

## Digital Pressure Measurement

### FEATURES

- DSP Technology
- Sample rates up to 625 Hz/channel
- Accepts up to 8 ZOC electronic pressure scanners (512 channels max)
- Ethernet 100baseT
- ARINC429 (optional)
- Digital Input and Output capability

### GENERAL DESCRIPTION

The Digital Service Module, DSM4000, is designed to interface up to eight Scanivalve ZOC pressure scanners or EIM (Electrical Input Module) units to an Ethernet network. The DSM4000 is a complete data acquisition system built in a rugged, stainless steel enclosure. The DSM4000 performs all of the engineering unit conversion, configuration and communication tasks for the analog ZOC modules and also gives the user 5 digital inputs and outputs. These outputs may be used to drive solenoid valves such as Scanivalve's DSMCPM or MSCP.

The DSM4000 utilizes advanced DSP (Digital Signal Processor) architecture. This processor is specifically designed for extremely fast math functions and is able to rapidly convert and output engineering unit data. The DSM4000 references pressure-temperature lookup tables that are uniquely created for every ZOC scanner. This pressure/temperature characterization allows for accurate pressure measurements across the full 0-60°C temperature range of the ZOC modules, minimizing errors due to temperature changes. The DSM4000 module can also perform zero offset correction calibrations on the ZOC modules. This feature, along with Scanivalve's unique calibration procedures allow accuracy specifications to be maintained for up to 6 months on most ZOC modules.

The DSM4000 is 70% smaller and 55% lighter than its predecessor, the DSM3400. Additionally, all moving components have been removed, the entire system is simpler and many features have been added. The DSM4000 boots significantly faster than the DSM3400 and is completely independent of Windows® operating system.

DSM4000-ARINC429 shown



### CONFIGURATIONS

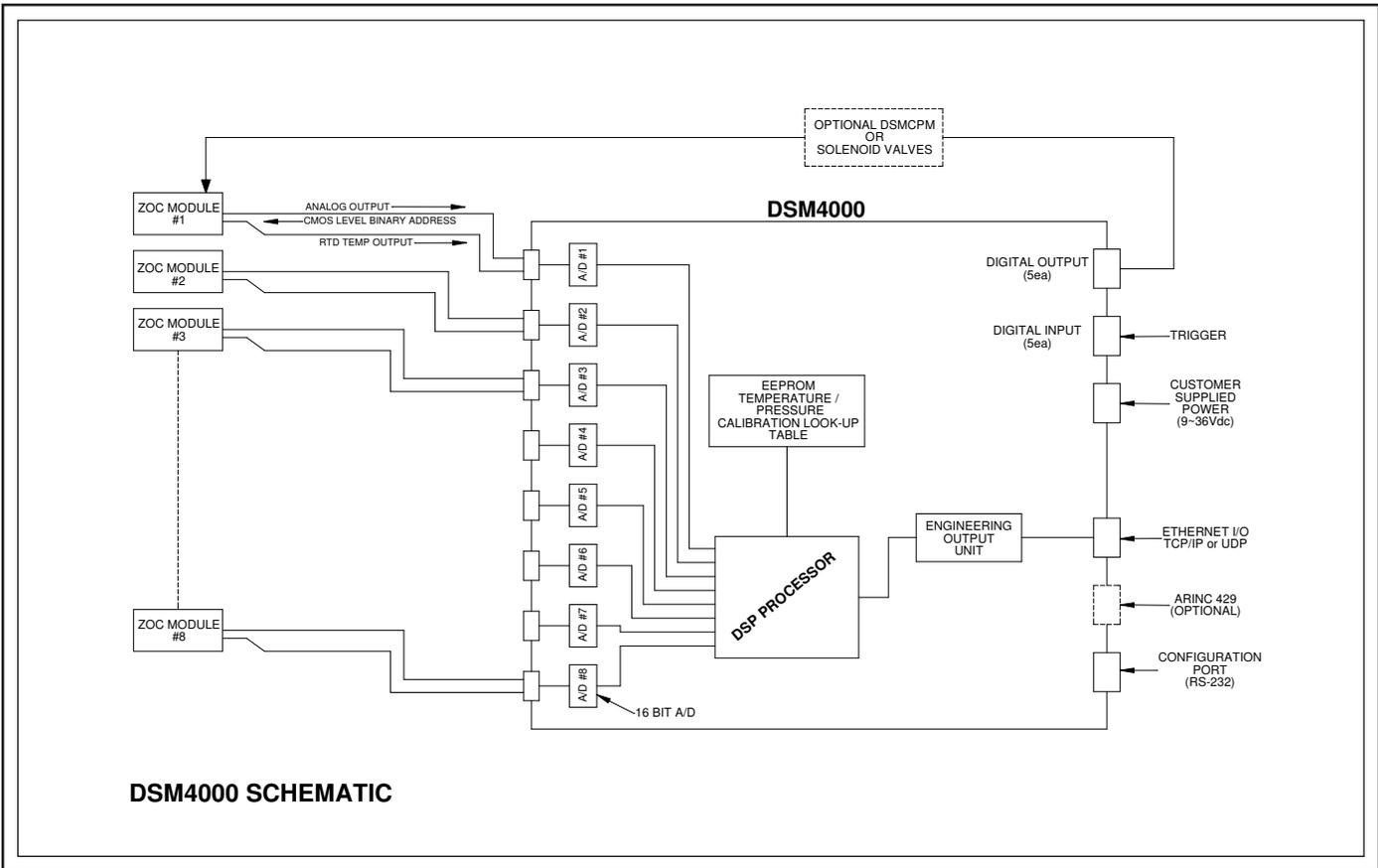
#### DSM4000/Ethernet (General, Wind Tunnel)

The DSM4000's rugged construction, digital input and output capabilities and fast data throughput rates are ideally suited for many applications including wind tunnel and gas turbine testing. One DSM4000 can support up to eight ZOC pressure scanners and output all data, converted to engineering units at up to 625 Hz/channel. All communications are through the single Ethernet 100baseT connection. For applications where the DSM4000 is too large, Scanivalve's ERAD4000 (Data Sheet #G562) may be a good alternative.

#### DSM4000/ARINC429 (Flight Test)

The ARINC429 version of the DSM4000 maintains all of the features and functionality of the Ethernet version except it has eight transmit-only ARINC429 channels in addition to the 100baseT Ethernet port. The DSM4000's power supply was specifically designed around the demanding requirements of a flight test application and can operate over a wide voltage input range. The Ethernet port remains fully functional for communication, data acquisition, setup, and diagnostics.

# DSM4000



DSM4000 SCHEMATIC

## DSM4000 HARDWARE

The DSM4000 is built around a DSP processor for fast EU conversion and throughput. There is an internal A/D for each ZOC module, plus internal memory for DSM and ZOC module information storage. Ethernet 100BaseT or ARINC429 interfaces are available. Also incorporated in the DSM module is a single serial configuration port and 5 digital I/O circuits.

Up to eight ZOC modules are connected through small diameter cables that can be up to 50 feet (15 meters) long.

There are no moving parts in the DSM4000. As a result, the number of failure points has been dramatically reduced and reliability increased.

## DSM COMMUNICATION

Communication with the DSM is either Ethernet TCP/IP or UDP, FTP or ARINC429. The network can be set up and variables configured via Windows HyperTerminal, a Telnet session, or through either Scanivalve's LabVIEW Configuration Utility or ScanTel communications

utility. A Scanivalve LabVIEW Development Kit is also optionally available for LabVIEW 2009 (ver 8.2 and up) that includes the Configuration Utility.

The IP address is user assignable and the DSM4000 is auto crossing, allowing either crossed or straight-through Ethernet cables to be used.

All scan and calibration variables are software configurable by the user. This includes data rate, data format, etc.

The DSM4000 includes configuration variables to support a NAS (Network Attached Storage) device allowing simple, high speed data collection.

In addition to the NAS support, the DSM4000 further takes advantage of it's networking capabilities by including NTP (Network Time Protocol) support.

In addition to the Ethernet and ARINC429 connections, the DSM4000 also has an RS-232 Configuration port. This can be used to verify and configure the DSM4000's communication and configuration variables.

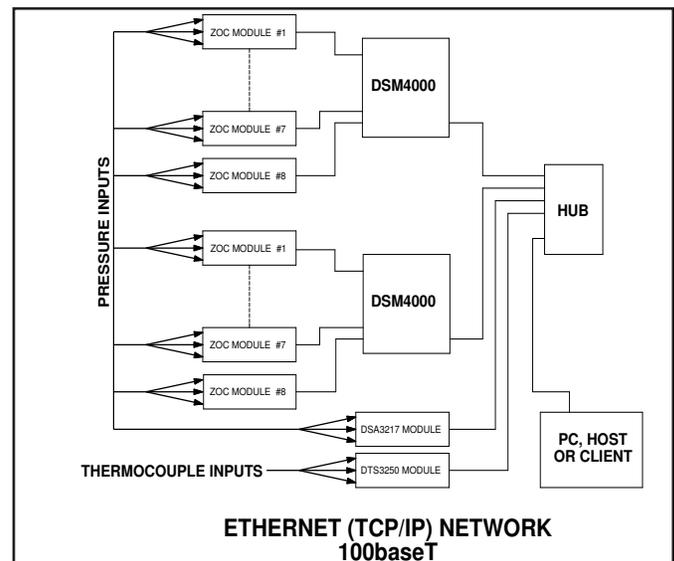
## ON-LINE SENSOR COMPENSATION AND CALIBRATION

When the system includes remote solenoid valves, taking advantage of the DSM4000's built in digital outputs, zero-offset calibrations can be performed. No pressure calibrator is required to perform zero-offset calibration. When actuated, the positive side of the pressure sensor is pneumatically shorted to the reference manifold, creating zero pressure differential across the transducer. The sensor zero offsets from each ZOC pressure scanner are recorded, then the zero-offset files are updated and saved to the DSM module.

The ZOC transducers used with the DSM4000 series are factory calibrated over their full pressure and temperature ranges. The resulting calibration data are stored in a 280 plane pressure temperature look-up table in the DSM module.

Each ZOC pressure scanner has a factory installed RTD temperature sensor. As the temperature changes, the DSP processor selects the appropriate temperature plane, or interpolates between planes, to correct the pressure reading. This on-line temperature correction and quick zero calibration correct for inherent zero drift and temperature sensitivity allowing for long-term 6 month accuracy specifications on most ZOC modules.

For field calibrations of ZOC modules connected to the DSM, Scanivalve has an accurate pressure calibrator, model SPC4000. Included with the calibrator is Scanivalve's calibration utility software, PressCAL. This allows for automated calibrations with the SPC4000 calibrator, or manual calibrations with the users own pressure calibrator or dead weight tester. PressCAL updates the module calibration coefficient files and generates "as received" and "calibration validation" reports.



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# SPECIFICATIONS

**No. of ZOC Pressure Scanners:** 1 to 8

**Operating Temperature Range:** 0–60° C

**Power Requirements:** 9-36Vdc, 44VA  
115/230Vac with PDM1500 power supply

**Power Mating Connector:** Bendix PTO6A-8-3S-SR

**Digital In Mating Connector:** Bendix PTO6A-12-10S-SR

**Digital Out Mating Connector:** Bendix PTO6A-12-10P-SR

**ZOC Mating Connector:** MDM-15SH003P

**Config Port Mating Connector:** Cannon DE9S

**Ethernet Connector:** RJ-45

**Communication Protocol:** Ethernet 10/100BaseT  
IEEE-802.3, TCP/IP or UDP, FTP, ARINC429 (optional)

**Sample/Throughput Rate:** 15 Hz/channel: TCP/IP ASCII  
500 Hz/channel: TCP/IP Binary\*\*  
625 Hz/channel: UDP Binary

**Dimensions (WxHxD):** 9.00" x 3.653" x 4.00"  
(228.6 mm) X (92.77 mm) X (101.6 mm)

**Weight:**  
DSM4000: 4.1 lbs. (1.86 kg)  
PDM1500: 0.9 lbs. (0.4 kg)

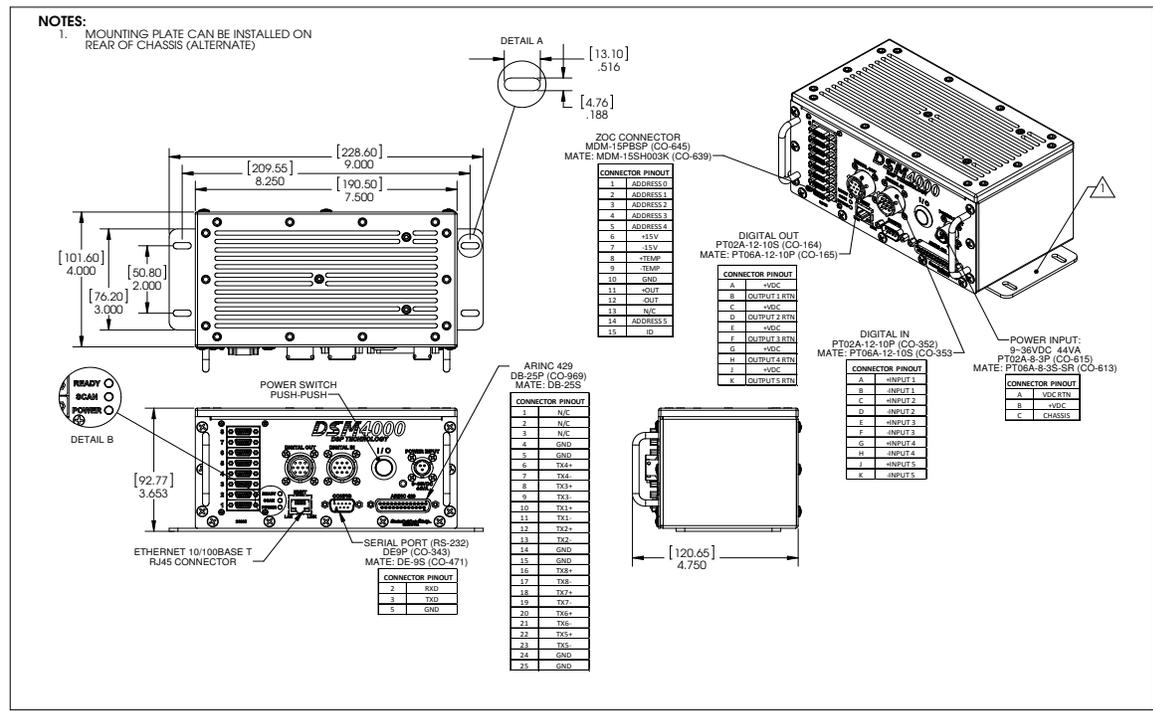
# ORDERING INFORMATION

DSM4000	Ethernet
Model	Interface
	-Ethernet
	-ARINC429

Note: When ARINC429 option is ordered, an Ethernet port is also included.

\*\* 500 Hz/channel is typical. TCP/IP binary data rates vary depending on specific network and host.

# DIMENSIONS Inches (mm)



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