SCAN FILE
Syntax	**CLOSE**<CR>

CREATE SENSOR PROFILE FILE

Command	CREATE SENSOR PROFILE FILE
Syntax	**CREATESPF** <*sensor serial number*> <*channel number*><CR>

DELETE FILE

Command	DELETE FILE
Syntax	**DELFILE** <*filename*><CR>

DELETE ERROR LOG FILE

Command	DELETE ERROR LOG FILE
Syntax	**DELETELOGFILE**<CR>

FILL

Command	FILL
Syntax	**FILL**<CR>

MERGE SENSOR PROFILE FILE

Command	MERGE SENSOR PROFILE FILE
Syntax	**MERGESPF** <*sensor profile file*> <*module profile file*> <*port number*><CR>

QUIT

Command	QUIT
Syntax	**QUIT**<CR>

RESTART

Command	RESTART
Syntax	**RESTART**<CR>
Notes	Performs same function as 'REBOOT' command

SHUTDOWN

Command	SHUTDOWN
Syntax	**SHUTDOWN**<CR>
Notes	Performs same function as 'DISCONNECT' command

LEGACY VARIABLE LIST

FM

Variable	**FM** *<code>*
Group	Group S
Valid Values	1 to 20

QPKTS

Variable	**QPKTS** *<enable>*
Group	Group S
Valid Values	0, 1, 2

ENABLE

Variable	**ENABLEn** *<enable>*
Group	Group M1 through M8
Valid Values	0, 1

AUX

Variable	**AUX** *<comport>* *<BAUD><terminator code>*
Group	Group I
Valid Values	Comport 0 - No external device connected. 1 - An external device is connected to COM1 2 - An external device is connected to COM2 3 - An external device is connected to COM3 4 - An external device is connected to COM4 BAUD This sets the BAUD rate of the serial communications channel. Valid values are: 110, 300, 1200, 2400, 4800, 9600, 19200, 38400, 57600, or 115200. Terminator code 0 - null terminator 1 - CR 2 - CR LF 3 - LF CR 4 - LF

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AUXSCHED

Variable	**AUXSCHED** *<enabled>* *<command>* *<internal interval time>*
Group	Group I

Valid Values	enabled
	        0 - AUXSCHED is not enabled.
	        1 - AUXSCHED is enabled
	command
	        Any valid command.
	Internal interval time
	        The valid range is 500 to 100,000 milliseconds, 0 disables this function

CAL

Variable	**CAL** *<comport>* *<BAUD>*
Group	Group I

Valid Values	Comport
	        0 - No Calibrator is connected.
	        1 - A Calibrator is connected to COM1
	        2 - A Calibrator is connected to COM2
	        3 - A Calibrator is connected to COM3
	        4 - A Calibrator is connected to COM4
	BAUD
	        This sets the BAUD rate of the serial communications channel. Valid values are: 110, 300, 1200, 2400, 4800, 9600, 19200, 38400, 57600, or 115200.

CALPER

Variable	**CALPER** *<code>*
Group	Group C
Valid Values	50 to 5000
Notes	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.

CALSCHED

Variable	**CALSCHED** *<enabled>* *<command>* *<internal interval time>*
Group	Group I

Valid Values	enabled
	        0 - CALSCHED is not enabled.
	        1 - CALSCHED is enabled
	command
	        Any valid command.
	Internal interval time
	        The valid range is 500 to 100,000 milliseconds, 0 disables this function.

CONOUT

Variable	**CONOUT** *<code>*
Group	Group I
Valid Values	1, 2, 3

DISPIN

Variable	**DISPIN** *<code>*
Group	Group I
Valid Values	1

FILLONE

Variable	**FILLONE** *<code>*
Group	Group C
Valid Values	0, 1

HAVENET

Variable	**HAVENET** *<code>*
Group	Group I
Valid Values	0, 1

NETIN

Variable	**NETIN** *<code>*
Group	Group I
Valid Values	0, 1

NETOUT

Variable	**NETOUT** *<code>*
Group	Group I
Valid Values	0, 1

PAGE

Variable	**PAGE** *<code>*
Group	Group S
Valid Values	1

RESCAN

Variable	**RESCAN** *<code>* *<time out>*
Group	Group I
Valid Values	*<code>* - 0, 1 *<time out>* - 0 to 10

TWOAD

Variable	**TWOAD** *<code>*
Group	Group I
Valid Values	0, 1

DSM4000 ID CHIP DATA FORMAT

The DSM4000 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
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)
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 Gain = 2.852 1 = 16 Bit 100KHz Gain = 1 2 = 16 Bit 100KHz Gain = 2 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 1 = ZSM Family Code = 5 0 = ZOC16EIM 1 = ZOCEIM16 2 = ZOCEIM32
4	DFC	Device Family Code	0 = DSM Temperature A/D Board 1 = DSM Pressure A/D Board 2 = Pressure Scanner Module 3 = DSM Digital I/O Device 4 = Test Fixture 5 = Voltage Scanner Module
24		Spare	

EEPROM MEMORY DATA FORMAT:

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

Bits	Name	Description	Assigned Values
DSM Temperature A/D Board (Device Family = 0) EEPROM Memory 256 Bits			
32	ADCA	A/D Correction Coefficient A	The A coefficient of $A x^2 + Bx + C$. 32 bit floating point coefficients.
32	ADCB	A/D Correction Coefficient B	The B coefficient of $A x^2 + Bx + C$. 32 bit floating point coefficients.
32	ADCC	A/D Correction Coefficient C	The C coefficient of $A x^2 + Bx + C$. 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) YYYYYY = Years Past 2000 (0 – 128)
12	SN	DSM Serial Number	Binary Number 0 – 4096
8	APPTYPE	DSM Application	Binary Number 0 – 255 0 = Standalone (Default) 1 = ENCL3200
92		Spare	

Bits	Name	Description	Assigned Values
DSM Pressure A/D Board (Device Family = 1) EEPROM Memory 256 Bits			
32	ADCA	A/D Correction Coefficient A	The A coefficient of $A x^2 + Bx + C$. 32 bit floating point coefficients.
32	ADCB	A/D Correction Coefficient B	The B coefficient of $A x^2 + Bx + C$. 32 bit floating point coefficients.
32	ADCC	A/D Correction Coefficient C	The C coefficient of $A x^2 + Bx + C$. 32 bit floating point coefficients.
32	ECC	Excitation Current	32 bit floating point number equals excitation current with exact 5 V reference. (nom .0015)
8	GAIN	Gain Code	0 = 2.852 Gain 1 = 1 Gain 2 = 2 Gain
16	ACDATE	A/D Calibration Date	DDDDDMMMMYYYYYYY DDDDD = Day (1 – 31) MMMM = Month (1 – 12) YYYYYY = Years Past 2000 (0 – 128)
104		Spare	

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Bits	Name	Description	Assigned Values
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.
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
16	RCDATE	RTD Calibration Date	DDDDDMMMMYYYYYYY DDDDD = Day (1 – 31) MMMM = Month (1 – 12) YYYYYY = Years Past 2000 (0 – 128)
16	PCDATE	Pressure Sensor Calibration Date	DDDDDMMMMYYYYYYY DDDDD = Day (1 – 31) MMMM = Month (1 – 12) YYYYYY = Years Past 2000 (0 – 128)
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
8	VALVE	Pressure Valve Arrangement	0 – None 1 – X1 2 – X2 3 – NPX 4 – NO 5 – IP
8	XDUCER	Transducer Type	0 – Differential 1 – Absolute 2 – Gage 3 – True_Delta 4 – EIM
64		Spare	

Pressure Scanner Module (Device Family = 2)
EEPROM Memory 256 Bits

DSM 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	

Scanivalve

DSM4000 SCAN FUNCTION

When a SCAN function is initiated, the DSM4000 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 DSM4000 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 DSM4000 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 DSM4000 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.

When ADTRIG is set to 1 (enabled), the SCAN function will be initiated by the SCAN command or a SCANTRIG input. The DSM4000 will enter the SCAN mode and wait for a hardware or software trigger. When a trigger is received, the DSM4000 will acquire and output one averaged frame of data and re-enter the 'Waiting for Trigger' 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 (FPS) variable has been satisfied or a STOP command is received.

When SCANTRIG is set to 1 (enabled), the SCAN function will be initiated by the DINSCAN digital input. When a digital input defined by the DINSCAN variable is received, the DSM4000 will enter the SCAN mode, acquire and output averaged frames of data until the Frames Per Scan (FPS) variable has been satisfied or a STOP command is received. Subsiquent trigger pulses received after the first trigger will stop the scan. When Frames Per Scan (FPS) has been satisfied, the DSM4000 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.

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 4.5 Vdc @ 6.5 mA. It may accept voltages as high as 15 Vdc. The external trigger input is on pins A and B of the DSM4000's Digital Input connector.

SOFTWARE TRIGGER

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

AUTO SCAN FUNCTION

The DSM4000 can be setup to automatically enter scan mode as soon as the unit has finished booting up. This is most commonly required for flight test applications or applications where a SCAN command will not be able to be sent. This is accomplished by setting the SCANTRIG variable to 2. See "SCANTRIG" on page 101 for more information. If the "STARTCALZ" function is used, the CALZ will be completed before the scanning commenses.

DSM4000 FAST MODE SCANNING

The speed limitation of a DSM 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 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 DSM4000 resets its port address selection lines and starts sampling at port one again. This cycle continues through the scan process.

CONFIGURING FAST 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 16 or 32, fast mode is enabled.

SGENABLE1 Settings

SGENABLE1	Description	Ports Sampled 32 Ch Module	Ports Sampled 64 Ch Module
0	Scan group disabled	-	-
1	Scan group enabled, normal mode	32	64
16	Scan group enabled, fast mode	First 16	First 16
32	Scan group enabled, fast mode	First 32	First 32

An error is generated if a channel in the channel list would not be sampled because of the fast mode setting.

EXAMPLE

This example shows how the frame number, sampled ports and scan rate are affected by fast 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 Mode
SGENABLE1	1	16
PERIOD (µs)	50	50
RATE CALCULATION	1/(50µs X 32chan)	1/(50µs X 16chan)
RATE	625Hz	1250Hz

This table shows the effect of changing the value of SGENABLE1 from 1 to 16.

Elapsed Time µS	Normal Mode SGENABLE1 1		Fast Mode SGENABLE1 16	
	Port#	Frame#	Port#	Frame#
0	1	1	1	1
50	2	1	2	1
100	3	1	3	1
150	4	1	4	1
200	5	1	5	1
250	6	1	6	1
300	7	1	7	1
350	8	1	8	1
400	9	1	9	1
450	10	1	10	1
500	11	1	11	1
550	12	1	12	1
600	13	1	13	1
650	14	1	14	1
700	15	1	15	1
750	16	1	16	1
800	17	1	1	2
850	18	1	2	2
900	19	1	3	2
950	20	1	4	2
1000	21	1	5	2
1050	22	1	6	2
1100	23	1	7	2
1150	24	1	8	2
1200	25	1	9	2
1250	26	1	10	2
1300	27	1	11	2
1350	28	1	12	2
1400	29	1	13	2
1450	30	1	14	2
1500	31	1	15	2
1550	32	1	16	2
1600	1	2	1	3
1650	2	2	2	3
1700	3	2	3	3
1750	4	2	4	3
1800	5	2	5	3
1850	6	2	6	3
1900	7	2	7	3
1950	8	2	8	3
2000	9	2	9	3
2050	10	2	10	3
2100	11	2	11	3
2150	12	2	12	3
2200	13	2	13	3
2250	14	2	14	3
2300	15	2	15	3
2350	16	2	16	3
2400	17	2	1	4
2450	18	2	2	4
2500	19	2	3	4
2550	20	2	4	4
2600	21	2	5	4
2650	22	2	6	4
::::	::::	::::	::::	::::

DSM4000 ARINC429

DSM4000 modules can be ordered with an optional ARINC429 interface. This options offers eight ARINC429 output channels through a single DB-25P connector on the front of the module. The following configuration variable settings are recommended to ensure proper ARINC429 operations in most flight test applications.

SET HAVEARINC 1   This enables the ARINC output

SETDINSCAN 2   This configures DIN2* to start and/or stop the scan function

SETDINCALZ 4   This configured DIN3* to start the CALZ function

SET STARTCALZ 1   With this configuration, the DSM will automatically perform a CALZ after boot up.

SET ARINCOUT1 1 20   This enables ARINC channel 1 to output Scan Group 1 data.

SET ARINCOUT2 2 20   This enables ARINC channel 2 to output Scan Group 2 data.

SET ARINCOUT3 3 20   This enables ARINC channel 3 to output Scan Group 3 data.

SET ARINCOUT4 4 20   This enables ARINC channel 4 to output Scan Group 4 data.

SET ARINCOUT5 5 20   This enables ARINC channel 5 to output Scan Group 5 data.

SET ARINCOUT6 6 20   This enables ARINC channel 6 to output Scan Group 6 data.

SET ARINCOUT7 7 20   This enables ARINC channel 7 to output Scan Group 7 data.

SET ARINCOUT8 8 20   This enables ARINC channel 8 to output Scan Group 8 data.

*More information on Digital Inputs can be found in "Digital I/O Connections" on page 15 and "Digital I/O Control" on page 24.

When HAVEARINC is enabled, commands can still be send to the DSM4000 module through the Ethernet connection. However, when HAVEARINC is enabled, all data and responses will be output to the ARINC ports, regardless of how the command was received. If less than eight modules are connected, the unused scan groups and ARINC channels should be disabled. If desired, both the SCAN and CALZ commands can be controlled by DIN 2 and 3. Otherwise, SCAN and CALZ functions will have to be initiated and/or terminated through an Ethernet connection.

ARINC OPERATION WITH DIGITAL INPUTS

To acquire data during flight:

1. Connect a source of a trigger pulse to Digital input 2 for SCAN control. This is pins 3 and 4 on the Digital Input connector. This should be a momentary switch.

The voltage must not be less than 4.5 Vdc and not more than 15 Vdc. The voltage source must be capable of sourcing 6.5 ma.

2. Connect a source of a trigger pulse to Digital input 3 for CALZ control. This is pins 5 and 6 on the Digital Input connector. This should be a momentary switch. The voltage must not be less than 4.5 Vdc and not more than 15 Vdc. The voltage source must be capable of sourcing 6.5 ma.

3. If a host computer will not be used to start and stop the SCAN function, and control the CALZ function, the momentary switches for SCAN and CALZ must be used. The SCAN function will start when the Scan trigger button is pushed, and stop the next time the button is pushed. The DSM will execute a CALZ when the CALZ trigger is pushed. If the CALZ button is pushed while the DSM is in the SCAN mode, the DSM will suspend the SCAN function, complete the CALZ function and then resume the SCAN function.

ARINC DATA WORD FORMAT

Bit #	Function	# of Bits	Value	Notes
31	Parity	1	0 or 1	Odd parity is required / Parity bit will be set as required to maintain odd parity. Parity is enabled by the setting of HAVEARINC
29, 30	SSM	2	00 or 11	SSM bits will be set to 11 if the pressure data are valid. SSM bits will be set to 00 if the pressure data are not valid
28	Sign	1	0 or 1	0 = positive 1 = negative
10-27	Scaled Pressure	18	Varies	See note 1
8, 9	Mode	2	00-11	00 = STOP 01 = CALZ 10 = SCAN 11 = PURGE
0-7	Label	8	Varies	When Mode = 10, the channel sequence number (max 256) will be output. For all other conditions of Mode, the output will be 000 000

Note 1: When the Mode bits are set to 10 (SCAN), scaled data are output. To determine pressure in PSI, isolate bits 10 through 28, shift right 10 bit positions and sign

exted value. Conversion to pressure in PSI with a 20 psi scaling factor (default) is calculated as follows:

$$\text{EU Pressure} = \frac{\text{ScaledPressure} * 20}{262144}$$

Different scaling factors may be used. The scaling factor is a modifier in the ARINCOUTn variable. If the scaling factor modifier is set to a number greater than 0, that will be the scaling factor for all modules in the scan group assigned to that ARINC output. If the scaling factor is set to 0, the software will calculate the scaling factor for each module in the scan group assigned by multiplying the value of NPR by 1.1. NPR is the Nominal Pressure Range of the module. The variable is in the Module Information configuration variables.

When the Mode bits are set to 00, 01, OR 11 (PURGE, CALZ, or STOP), a single ARINC word will be output to indicate that scanning and, consequently data transmission, has stopped. Bits 28 through 10 will be set to 1. The data are:

111 1111 1111 1111 1111

ARINC CHANNEL ASSIGNMENT
Each of the eight ARINC channels can be user configured to output data from the corresponding Scan Group. ARINCOUT1 is assigned to Scan Group 1, ARINCOUT2 is assigned to Scan Group 2, etc.

ARINCOUT1 20
ARINCOUT2 20
ARINCOUT3 20
ARINCOUT4 20
ARINCOUT5 20
ARINCOUT6 20
ARINCOUT7 20
ARINCOUT8 20

The ARINC label will be the sequence number of the module-port list generated by the CHANNEL command. More information on Scan Groups can be found on "Scan Group Configuration Variables (Group SG)" on page 103.

ARINC THROUGHPUT
Throughput rate for one ARINC transmit line is calculated given as follows. Note that each DSM will have two transmit lines. There are two transmit lines for the entire system.

ARINC limit = 100K BITS / sec
ARINC word size = 36 bits (32 data bits plus 4 spacing bits)
One channel = one ARINC word (formatted as above)

Max channels = 256 channels

$$\text{Rate} = \frac{100000\text{bits/second}}{36\text{bits/channel} * (256\text{channels/frame})} = 10.8\text{Hz}$$

The calculation is based on a worst case of 256 channels, which is the maximum for one ARINC channel. Faster throughputs could be obtained with fewer pressure channels per ARINC channel. The number of pressure channels per ARINC channel is user configurable within the constraints listed under ARINC Options.

NOTE: It should not be assumed that ARINC transmissions can be achieved at the same speeds as are available in Ethernet. ARINC transmissions are serial and limited to 100,000 bits per second which is approximately equal to an RS232 transmission at 11100 BAUD. The actual throughput will be determined by the number of channels being scanned, the scan period, the scan average, and the number of ARINC output channels being used. A user should test a setup configuration to determine the actual throughput available prior to attempting to collect critical data.

DSM4000 PROFILE FILE

When the DSM4000.EXE program is started, including a RESTART, a DSM4000 Profile file will be generated. This file is named DSM4000nnn.DPF, where nnn is the serial number of the DSM4000. This file is an ASCII text file and contains the following information:

DSM4000 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 DSM4000nnn.DPF file exists when the DSM4000.EXE program starts up, it will be overwritten by the information obtained from the polling of the ID chips.

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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 DSM4000. These files are read when the DSM4000.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 through 7	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 through 19	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.

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 "Scan" on page 69.

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APPENDIX

APPENDIX A - TEMPERATURE COMPENSATED PRESSURE CONVERSION
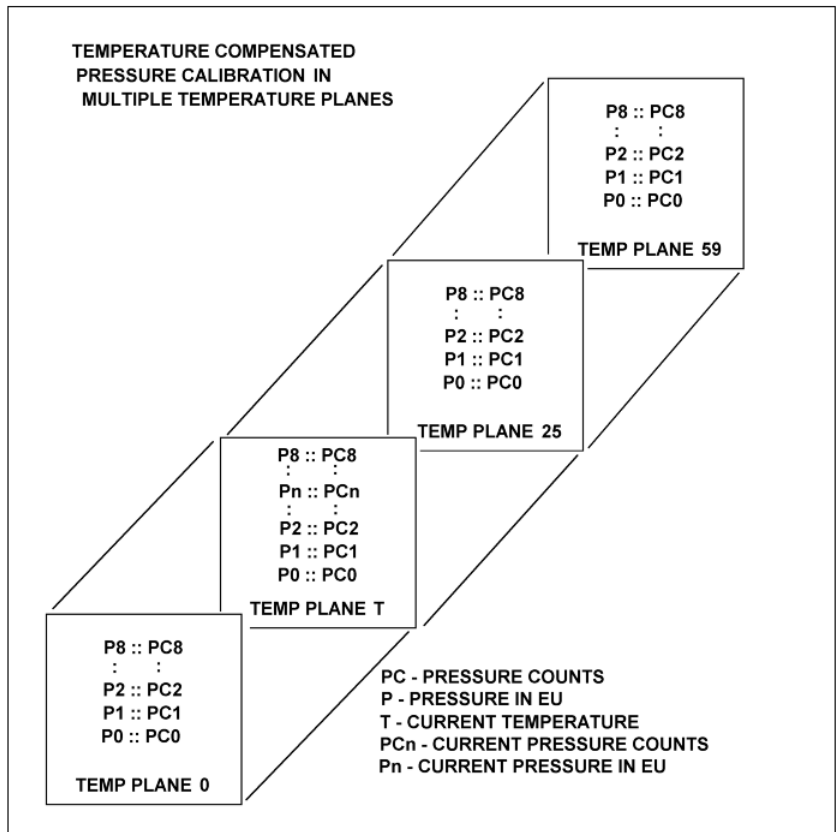
FORMULAS:

Pressure interpolation within current temperature plane:

$$P_{n_t} = \frac{1}{PC_{1_t} - PC_{0_t}} ((PC_{1_t} - PC_{n_t})P_{0_t} - (PC_{0_t} - PC_{n_t})P_1)$$

Calculation of entries in current temperature plane:

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

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 cmH2O	0.014223 psi
DECIBAR	Decibar	0.68947 db	1.4504 psi
FTH2O	Foot of Water	2.3067 ftH2O	0.43352 psi
GCM2	Gram per square Centimeter	70.306 g/cm2	0.014224 psi
INHG	Inch of Mercury @ 0C	2.0360 inHg	0.491159 psi
INH2O	Inch of Water @ 4C	27.680 inH2O	0.036127 psi
KGCM2	Kilogram per square Centimeter	0.0703070 kg/cm2	14.2235 psi
KGM2	Kilogram per square Meter	703.069 kg/m2	0.0014223 psi
KIPIN2	kips per square inch(ksi)	0.001 kip/in2	1000.0 psi
KNM2	Kilonewton per square Meter	6.89476 kN/m2	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 mH2O	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/cm2	1.45038 psi
NM2	Newton per square Meter	6894.76 N/m2	0.000145038 psi
OZFT2	Ounce per square Foot	2304.00 oz/ft2	0.000434028 psi
OZIN2	Ounce per square Inch	16.00 in/ft2	0.062500 psi
PA	Pascal	6894.76 Pa	0.000145038 psi
PSF	Pound per square Foot	144.00 lb/ft2	0.00694444 psi
TORR	Torr	51.7149 T	0.0193368 psi

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APPENDIX C - DATA CONFIGURATION SELECTION CHART

Data Destination	Data Type	RTDA	Packet Type	Trig	ENNAS	EU	SA	BIN	HAVE ARINC	ARINC OUT	FORMAT	ADTRIG	BINADDR
NAS Date/Time FileName	Pressure	Yes	Binary	Int	2	1	1	1	0	0	X	0	X
		Yes	ASCII	Int	2	1	1	0	0	0	0	0	X
		No	Binary	Int	2	1	0	1	0	0	X	0	X
		No	Binary	Ext	2	1	0	1	0	0	X	1	X
		No	ASCII	Int	2	1	0	0	0	0	0	0	X
		No	ASCII	Ext	2	1	0	0	0	0	0	1	X
	Counts	No	Binary	Int	2	0	X	1	0	0	X	0	X
		No	Binary	Ext	2	0	0	1	0	0	X	1	X
		No	ASCII	Int	2	0	X	0	0	0	0	0	X
		No	ASCII	Ext	2	0	0	0	0	0	0	1	X
NAS Sequence FileName	Pressure	Yes	Binary	Int	1	1	1	1	0	0	X	0	X
		Yes	ASCII	Int	1	1	1	0	0	0	0	0	X
		No	Binary	Int	1	1	0	1	0	0	X	0	X
		No	Binary	Ext	1	1	0	1	0	0	X	1	X
		No	ASCII	Int	1	1	0	0	0	0	0	0	X
		No	ASCII	Ext	1	1	0	0	0	0	0	1	X
	Counts	No	Binary	Int	1	0	X	1	0	0	X	0	X
		No	Binary	Ext	1	0	0	1	0	0	X	1	X
		No	ASCII	Int	1	0	X	0	0	0	0	0	X
		No	ASCII	Ext	1	0	0	0	0	0	0	1	X
UDP	Pressure	Yes	Binary	Int	0	1	1	1	0	0	X	0	>0
		No	Binary	Int	0	1	0	1	0	0	X	0	>0
		No	Binary	Ext	0	1	0	1	0	0	X	1	>0
	Counts	No	Binary	Int	0	0	X	1	0	0	X	0	>0
		No	Binary	Ext	0	0	0	1	0	0	X	1	>0
TCP Telnet	Pressure	Yes	ASCII	Int	0	1	1	0	0	0	0	0	X
		No		Int	0	1	0	0	0	0	0	0	X
		No		Ext	0	1	0	0	0	0	0	1	X
		No		Int	0	1	0	0	0	0	1	0	X
		No		Ext	0	1	0	0	0	0	1	1	X
	Counts	No		Int	0	0	X	0	0	0	0	0	X
		No		Ext	0	0	0	0	0	0	0	1	X
		No		Int	0	0	X	0	0	0	1	0	X
		No		Ext	0	0	0	0	0	0	1	1	X
TCP Binary	Pressure	No	Binary	Int	X	1	0	1	0	0	0	0	0
		No		Ext	X	1	0	1	0	0	0	1	0
	Counts	No		Int	X	0	0	1	0	0	0	0	0
		No		Ext	X	0	0	1	0	0	0	1	0
ARINC429	Pressure	No	Binary	Int	0	1	0	1	1	1	0	0	0
		No		Ext	0	1	0	1	1	1	0	1	0

APPENDIX D - SOFTWARE CHANGE LIST

Version 1.00 - Initial software release. (11/21/2011)

Version 2.00 - Support for ARINC429 output added. (1/23/2012)

Version 2.01 - Modified the temperature reading algorithm to continue scanning the temperature even while pressure data is not being scanned. Modified the FILLONE variable to make non functional as previously documented. (3/29/2012)

Version 2.02 - Increased ID chip programming dwell time from 3.2ms to 10.0ms. (6/1/2012)

Version 2.03 - Resolved a bug that caused excessive '>' characters to be returned from a 'RELOAD' command. (7/23/2012)

Version 2.04 - Changed the index on the delete command to ensure all old data is deleted. Improved the foreground/background signaling at the start of a scan to prevent RTD reading sync problems. (9/21/2012)

Version 2.05 - Decreased the debounce time out for digital input state changes. Eliminated the irrelevant   command (10/31/2012)

Version 2.06 - Added support for SCANTRIG 2 setting which automatically enters scan mode upon power up. Resolved a bug in the ARINC data output that prevented ARINC channel 1 data from being output. (6/14/2013)

Version 2.07 - Increased the resolution of the saved A/D correction coefficients. Added a disconnect at the close of NAS save to a file. (5/21/2014)

Version 2.08 - Reduced the maximum accepted incoming string length from 1000 characters to 80 characters to prevent buffer overflows. Added an error output, "ERROR: Line length exceeded 80 characters" (11/2/2015)

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