Scanner Digitizer Interface

measurement SPECIALTIES

8400 SDI

FEATURES

- 20:1 Reduction in ESP Thermal Errors
- Up to 90% Savings in Calibration Time
- Improved Diagnostic Capabilities
- Deranging Capability
- Compatibility with Conventional 8400 Systems

APPLICATIONS

- Windtunnel Test

The Scanner Digitizer Interface (SDI) configuration of the System 8400 represents a major advancement in electronic pressure scanning for windtunnel applications. This configuration executes digital temperature compensation on a new generation of ESP pressure scanners to significantly improve overall accuracy while reducing the frequency of on-line calibrations and the time to perform them. The technology dramatically enhances data quality while equally increasing productivity.

The compact scanner interface (SDI) is located close to the scanners to locally digitize analog signals and transmit the resultant data via fiber optic cable to a Fiber Interface Unit (FIU) within the 8400 System Processor. The FIU-SDI combination replaces the previous combination of a Scanner Digitizer Unit (SDU) and its remote interface (IFC) while providing increased functionality and data quality. Longer, yet significantly smaller cabling is now possible between the 8400 System Processor and the ESP scanners. Data quality is greatly enhanced since all data acquisition is local to the scanners and only digital data traverses the fiber optic link between the SDI and FIU.

The new DTC Series of ESP scanners incorporates Digital Temperature Compensation (DTC) technology, which individually monitors the temperature of the sensors and compensates for any changes using pressure and temperature algorithms stored in an onboard EEPROM. The embedded memory also houses scanner identity and date of last calibration. When used with the SDI configuration, the scanner supports programmable gain manipulation to derange its full-scale pressure range by 66%. New diagnostic features include calibration valve position indication and excitation voltage sense to significantly decrease setup time.

Existing conventional 8400 systems can be upgraded to the SDI configuration with the addition of the new hardware and a firmware upgrade. Both conventional and DTC ESP scanners are supported by this new configuration.

AGT Absolute Gauge Technologies™

Presented by: Absolute Gauge Technologies
sales@absolutegauge.com; www.absolutegauge.com,
Toronto: 416 754 3168, Montreal: 514 695 5147, Toll Free: 1 888 754 7008

Specifications subject to change without notice.

After 1 hour warmup @ 25^{0}C with atmospheric reference pressure unless otherwise stated.

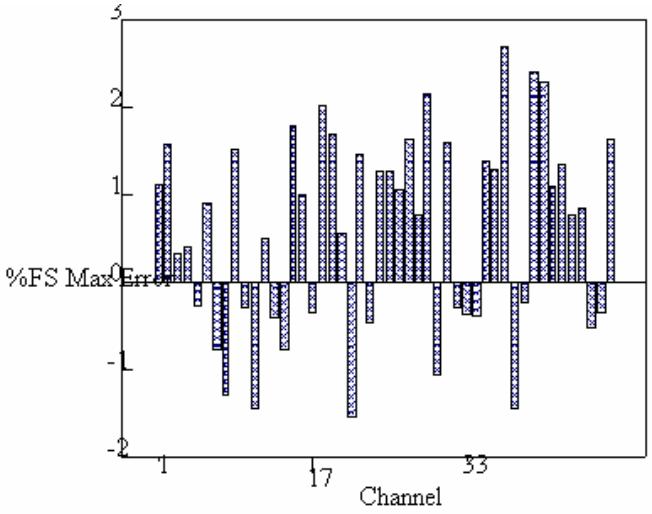
Parameter	9022	Units	Comments
CONFIGURATION			
Type of ESP's Supported[1]	ESP-64HD ESP-32HD		incorporating DTC option
Number of FIU's Supported per 8400 SP	2	ea.	for 2048 channels, max
Number of SDI's supported per FIU	1	ea.	for 1024 channels, max
Number of ESP's supported per SDI	12 or 16	ea.	for 1024 channels, max depends on SDI model
PERFORMANCE			
Static Accuracy			
@ 100% Range	±0.03 ±0.05 ±0.06 ±0.10	%FS %FS %FS %FS	after span cal (ranges ³ 5 psid) after rezero (ranges ³ 5 psid) after span cal (ranges< 5 psid) after rezero (ranges< 5 psid)
@ 33% Range[2]	±0.05 ±0.08 ±0.10 ±0.16	%FS %FS %FS %FS	after span cal (ranges ³ 5 psid) after rezero (ranges ³ 5 psid) after span cal (ranges< 5 psid) after rezero (ranges< 5 psid)
Total Thermal Stability			
@ 100% Range	±0.001 ±0.002 ±0.002 ±0.004	%FS/ºC %FS/ºC %FS/ºC %FS/ºC	typical (ranges ³ 5 psid) worst case (ranges ³ 5 psid) typical (ranges< 5 psid) worst case (ranges< 5 psid)
@ 33% Range[2]	±0.0015 ±0.003 ±0.003 ±0.005	%FS/ºC %FS/ºC %FS/ºC %FS/ºC	typical (ranges ³ 5 psid) worst case (ranges ³ 5 psid) typical (ranges< 5 psid) worst case (ranges< 5 psid)
Measurement Rate[3]	50,000	ch/sec	max (per FIU)
A/D Resolution	16	bits	for SDI

ELECTRICAL	SDI-12	DTC 32HD	DTC 64HD		
Power Requirements[4]					
+5 volts	1200	30	30	ma	
+12 volts	50	60	85	ma	
-12 volts	50	20	20	ma	

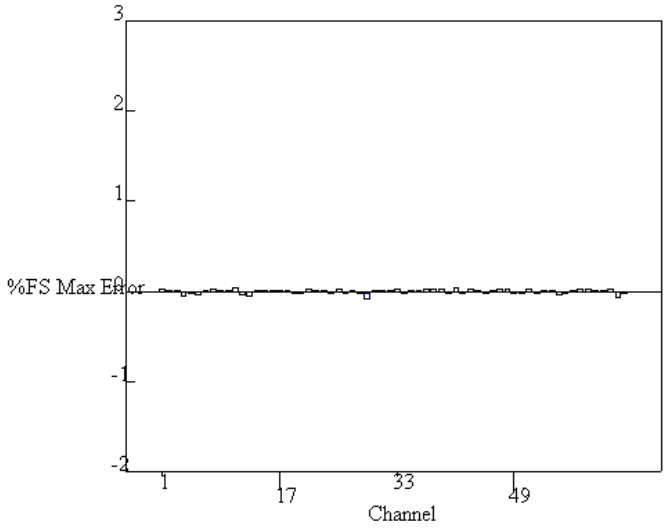
ENVIRONMENTAL/ PHYSICAL	8426 FIU	8411 SDI	ESP (DTC) SCANNERS		
Calibrated Temp Range		0 to 80			
Operating Temp Range	0 to 50	0 to 80	-25 to 80		
Storage Temp Range	-25 to 80	-25 to 80	-25 to 100		

Specifications subject to change without notice.

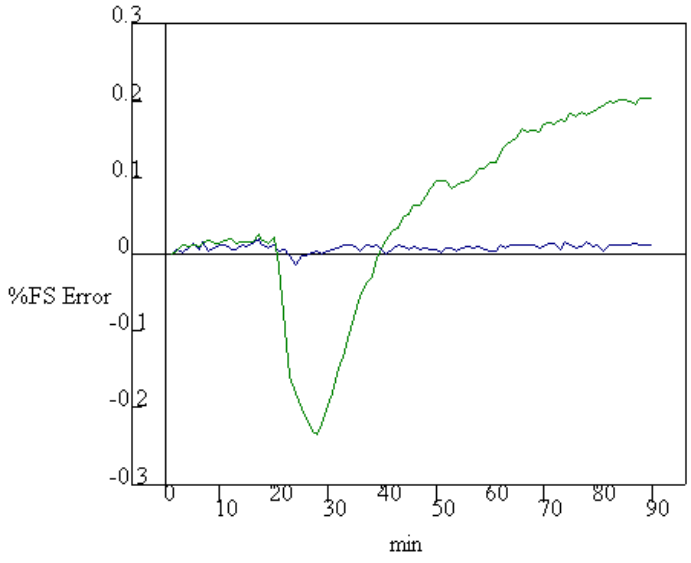
ENVIRONMENTAL/ PHYSICAL	8426 FIU	8411 SDI	ESP (DTC) SCANNERS		
Size		4.25 x 1.89 x 2.13 10.81 x 4.80 x 5.40	3.15 x 1.35 x 1.00 8.02 x 3.46 x 2.55	in cm	L x W x H (for ESP-64HD)
Weight		14 400	7.0 195	oz g	max (for ESP-64HD)



Maximum Thermal Error per Channel for an Uncompensated ESP Scanner with a 10 to 60°C Shift



Maximum Thermal Error per Channel for a DTC ESP Scanner with a 10 to 60°C Shift

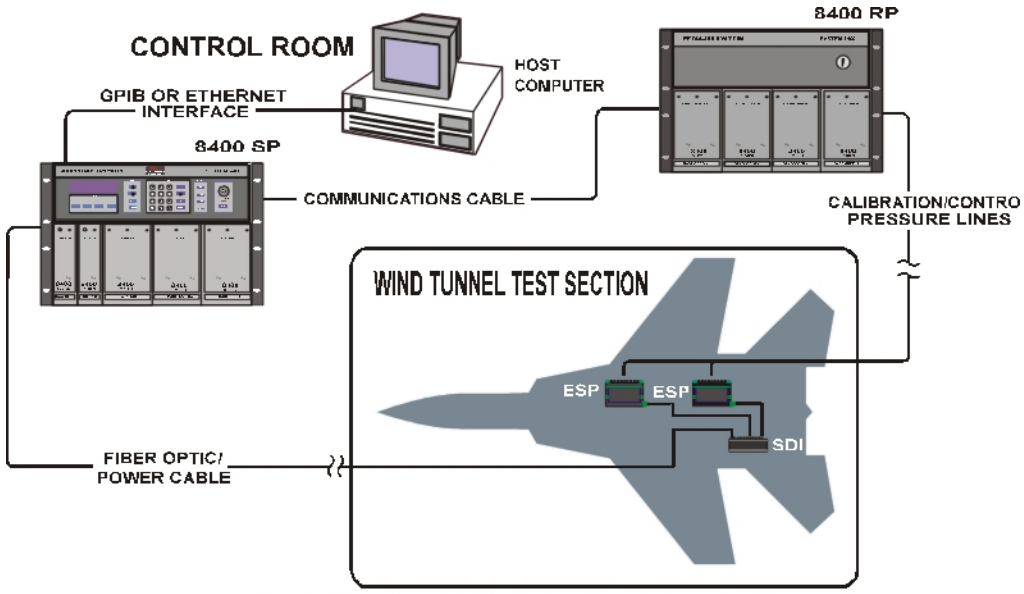


Typical Thermal Errors with Time for DTC Compensated and Uncompensated ESP Scanner with a 10 to 60°C Shift

Absolute Gauge Technologies
Presented by: Absolute Gauge Technologies
sales@absolutegauge.com; www.absolutegauge.com,
Toronto: 416 754 3168, Montreal: 514 695 5147, Toll Free: 1 888 754 7008

Development Background

The SDI configuration of the System 8400 was conceived to optimize the use of electronic pressure scanning in windtunnel applications. The single largest potential savings was the reduction of on-line calibrations required to maintain ESP accuracy in changing temperature environments. To achieve this, PSI employed our proven Digital Temperature Compensation technology, originally developed in the early 1980's and implemented in several successful products since then, including the S8256 Flight System and the NetScanner™ System Intelligent Pressure Scanners. To implement this technology in the miniature format of the ESP scanners while providing a user friendly configuration, required several obstacles to be overcome. The end result incorporates several advanced technologies and yields an overall improvement in the technology of digital temperature compensation. In addition, the improved diagnostic capabilities derived from these enhancements serves to greatly minimize setup time

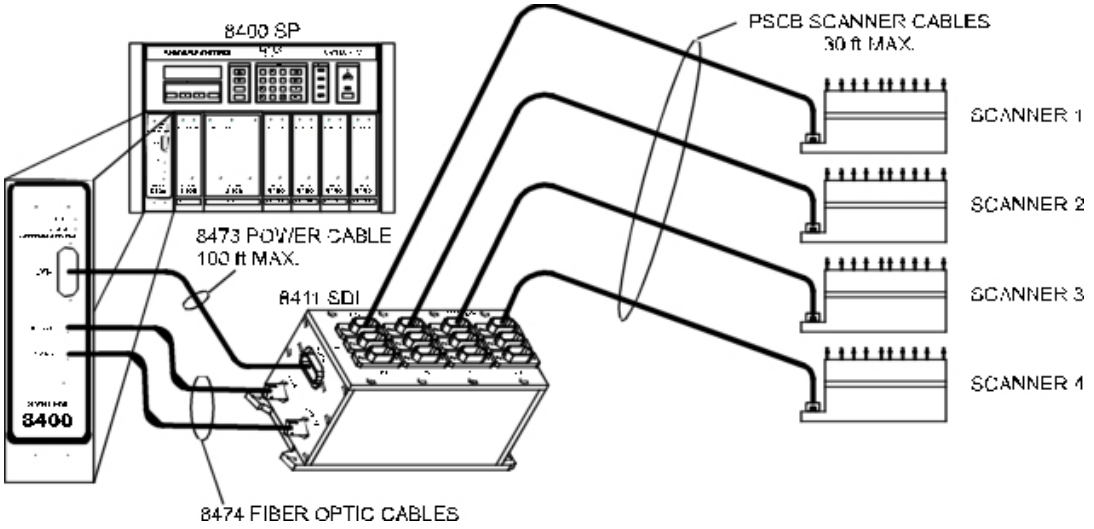


SYSTEM 8400 WINDTUNNEL CONFIGURATION
USING SDI SCANNER DIGITIZING INTERFACE

System Configuration

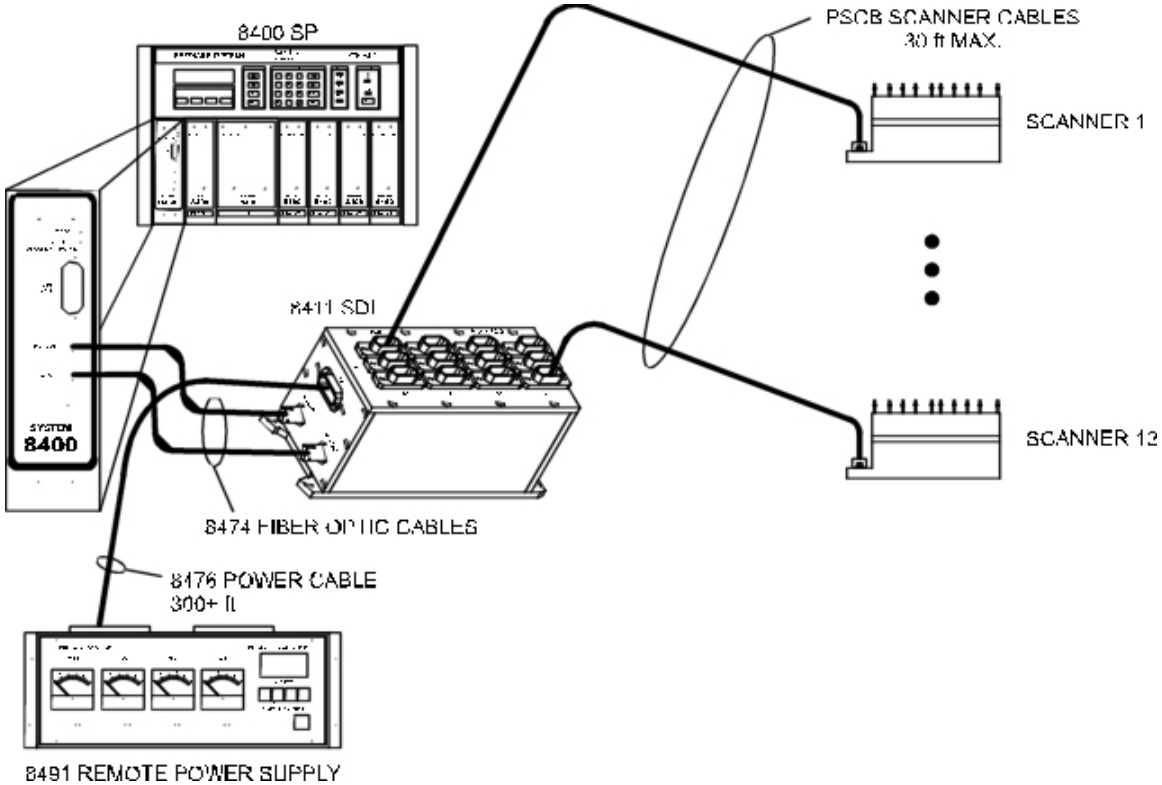
The SDI configuration consists of three basic components; the Fiber-optic Interface Unit (FIU), the Scanner Digitizer Interface (SDI) and the ESP Pressure Scanners incorporating the Digital Temperature Compensation (DTC) option.

The FIU is a single wide module installed within the 8400 System Processor and generally replaces the traditional SDU. The remotely located SDI combines much of the SDU and its 84IFC functions. The FIU communicates with SDI via the 8474 fiber optic cable and transfers raw pressure data from the SDI into the VME memory of the System Processor for data reduction. One FIU can directly power up to 256 channels (four ESP-64HDs) using the 8473 power cable. An 8491 Remote Power Supply is required for larger ESP configurations. Configurations using up to two FIUs and/or SDIs can be accommodated.



SDI Configuration for up to 256 Channels

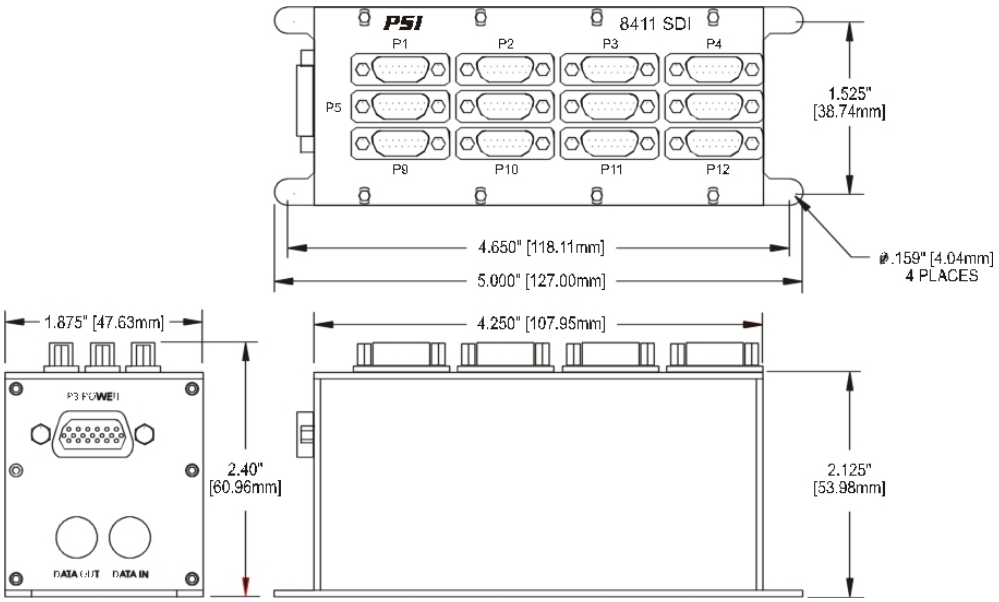
The SDI is designed to be placed in or near the model as space permits. PSCB scanner cables permit 12 scanners to be directly connected to one SDI. Alternatively, 8475 scanner breakout cables connect up to eight ESP scanners to each of two electrical connectors on the SDI to support a total of sixteen scanners and up to 1024 channels. From the breakout cable, PSCB scanner cables are used to connect each of the ESP scanners.



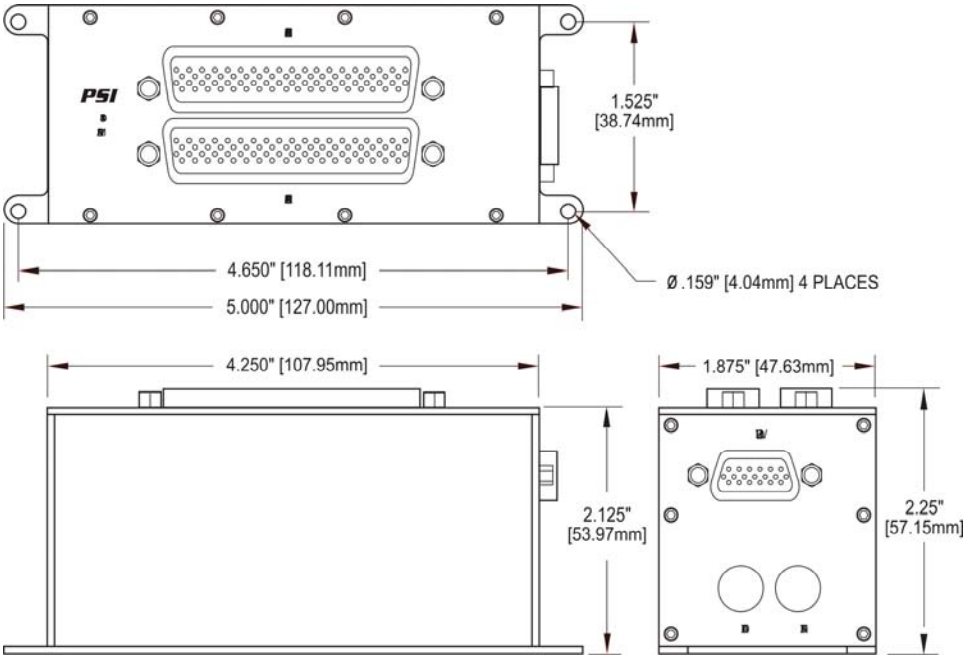
SDI Configuration for up to 768 Channels

Scanner Digitizer Interface (SDI)

The SDI configuration addresses and digitizes the analog data in or near the model where the ESP Pressure Scanners are located. This eliminates sources of errors associated with routing analog signals through long lengths of cables. The SDI incorporates a 16-bit A/D converter as well as circuitry to control the ESP scanners and communicate with the 8400 System via an advanced high speed fiber optic interface. The use of fiber optic communication minimizes the cable size while increasing the distance from the system to the ESP scanners.



12-Connector Scanner Digitizer Interface (PN: 8411-0002000000)



2-Connector Scanner Digitizer Interface (PN: 8411-0000000000)

ESP Pressure Scanners

The DTC option of the ESP pressure scanners incorporates many advanced features to increase the utility of the scanners while providing digital temperature compensation of the silicon sensors.

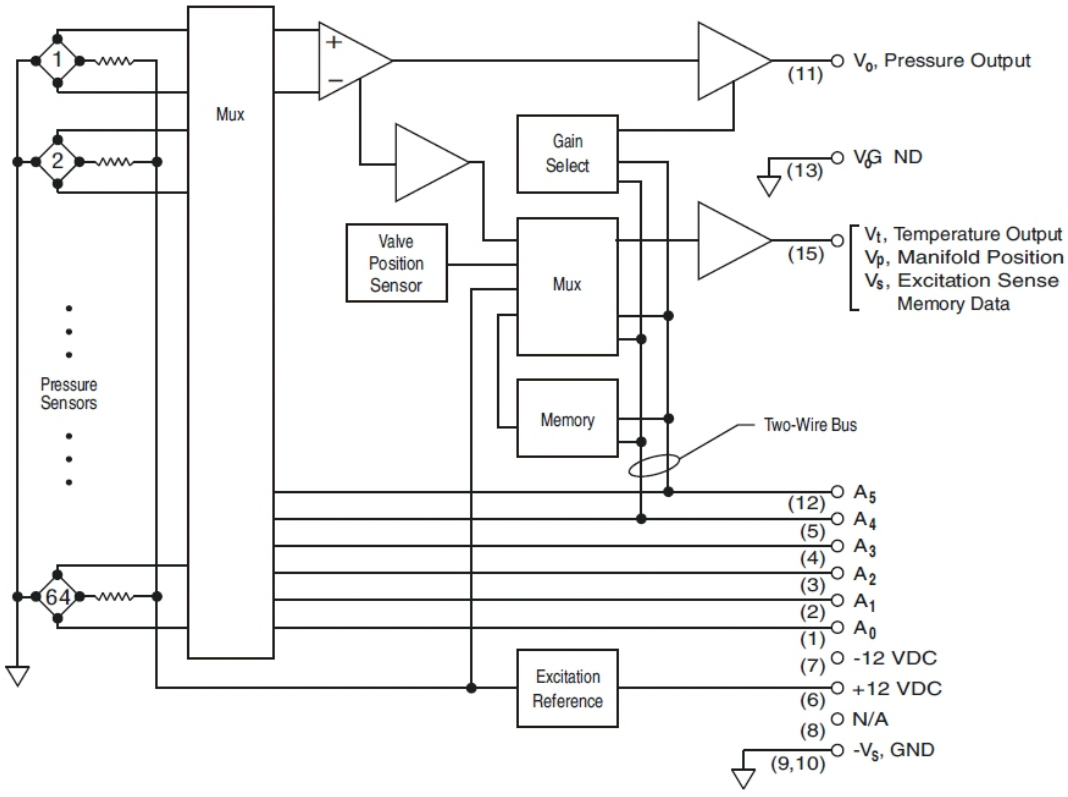
An onboard EEPROM stores the thermal calibration data for each channel. Also stored in the EEPROM is information identifying the range of the scanner, number of channels, model number, serial number, date of manufacture, date of calibration, and the model and serial number of the calibration unit used to calibrate the scanner. This data is serially transmitted to the SDI using the ESP address lines and then transferred to the System Processor via a fiber optic cable.

Using a proprietary PSI-developed method, the temperature of each sensor within the scanner is measured and transmitted along with the raw pressure measurements to the system. The frequency of these temperature updates is user specified to balance data acquisition speed with compensation requirements.

The ESP scanners also incorporate a hall effect sensor which is used to indicate the position of the calibration manifold. This position information can be transferred to the system upon command.

Another advanced feature is the ability to derange the ESP scanner upon command. This alters the gain on the amplifier to derange the scanner by a factor of three, enabling additional windtunnel tests to be conducted without reinstrumenting the model with lower range ESP scanners. The calibration coefficients within the EEPROM are developed to maximize the accuracy of the scanner at the lower range.

The DTC option for ESP scanners only slightly increases scanner length to allow for the additional components.



PN: 8426-0000000000 8400 Fiber-Optic Interface Unit

PN: 8411-00BB000000 8400 Scanner Digitizer Interface

BB = Type

00, 2 Connector Top Plate, supports 16 ESP scanners requires 8475 cable
02, 12 Connector Top Plate, supports 12 ESP scanners via PSCB cables (standard)

PN: PSCB-AA00000000 Scanner Cable (30' max)
PN: 8473-AABB000000 SDI Power Cable, 8426 to 8411 (100' max) AA, BB, CC, DD = Length
PN: 8474-AABBCCDD00 SDI Fiber-Optic Interface Cable, 8426 to 8411
PN: 8475-AA00000000 SDI/Scanner Breakout Cable (5' min, 50' max)
PN: 8476-AABBCCDD01 SDI Power Cable 8491 to 8411 (300' max)

PN: 8491-AA00000000 SDI Remote Power Supply

AA = Power Supply

00, 120 VAC
01, 240 VAC
02, 100 VAC

PN: 32HD-AABBCC1000 ESP-32HD (DTC) Scanner, 32 Port
PN: 64HD-AABBCC1000 ESP-64HD (DTC) Scanner, 64 Port

AA = Pressure Range (Consult factory for pressure ranges not listed)

01, ±10"WC (2.5 kPa)	06, ±10 psid (69 kPa)
02, ±20"WC (5.0 kPa)	07, ±15 psid (103 kPa)
03, ±1 psid (7 kPa)	08, ±30 psid (207 kPa)
04, ±2.5 psid (17 kPa)	09, ±45 psid (310 kPa)
05, ±5 psid (34 kPa)	10, +100 psid (689 kPa)

BB = Pneumatic Connection

01, .040", 90º
02, .040", 60º
03, .063", 90º

CC = Purge

00, Standard
02, Purge option

Order Example:
64HD-0702001000 ESP-64HD Scanner, ±15 psid, .040, 60º, DTC option