

## Features

- DSP technology
- 625 Hz/channel/second throughput
- Modular design: 1-8 A/D sections per RADBASE
- Compact base: 1.75 x 1.75 x 2.68 inches  
(44.45 x 44.45 x 68.07 mm)
- Engineering Unit output
- Support up to 2048 measurement channels
- Ethernet TCP/IP & UDP protocol, "Network Ready"

## General Description

The state-of-the-art DSP technology is at the heart of our new E-RAD4000 pressure measurement system. Located inside the RADBASE is a programmable device, (Digital Signal Processor, DSP) capable of extremely fast math functions that operate on the data stream in real time. All measurements are converted into Engineering units.

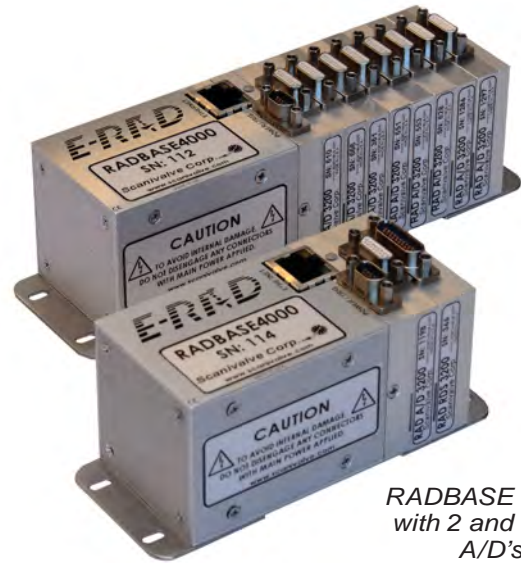
Advantages of DSP technology:

- Boots up quickly
- Real Time Operating System
- Low Data Latency

The RADBASE DSP processor utilizes a pressure temperature look-up table to compensate the pressure sensors for temperature changes, thus reducing thermal errors. It also can control the actuation of an external calibration valve via the RDS3200 module to perform on-line zero offset corrections. Long term accuracy is achieved for up to 6 months before recalibration is required.

This new Ethernet remote A/D system is a turnkey pressure measurement system that combines the field proven RAD3200 with Ethernet TCP/IP. E-RAD4000 system is capable of maintaining its performance even as computer technology and operating systems upgrade. E-RAD will work on any hardware platform that has an Ethernet port, thus minimizing the user's future interface risks.

The E-RAD system is modular and allows up to 8 each A/D (16 bit) modules to be plugged into one



*RADBASE shown  
with 2 and with 8  
A/D's*

RADBASE. Each A/D supports one 16, 32, or 64 channel ZOC pressure scanner or one ZOCEIM.

The output of the RADBASE is Engineering units via a small diameter Standard CAT5 Ethernet cable. The RADBASE has the pressure sensor calibration data stored in memory and converts the digital data to temperature compensated Engineering units.

Data are then output Ethernet TCP/IP 100 baseT to a host computer.

## Applications

Typically, the RADBASE would be located inside a wind tunnel model or other space limited location in close proximity to the ZOC pressure scanners.

For small models with low number of pressure channel requirements, the RADBASE can be minimal size to fit into the model. For large systems the E-RAD system can be expanded with modular A/D modules or multiple RADBASES for up to 2048 pressure channel system.

A feature of the system is that each A/D and each ZOC pressure scanner has an ID chip installed. During power up or on demand, the RAD can read the ZOC ID chip information -model, pressure range, serial number, number of channels, date of manufacture and calibration date.

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## E-RAD4000 Remote A/D Operation

The E-RAD4000 is a complete pressure measurement system consisting of a RADBASE4000 base unit, 1 to 8 A/D's, and ZOC pressure scanners. It is designed to be installed inside or in close proximity to a wind tunnel model. By digitizing the transducer analog signals in the model, potential noise errors due to long cable lengths are eliminated.

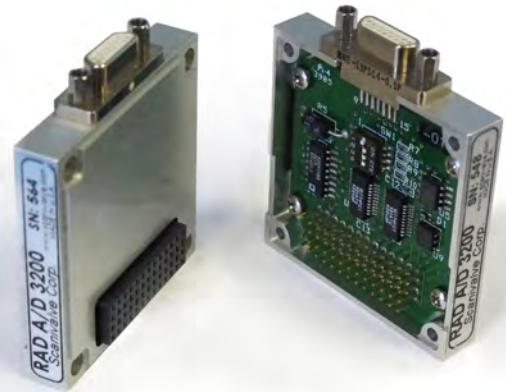
1) RADBASE4000 is the base unit that incorporates the communication and power connectors, and real time DSP operating system. Communication and data throughput are via a small diameter Ethernet cable. Power required is +/-15Vdc and +5Vdc. Multiple RAD bases can be part of one E-RAD system.



**RADBASE4000 with 8 RAD A/D3200s**

2) RAD A/D 3200 is the modular A/D portion of the E-RAD system. The RAD A/D's are temperature compensated. Each 16 bit A/D module supports one ZOC pressure scanner or one Electrical Input Module (ZOCEIM). Additional A/D modules can be plugged into the RADBASE to easily expand from 1 to 8 A/D's (512 channel system).

Each A/D has an ID chip to identify itself with its serial number, date of manufacture, date of last calibration, and temperature coefficients. The analog cable between the RAD A/D and a ZOC pressure scanner may be up to 15 feet (4.61m) maximum in order to maintain maximum scanning speed. Contact Scanivalve for longer cable lengths.



**RAD A/D3200 MODULE**

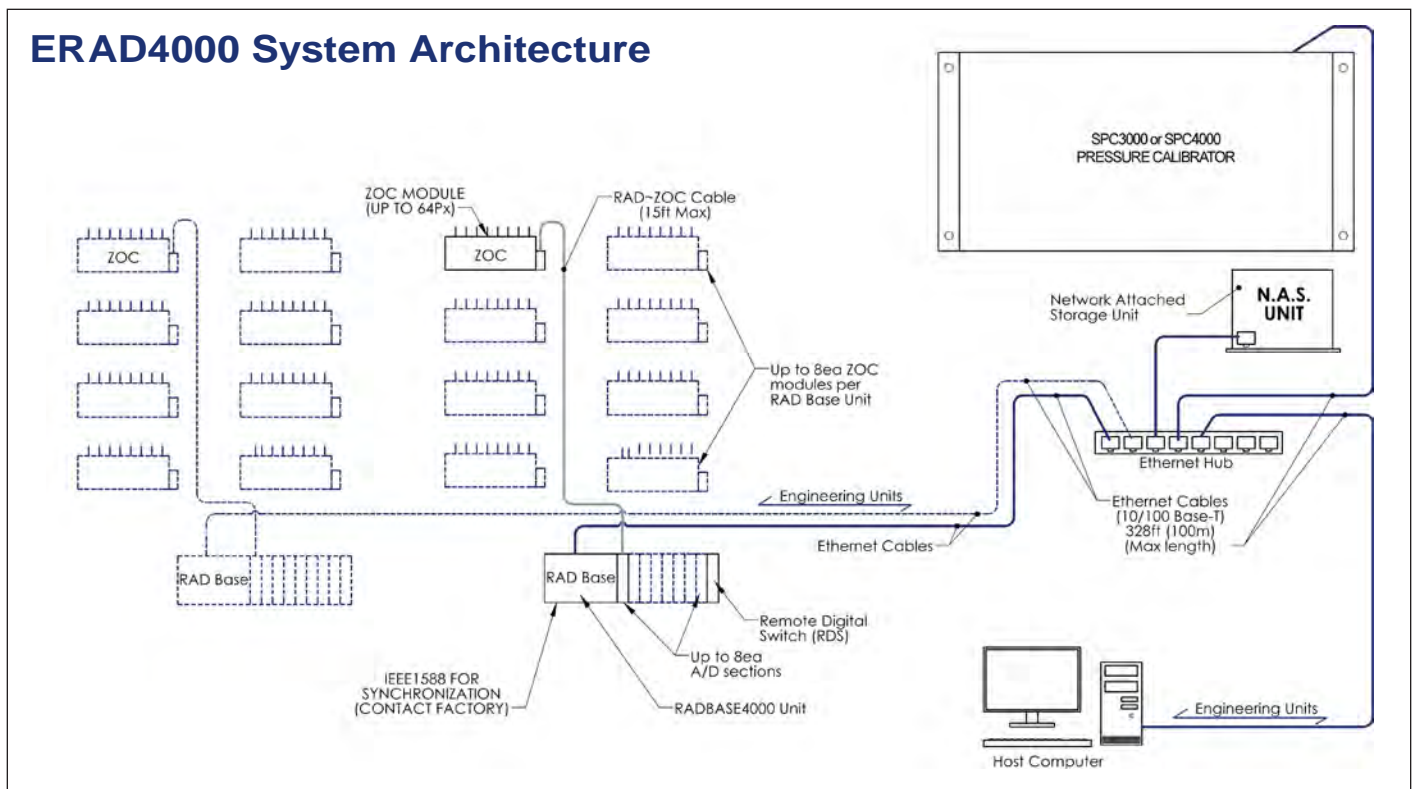
3) RDS3200 (Remote Digital Switch) is a plug in module that incorporates 8 software controlled switches. These switches can open or close relays that operate solenoid valves or other devices. Scanivalve's model MSCP3200 miniature solenoid control pack contains 3 solenoid valves. It can be operated by the RDS3200 and is small enough to fit inside a wind tunnel model. User supplied power is required for this feature (24Vdc std, 5 & 12Vdc optional and must be specified at time of order). Up to 8 RDS modules can be used on one RADBASE.



**RDS3200 MODULE**

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## ERAD4000 System Architecture



## E-RAD System

The E-RAD Ethernet pressure measuring system consists of:

- 1 RADBASE4000 (for each 512Px)
- 1 to 8 each RAD A/D per RADBASE
- 1 ZOC pressure scanner per RAD A/D
- Cables, power supplies, & accessories
- Optional SPC pressure calibrators
- Optional NAS network data storage (user supplied)

The E-RAD system allows for the RADBASE, A/D's and ZOC pressure scanners to be mounted inside a wind tunnel model. Data are converted to EU in the RADBASE and exit the model and sting via a small diameter standard CAT5 Ethernet cable connecting to the user's host computer or network.

The E-RAD robust turnkey pressure measurement system will operate with any hardware platform that can communicate Ethernet TCP/IP. This would include PC's, MAC's, VXI systems, or any user host or network

Large and expensive data systems are no longer required for fast accurate data measurement and acquisition. The cost involved to buy into this technology is now relatively low and affordable by universities and small research facilities.

## E-RAD Command Set

E-RAD firmware contains user commands and configuration variables that are installed in the RAD-BASE4000. The commands permit a user to control all functions of the RAD, including control of external devices when the RDS3200 digital switch is connected. The configuration variables permit a user to define communications, RAD module setup, identification, scanning EU conversion, and data output. Because the pressure calibration files for the ZOC pressure scanners are stored in memory, all Engineering Unit conversion occurs in the RADBASE4000.

Variables for any test configuration may be saved to a file for future use.

Scanning may be initiated through a software or hardware trigger for synchronization with other data systems.

An option for the E-RAD4000 system is a Configuration utility (includes LabVIEW® 2009 runtime engine) and a Scanivalve Software Development Kit for LabVIEW® 2009 for users who want to write their own detailed data acquisition program in LabVIEW®.

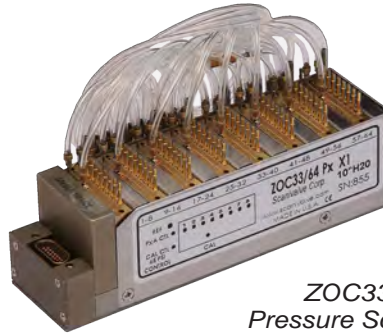
Direct communication to the RADBASE can also be made using ASCII commands via Telnet, Windows HyperTerminal or Scanivalve's ScanTel utility.

A free program for performing on-line calibration of the ZOC pressure scanners can be downloaded from the Scanivalve website (PressCal).

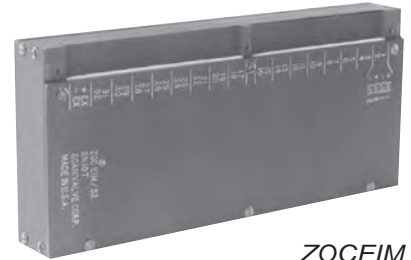
# ZOC Pressure Scanners



ZOC22B/32Px  
Pressure Scanner



ZOC33/64Px  
Pressure Scanner



ZOCEIM  
Electrical Input Module

## General Description

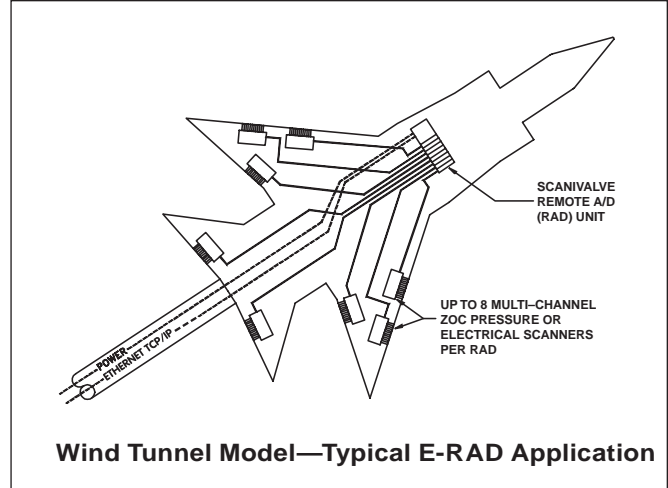
The ZOC (Zero, Operate, and Calibrate) pressure scanners contain piezoresistive pressure sensors in arrays of 16, 32, and 64. An RTD is factory installed to sense the ZOC pressure scanner's temperature. The analog pressure sensor and the RTD data are digitized in the RAD and data converted to temperature corrected Engineering Units.

Also incorporated into each ZOC pressure scanner is a pneumatic calibration valve that allows for sensor rezero or multipoint calibrations on demand. This calibration valve also permits purging of the pressure input lines of condensation and contaminants. Available ZOC pressure ranges are 5 inches H2O up to 750 psi full scale.

Upon power up, the RADBASE automatically interrogates the ZOC ID chip and auto selects the appropriate ZOC calibration coefficients for each module connected on the system.

## ZOC Pressure Scanner Upgrades

All ZOC pressure scanners (ZOC22B, ZOC33, ZOC17, ZOCEIM) are manufactured with an ID chip installed. Legacy ZOC pressure scanners may be upgraded with an ID chip at Scanivalve's factory. ZOC pressure scanners may also be used without an ID chip installed, but will lose the auto configuration capability.



Wind Tunnel Model—Typical E-RAD Application

### ZOC Models

ZOC17/16Px	16 pressure inputs	(data sheet G447)
ZOC22B/32Px	32 pressure inputs	(data sheet G436)
ZOC22B/32PxX2 *	64 pressure inputs	(data sheet G436)
ZOC33/64Px	64 pressure inputs	(data sheet G480)
ZOC33/64PxX2 *	128 pressure inputs	(data sheet G480)
ZOCEIM	16 or 32 analog inputs	(data sheet G466)

\* Models available with Duplexing function. Duplexing shares two pressure inputs (Px) with one pressure sensor.

# System Network

## E-RAD4000 System Network

Data are transmitted via Ethernet TCP/IP or UDP 100baseT in Engineering Units using ASCII or binary format. Data are transmitted at 625 Hz/channel maximum. This unloads the user's host from making these calculations. This architecture design enhancement allows for universal operation on all hardware platforms and operating systems that have an Ethernet port.

Scanivalve's optional Configuration Utility (includes LabVIEW® 2009 runtime engine) is designed to assist a user in configuring the RADBASE. Also available is a Scanivalve Software Development Kit for LabVIEW® 2009 for users who want to write their own detailed data acquisition program in LabVIEW®. Examples are provided. This Development kit includes the Configuration utility.



**RADBASE4000 with 1 RAD A/D3200**

## E-RAD Specifications

### Power

#### Requirements:

RADBASE:	+15Vdc @ 41mA
	- 15Vdc @ 4mA
	+ 5Vdc @ 610mA
A/D (each):	+15Vdc @ 105mA
	- 15Vdc @ 5.5mA
ZOC (each):	+15Vdc @ 120mA
	- 15Vdc @ 16mA

#### No. of RAD A/D Modules Supported on one RAD base:

1 to 8

#### No. of ZOC Modules Supported by one RAD base:

1 to 8

#### Type of ZOC Modules Supported:

ZOC17, ZOC22B, ZOC33, ZOCEIM

#### Accuracy:

10 inch	H <sub>2</sub> O	±0.15%F.S.
20 inch	H <sub>2</sub> O	±0.12%F.S.
1 to 2.5	psid	±0.10%F.S.
5 to 50	psid	±0.08%F.S.
51 to 500	psid	±0.05%F.S.
(ZOC17)		
501 to 750	psid	±0.08%F.S.
(ZOC17)		

### A/D Module

#### Mating Connector:

Cannon 15 pin MDM15SL2P

#### RADBASE Mating Communication Connector:

RJ-45

#### A/D Resolution:

16 bits

#### Sample Throughput Rates\*:

625/Hz/channel binary UDP for 512Px channel system

### RAD

#### Operating

#### Temperature Range:

5°C to 60°C

#### Humidity:

up to 95% non-condensing

### Dimensions:

RADBASE:	1.75 in. x 1.75 in. x 2.68 in. (44.45mm x 44.45mm x 68.07mm)
RAD A/D 3200:	1.75 in. x 1.75 in. x 0.31 in. (44.45mm x 44.45mm x 7.87mm)
RDS3200:	1.75 in. x 1.75 in. x .45 in. (44.45mm x 44.45mm x 11.43mm)

### Weight:

RADBASE:	0.31 lbs. (141gms)
RAD A/D3200:	0.05 lbs. (23gms)
RDS3200	0.05 lbs. (23gms)

\*Actual rates may vary depending on host computer memory and speed. Contact factory for ASCII data throughput via TCP/IP.

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