DIGITAL SENSOR ARRAY

DSA 3000 Series Modules

DSA3017 DSA3018 DSA 3200 Series Modules DSA3217 DSA3218

INSTRUCTION AND SERVICE MANUAL

11/2010

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SPECIFICATIONS - DSA 3017/3217/3018/3218

Pressure Inputs:	16 (Standard), or 8 (True Differential)
Input Fittings: DSA3017/3217 DSA3018/3218	Px Inputs063 inch TubulationControl Inputs063 inch TubulationPx Inputs- 1/8 inch Swagelok (1/16 and 1/4 inch Swagelok optional)Control Inputs- 1/8inch Swagelok (1/16 and 1/4 inch Swagelok optional)
Full Range Scales: Differential	±10" WC, 1, 2.5 ,5, 15, 30, 50, 100, 250, 500, 750, 850 psid (±2.5, 7, 17, 35, 100, 210, 345, 700, 1725, 3500, 5170, 5860 kPa)
Absolute	15, 30, 50, 100 and 250 psia (100, 210, 345, 700 and 1725 kPa)
Accuracy (differential): 10" WC 1 psid 2.5 psid 5 to 500 psid 501 to 850 psid	\pm 0.2% of full scale \pm 0.12% of full scale \pm 0.08% of full scale \pm 0.05% of full scale \pm 0.08% of full scale
Accuracy (absolute):	
15 psia 30 psia 50 psia 100 psia 250 psia	With CALB performedWithout CALB performed $\pm 0.05\%$ of full scale $\pm 0.10\%$ of full scale $\pm 0.05\%$ of full scale $\pm 0.10\%$ of full scale $\pm 0.05\%$ of full scale $\pm 0.10\%$ of full scale $\pm 0.05\%$ of full scale $\pm 0.10\%$ of full scale $\pm 0.05\%$ of full scale $\pm 0.10\%$ of full scale $\pm 0.05\%$ of full scale $\pm 0.10\%$ of full scale $\pm 0.05\%$ of full scale $\pm 0.10\%$ of full scale
Overpressure Capability 10" WC 1 psid 2.5 to 499 psid 500 psid 750 psid 850 psid	2 psi (13.79 kPa) 5 psi (35 kPa) 200% 150% 113% 100%
I/O and mating Connectors Ethernet 10Base-2 Ethernet 10Base-T DSA 3017/3217 DSA 3018/3218 Trigger (bulkhead/mating) Trigger/RS232 (bulkhead/mating) Power (bulkhead/mating)	BNC(RG58) RJ45 PT06A-8-4S-SR PT02A-8-2P/PT06A-8-2S-SR(SN 179 and below) ng) JTP02RE8-6P/JT01RE8-6S-SR(SN 180 and up) PT02A-8-3P/PT06A-8-3S-SR

Power	Requirements DSA 3017/3217 DSA 3018/3218	20 to 36 Vdc @ No Heater With Heater	22 to 36 Vdc @ 8W (Nominal 28Vdc). 22 to 36 Vdc @ 35W (Nominal 28Vdc). Power requirements will drop to 8 W after the module
Maxim	um Reference Pressure	250 psid (1725	has reached temperature. kPa) or sensor overpressure, whichever is less
Media	Compatibility	Gases compati steel	ble with silicon, silicone, aluminum, and stainless
Comm	unications Protocol	Ethernet IEEE	802.3
Typical	Data Acquisition Rate DSA3000 Series DSA3200 Series	200 samples/ch	nnel/sec TCP/IP ASCII (Engineering Units) nannel/sec TCP/IP ASCII (Engineering Units) nannel/sec UDP Binary
Typical	Communications Rate Ethernet RS232	10 Mbits/sec DSA3000 Serie DSA3200 Serie	es - 1200 to 19200 BAUD (Back Door) es - 1200 to 19200 BAUD (Configuration Only)
Weight	DSA3017/3217 DSA3018/3218	6.4lbs (2.91kg) 9.78 lbs (4.45kg	g)
Dimens	sions (LxWxH) DSA3017/3217 DSA3018/3218		m) X 2.86in(72.6mm) X 3.40in(86.4mm) n) X 4.08 in(103.6mm) X 6.97in(177mm)
Operat	ing Temp DSA 3017/3217 DSA 3018/3218	That i loador	- 0 to 60°C 55 to 60°C ilable for operation above 55°C
Compe	nsated Range DSA3000 Series DSA3200 Series	0 to 59°C 0 to 69°C	
Total T	hermal Error	Less than ±0.00	01% FS

GENERAL DESCRIPTION

The Digital Sensor Array is a stand alone temperature compensated electronic pressure scanner which can accept up to 16 pneumatic. Each Digital Sensor Array incorporates 16 individual, temperature compensated, piezoresistive pressure sensors with an A/D converter and a microprocessor to create an intelligent pressure scanner. Each pressure sensor is characterized for pressure and temperature from 0 to 59°C (DSA3000 Series) or 0 to 69°C (DSA3200 Series). This information is stored in EEPROM memory in the module. The DSA 3018/3218 may also include a optional Thermal Control Unit which will maintain the core module at a temperature of 20°C (other temperatures may be set to meet customer requirements). This electronic pressure scanning module is specifically designed for use in applications where long calibration intervals are required and ambient temperatures can vary below 0° C.

The DSA 3017/3217/3018/3218 sensors are arranged in blocks of eight(8). Each block of eight sensors has its own individual calibration valve. This valve has four modes of operation:

(1) Operate(2) Calibrate(3) Purge(4) Isolate

The modes are selected by applying control pressures in a predetermined logical order. The Digital Sensor Array calibration valve utilizes "Normally Px" valve logic where the valve defaults to the operate mode when no control pressures are applied.

The DSA 3017/3217/3018/3218 modules are manufactured in a 16 channel model, a 16 channel module with individual references, an 8 channel "true differential" model, and a 16 channel absolute model.

The DSA 3017/3217/3018/3218 modules are powered by a nominal +28Vdc.

GETTING STARTED

HARDWARE

The Digital Sensor Array is a self-contained pressure scanning system. It requires minimal interfacing by a user.

- 1) Mount the Digital Sensor Array to the test fixture using the mounting holes provided or the Mounting Bracket provided with the unit. The mounting bracket may be mounted on the side of the module. Mounting dimensions and other information may be found in figures 2 and 3.
- 2) Connect +28Vdc to the unit. Wiring information may be found in figure 7.
- 3) If the module is a DSA 3217 or DSA 3218 and the IP Address must be modified to operate in the user's network, the RS232/Trigger cable must be connected. The IP Address can only be modified by following the DSA3200 Boot Parameter Modification procedure in the DSA3200 Software Specification. The DSA Software Specification is a separate manual. If the module is a DSA 3017 or DSA 3018, the IP Address is changed using the IPPADDR command and can be done through ethernet communications.
- 4) Connect the Ethernet link. Refer to page 14 for more information on the Ethernet connections.
- 5) If external triggering is to be used, connect the Trigger Input. Wiring information may be found in figures 8 and 9.
- 6) Connect the Control Pressures. Control pressure are explained starting on page 15. Control pressure truth tables may be found on pages 15 and 17.
- 7) Connect the Px inputs.
- 8) Allow a minimum of 30 minutes for warmup. However, in many cases, a one hour warmup is preferred.
- 9) When the sensor temperatures have stabilized, execute a CALZ command before acquiring data. If the module, and sensor temperatures, change more than 3 degrees C between data points, the CALZ command should be executed before acquiring the data.

SOFTWARE

Communication with the Digital Sensor Array must use one of the following methods:

- a) Ethernet (10base-2 or 10Base-T) TCP/IP or UDP
 - b) National Instruments LabVIEW*
 - c) Scanivalve Corp DSALink3
 - d) Windows* HyperTerminal
 - e) Scanivalve Corporation's LabVIEW** Configuration Utility

** LabVIEW is a registered trademark of National Instruments, Inc.

^{*} Windows is a registered trademark of Microsoft Corporation.



Figure 1 - DSA3217

HARDWARE INSTALLATION

DSA3017/3217

Figure 2 shows the DSA 3217 with the Universal Mounting Bracket. Dimensions are in inches and (millimeters).

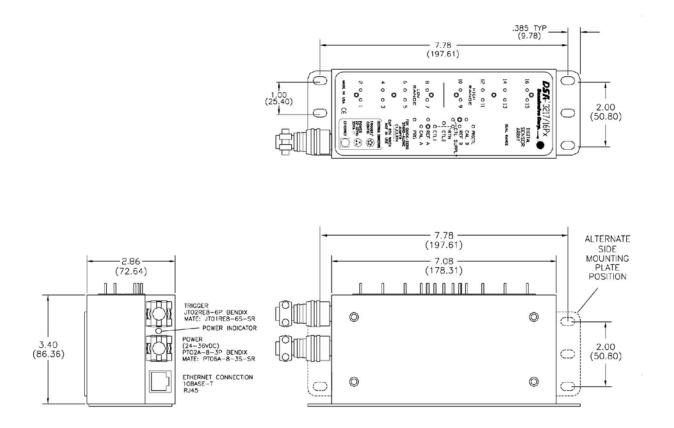


Figure 2 - Mounting and configuration

DSA3018/3218

Figure 3 shows the DSA 3018/3218 with the Universal Mounting Bracket. Dimensions are in inches and (millimeters).

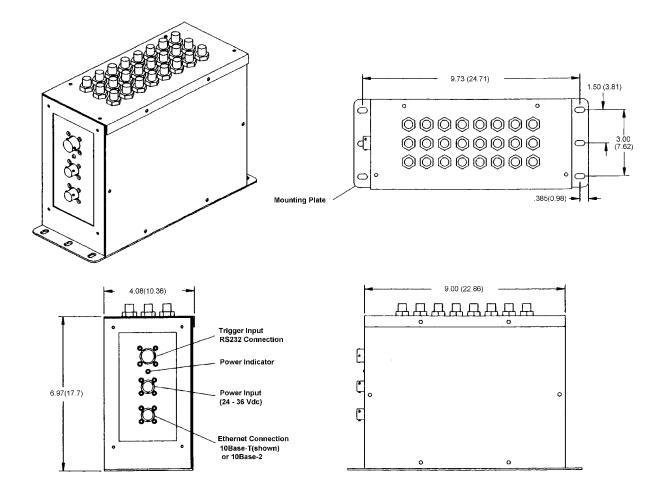


Figure 3 - DSA 3018/3218 Mounting and configuration

DSA3217 - Digital Out Module

The DSA3217 - Digital Output Module is a special version of the DSA3217. It incorporates a special section to provide five digital outputs. The condition of the outputs are controlled by a Digital Output Command in the DSA3200 software. The Trigger and Power connectors are configured exactly as a standard DSA3217. Control pressures are also identical to a standard DSA3217. This information may be found in following sections of this manual. Information on the Digital Outputs may be found on page 9. Dimensions are in inches and (centimeters).

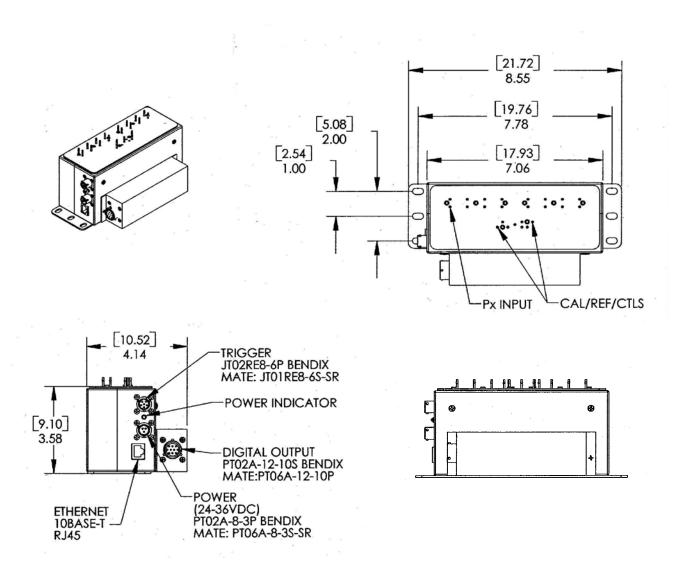


Figure 4 - DSA3217 - Digital Output Module Mounting

Digital I/O Connections

The DSA3217 - Digital Output Module has a maximum of five(5) Digital Outputs.

The Digital Outputs are powered directly by the DC input voltage input. It is recommended that the user supply be capable of providing sufficient current drive for the DSA3217 and the Digital Outputs. Each Digital Output requires approximately 500 mA @ 24 Vdc.

Figure 5 shows the wiring of the Digital Outputs.

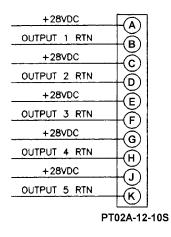


Figure 5 - DSA3217 - Digital Output Module - Digital Output wiring

DSA3217 - Individual Reference Module

The DSA3217 - Individual Reference Module is another special version of the DSA3217. It incorporates a reference tube for each input. The reference inputs are not "valved", that is, these inputs are not switched during transitions of the control valves. The control valve logic is identical to a standard DSA3217. The Trigger and Power connectors are also configured exactly as a standard DSA3217. This information may be found in following sections of this manual. Figure 6 shows the mounting information. Dimensions are in inches and (centimeters).

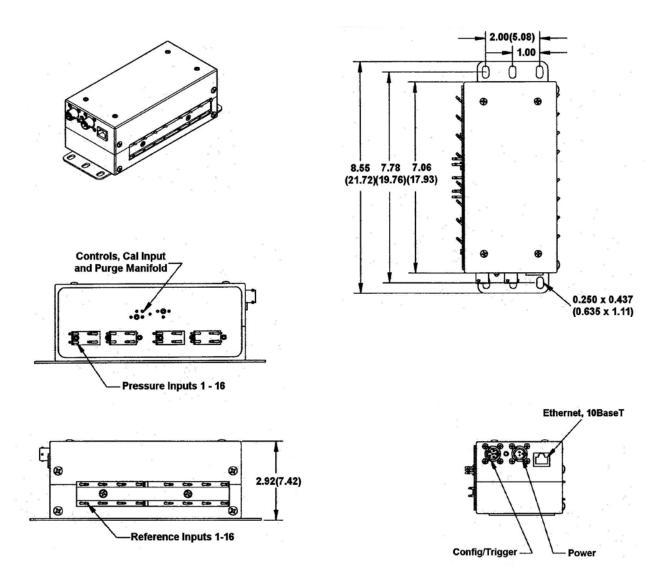


Figure 6 - DSA3217 - Individual Reference Module Mounting

POWER REQUIREMENTS DSA3017/3217/3018/3218

The DSA3017/3217 requires 28±8Vdc at approximately 8 W. This will remain constant while the module is operating normally. The DSA3018/3218 requires 28±8Vdc at approximately 8 W. The power requirements for these modules increase to 28±8Vdc at approximately 35 W if the optional heater is installed. The power requirements will drop when the module reaches the normal operating temperature. If the module is used in an environment where the ambient temperature is 0°C or less, power requirements could remain high. Power connections are made through a three pin connector located on the side of the module. The pinouts of the connector may be found in figure 7.

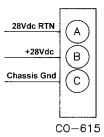


Figure 7 - DSA 3017/3018/3217/3218 Power Wiring

EXTERNAL TRIGGER REQUIREMENTS

The Digital Sensor Array scan functions may be synchronized with other data acquisition devices by using the external trigger.

DSA 3017/3018 Modules

The 3000 Series Modules may be triggered by a hardware trigger. The external trigger input is optically isolated to prevent grounding problems. It is a CMOS level, edge sensing device. It requires a minimum signal of 9Vdc @ 6.5 mA. It may accept voltages as high as 15 Vdc. The external trigger will only be active if XSCANTRIG is set to 1. When a SCAN command is issued by the Client/host, the module enters the SCAN mode and waits for a trigger. The module will return an averaged frame of data for each trigger pulse received. This will continue until the Frames_per_Scan variable value is met, or until a STOP command is issued.

DSA 3217/3218 Modules

The 3200 Series modules may be triggered by a hardware or software trigger.

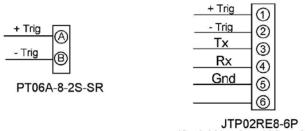
Hardware Trigger

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 9Vdc @ 6.5 mA. It may accept voltages as high as 15 Vdc. The external trigger will only be active if XSCANTRIG is set to 1. When a SCAN command is issued by the Client/host, the module enters the SCAN mode and waits for a trigger. The module will return an averaged frame of data for each trigger pulse received. This will continue until the Frames_per_Scan variable value is met, or until a STOP command is issued.

Software Trigger

The software trigger will only be active if XSCANTRIG 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 the TRIG command or a <TAB> character (9 HEX or Control I) is received. Data will be output with each successive trigger command. This will continue until the Frames_per_Scan variable value is met, or until a STOP command is issued.

DSA 3017/3018 Modules Serial Number 180 and higher and all DSA 3217/3218 modules use a 6 pin connector for a combination Trigger and Serial Communications Interface. The wiring of the trigger input connector for both configurations is shown in figure 8.



(Serial Number 180 and higher)

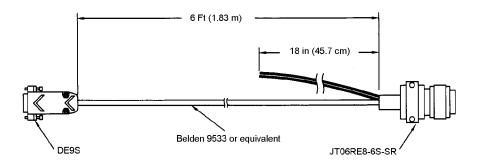
Figure 8 - Trigger wiring

RS 232 COMMUNICATIONS

Every DSA3200 Series Module has an RS 232 output. It is available at the Serial Communications/Trigger Connector. It is designed to be used to configure the module, upload coefficients and operating system upgrades, and provide emergency communications. The wiring of the RS 232 output is shown in figure 10.

NOTE: The cable wiring must connect the Tx output from the host computer to the Rx input of the DSA module. Also the Rx input of the host computer must connect to the Tx output of the DSA module.

A combination RS22 and External Trigger cable (Scanco PN 155829) is available as an option. If the optional cable is not ordered, then the mating connectors are supplied with every DSA3018/3218 order. The cable is shown below along with a recommended wiring diagram.



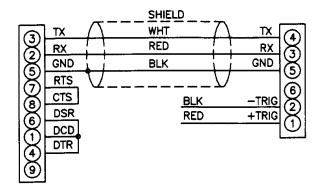


Figure 9 - RS232 / External trigger test cable

ETHERNET CONNECTIONS

The DSA 3017/3018 has provisions for 10Base-T or 10Base-2 Ethernet connections. The DSA 3217/3218 only supports 10Base-T.

10Base-2

The 10Base-2 connection is a BNC connection. Each module is provided with a BNC-T connector and a 50 ohm terminator. Modules configured for 10Base-2 are connected in a multi-drop configuration. Each module has a BNC-T connected at the BNC connector. A coaxial cable is run from the host computer and connected module to module. A 50 ohm terminator must be connected to BNC-T connector at the host computer and the last module in the string. The maximum number of module that may be connected on a 10Base-2 string is 1024. The minimum length of coaxial cable between modules is 0.5 meters. The maximum length of the 10Base-2 string is 1.5 kilometers. It is recommended that IEEE 802.3 coaxial cable (Belden-E 82907 or equivalent) be used, but RG-58 coaxial cable will function correctly.

10Base-T

DSA 3017/3217 series modules use a standard Category 5 RJ45 connection. Shielded Category 5 cable is recommended. All DSA3018/3218 modules use a Bendix connector at the module, which must be interfaced to the standard RJ-45 connector. A 10Base-T connection may be straight through(pin to pin) or crossover. A straight through cable must be used if the module is connected to a hub. Crossover connections are used if the module is connected directly to the host computer. It is recommended that shielded Category 5 cable be used for 10Base-T cables.

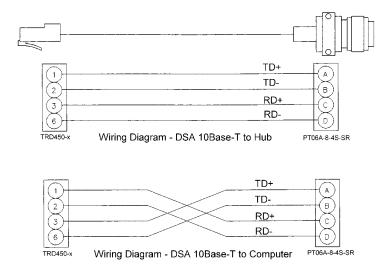


Figure 10 - DSA 3000 Series 10Base-T cables

CONTROL VALVES

The Digital Sensor Array does not require control pressures for normal operation. It does require control pressures if a multipoint or quick zero calibration is to be performed. Truth tables are different for each module type.

Standard Modules

Pneumatic Inputs

Pneumatic inputs consist of: 16 - Px Inputs, Control Pressure Inputs, and Calibration/Reference Inputs. Each valve block has its own set of pneumatic inputs.

All Px inputs are .063 inch tubulations or Swagelok fittings depending on the module. Each valve block contains eight(8) Px inputs. Digital Sensor Array modules are capable of measuring pressures up to 850 psid.

Control inputs consist of: CTL1, CTL2, CTL, and RTN. These inputs are used to switch the valve logic to each of the five(5) states: Operate, Calibrate, Quick Zero, Purge, and Isolate. The pressure required to switch the valve logic is dependent upon the input pressure. 90 psi is required for input pressures up to 500 psi. Input pressures greater than 500 psi require 120 psi control pressures. The Control inputs are .063 inch tubulations in a DSA3017/3217 r 1/8 inch Swagelok fittings in a DSA3018/3218. The Digital Sensor Array module is only available in the ISO-Purge Valve configuration. Figure 11 shows the ISO-Purge Valve Logic.

Calibration/Reference Inputs consist of a Calibration input and a Reference input. These inputs are .063 tubulations in a DSA3017/3217 or .1/8 inch Swagelok fittings in a DSA3018/3218. The Calibration input is normally connected to a source of calibration pressures. Internally, this input is manifolded to all of the sensors through the calibration valving. The Reference input provides a point of reference for the transducers. All of the sensors in each block of eight share a single reference.

MODE	CTL1	CTL2	CTL*	CTLPRG
Operate				
Calibrate	90 psi	90 psi		
Quick Zero	90 psi	90 psi	90 psi	
Purge	90 psi	90 psi		90 psi
Isolate	90 psi			

* CTL is generated by the DSA module

NOTE: Control Pressures may be increased to 120 psi for operation at 850 psi FS

Figure 11 - Standard Modules Control Pressure Truth Table

Quick Zero Calibrations

The Quick Zero Calibration is used to make the minor corrections that may be necessary to maintain the Digital Sensor Array accuracy. The Quick Zero function corrects the small zero drift problem inherent in piezoresistive sensors. A functional drawing of the Standard Valve with Quick Zero Logic is shown in Figure 12. The operation of the Quick Zero Calibration is described in the Special Procedures section on pages 34 and 35 of this manual. Scanivalve Corp recommends that a Quick Zero Calibration (CALZ) is performed daily, any time the temperature of the module varies more than 3°C or before any test is performed.

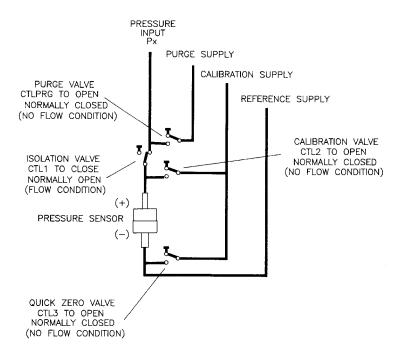


Figure 12 - Quick Zero Valve Logic

Absolute Modules

Pneumatic Inputs

Pneumatic inputs consist of: 16 - Px Inputs, Control Pressure Inputs, and Calibration Inputs.

All DSA 3017/3217 Px inputs are .063 inch bulged tubulations. These tubulations are designed to accept any .063 inch tubing manufactured by Scanivalve Corp. DSA 3018/3218 Px inputs are 1/8 inch Swagelok fittings.

Control inputs consist of: CTL1, CTL2, and PrgCTL. These inputs are used to switch the valve logic to each of the four(4) states: Operate, Calibrate, Purge, and Isolate. The pressure required to switch the valve logic is dependent upon the input pressure. 90 psi is required for input pressures up to 500 psi. Input pressures greater than 500 psi require 120 psi control pressures. The Digital Sensor Array module is only available in the ISO-Purge Valve configuration. Figure 14 shows the Absolute Valve Logic. Figure 15 shows the Iso-Purge Valve Logic.

The Calibration input is an .063 inch O.D. tubulation in a DSA 3017/3217. The DSA 3018/3218 uses a 1/8 inch Swagelok fitting for the calibration input. It is normally connected to a source of calibration pressures. Internally, this input is manifolded to all of the sensors through the calibration valving.

For single range, absolute DSA 3218 modules, the CAL A port is used to apply the calibration pressure. For dual range, absolute DSA 3218 modules, the CAL A port is used to apply the calibration pressure to the first range, and the CAL B port is used to apply calibration pressure to the second range. Reference Figure 19 for all of the layouts of pneumatic interface panels of DSA 3218 modules.

MODE	CTL1	CTL2	CTLPRG
Operate			
Calibrate	90 psi	90 psi	
Purge	90 psi	90 psi	90 psi
Isolate	90 psi		

Figure 13 - Absolute Modules Control Pressure Truth Table

Quick Baro Calibration

The Quick Zero Calibration cannot be performed on an absolute DSA module. Using CALZ command will move the zero to barometric (14.7 psia typical). In order to zero an absolute DSA module, a CALB command (performs a baro zero) to make the minor corrections that may be necessary to maintain the Digital Sensor Array accuracy. The CALB function corrects the small zero drift problem inherent in piezoresistive sensors. A functional drawing of the Standard Valve with Quick Baro Logic is shown in Figure 14.

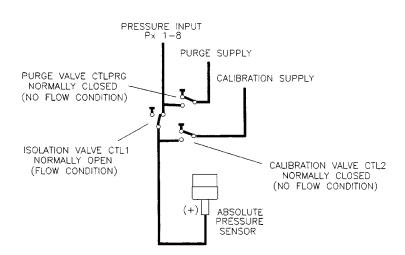


Figure 14 - Absolute Valve Logic

Isolate-Purge Valves

All Digital Sensor Array modules have Isolate-Purge valves. This valve adds another set of valving which permits the input lines to be purged at pressures up to 850psi. This is especially useful when Digital Sensor Array modules are used in applications where corrosive gases may be present in the input lines. This permits the safe use of a high pressure purge of low pressure sensors. A schematic of the Isolate-Purge Valves may be found in Figure 15.

The user must be familiar with the Control Pressure Truth Table for the valve being used. This table shows the pressure requirements for each mode of the Digital Sensor Array valves. The basic modes are quite simple to set. The purge mode **MUST** be established in a set order in order to protect the sensors and Calibration modules from damage.

Isolate-Purge Mode Procedure

- 1. Set the internal valve to the Calibrate mode .
- 2. Set the Calibrator(s) to the Zero Mode. If Scanivalve Corp Calibrator modules are being used, Steps 1 and 2 can be implemented by setting the Calibrator module(s) to the Cal Zero mode using the CALZ command.
- 3. Set the calibration valve(s) to the Purge mode by applying CTLPRG pressure.
- 4. Apply the Purge pressure.

It is also imperative that a procedure be followed when switching from the Purge mode to one of the other modes.

- 1. Shut off the Purge pressure. Allow sufficient time for the input lines to stabilize. The actual time required will depend upon the physical characteristics of the input tubing.
- 2. Switch the valve(s) from the Purge mode by removing the CTLPRG pressure.
- 3. Switch the valve(s) to the desired mode.

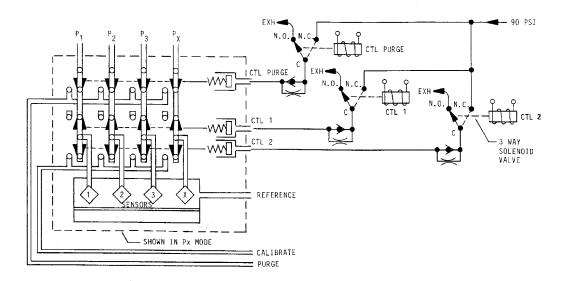


Figure 15 - Isolate-Purge schematic

PNEUMATIC INTERFACE PANELS

DSA 3017

The DSA 3017/3217 modules use a pneumatic interface panel to connect the pressure inputs to the module. This panel acts as a splash plate to protect the module from liquids. The plates are fitted with 1/16 inch tubulations for the Px and control inputs. Figure 16 shows the panels used on the DSA 3017 modules.

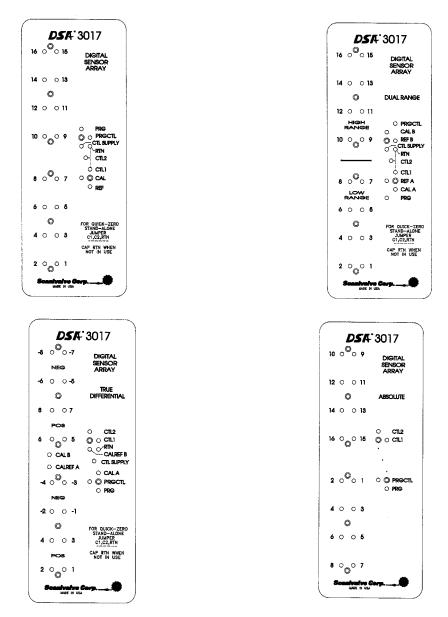


Figure 16 - DSA3017 Pneumatic Interface Panels

DSA 3217

The DSA 3217 modules use a pneumatic interface panel to connect the pressure inputs to the module. This panel acts as a splash plate to protect the module from liquids. The plates are fitted with 1/16 inch tubulations for the Px and control inputs. Figure 17 shows the panels used on the DSA 3217 modules.

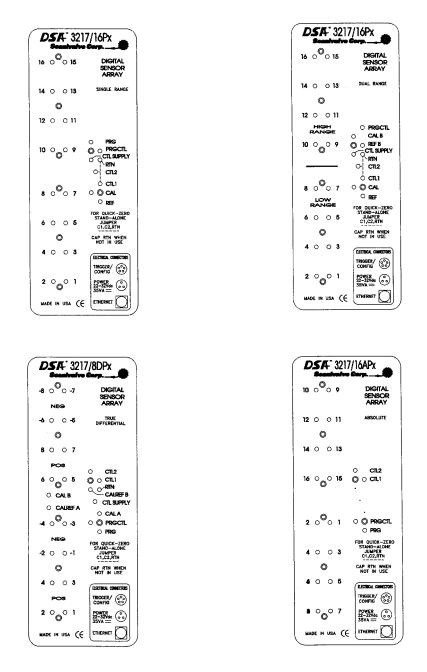


Figure 17 - DSA3217 Pneumatic Interface Panels

DSA 3018

The DSA 3018 uses a pneumatic interface panel to connect the pressure inputs to the module. The panels are fitted with 1/8 inch Swagelok fittings for the Px and control inputs. Figure 18 shows the panels used on the DSA 3018 modules.

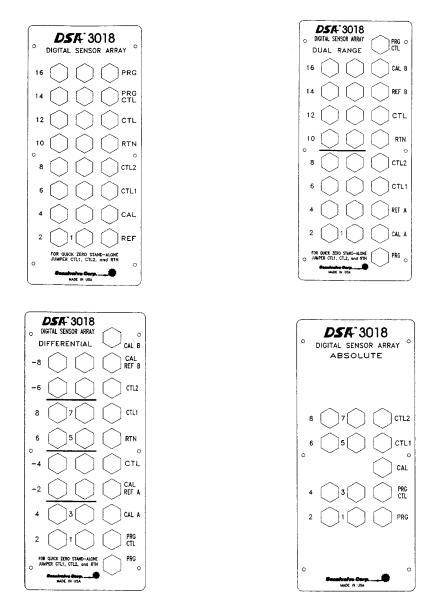


Figure 18 - DSA 3018 Pneumatic Interface Panels

DSA 3218

The DSA 3218 uses a pneumatic interface panel to connect the pressure inputs to the module. The panels are fitted with 1/8 inch Swagelok fittings for the Px and control inputs. Figure 19 shows the panels used on the DSA 3218 modules.

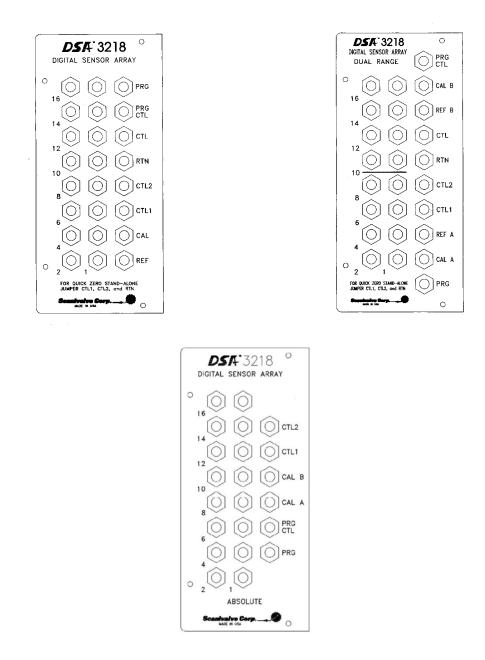


Figure 19 - DSA 3218 Pneumatic Interface Panels

Splash Plate Removal and Re-Installation

DSA 3017/3217 modules are furnished with a splash plate to protect the module from moisture. The splash plate has a formed gasket on the bottom side which seals the edges of the top of the module.

To Remove the Splash Plate:

- 1. Loosen the six (6) allen head screws. These are captive screws.
- 2. Carefully lift the plate from the unit.
- 3. Verify that all of the o-rings stay with the module.

To install the splash plate:

- 1. Inspect the o-rings for nicks and contamination. Replace any o-rings that do not appear to be perfect.
- 2. Inspect the header surface for contamination. This surface must be clean.
- 3. Re-Install the splash plate by slipping it over the tubulations.
- 4. Engage a few turns on each of the allen screws. Do not attempt to tighten these screws until all have been started and the plate is aligned.
- 5. Tighten, but do not over torque the allen screws.

NOTE: The splash plate must be removed for access to the module.

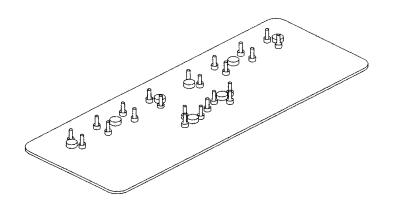


Figure 20 - Splash plate installation

MAINTENANCE

DSA 3017/3018 Series Modules

The Digital Sensor Array requires no special maintenance. The modules are tested extensively prior to shipment. Many of the components used in the Digital Sensor Array are the same as, or derived from, components currently on use in existing modules. The Isolate-Purge Valves have been tested in excess of one million cycles.

Circuit Boards

All of the circuit boards in the Digital Sensor Array are multi layer boards using surface mount technology. The Digital Sensor Array contains 6 circuit boards:

Excitation Board

The Excitation Board is the same board that is used in ZOC 17 and ZOC 16TC modules with one difference. Besides a 1.5ma constant excitation current for each sensor, It also outputs a signal proportional to the sensor bridge resistance. This signal is used to determine the temperature of each sensor and ultimately the temperature plane to be used for Engineering Unit conversions.

Processor Board

The Processor Board is the heart of the module. All of the software and module intelligence resides in this board. It uses an 80186 processor operating at 12 MHz.

Power Supply Board

The power supply is a DC to DC converter which converts the +24 Vdc input voltage to +5 Vdc and \pm 15 Vdc outputs.

Ethernet Interface Board

The Ethernet Interface board adapts the 10Base-2 output of the processor board to 10Base-Tif the module is designated for that output. This board is not installed if the module is designated for a 10Base-2 interface.

Serial Adapter Board

This board is used to bring the internal serial "back door" connection out to the 6 pin trigger connector.

Analog to Digital Converter Board

This board is used to convert the analog signals from the sensors to a digital signal .

Calibration Valves

The calibration valves are included so a customer can perform a calibration or a data validity check. The valves do not require any special maintenance by a user. They should not be disassembled by a user that has not completed training at the Scanivalve Factory.

DSA 3217/3218 Series Modules

The DSA 3200 Series Modules require no special maintenance. The modules are tested extensively prior to shipment. Many of the components used in the DSA 3200 Series are the same as, or derived from, components currently on use in existing modules. The Isolate-Purge Valves have been tested in excess of one million cycles.

Circuit Boards

All of the circuit boards in the DSA 3200 Series are multi layer boards using surface mount technology. The Digital Sensor Array contains 4 circuit boards:

Excitation Board

The Excitation Board is the same board that is used in ZOC 17 and ZOC 16TC modules with one difference. Besides a 1.5ma constant excitation current for each sensor, It also outputs a signal proportional to the sensor bridge resistance. This signal is used to determine the temperature of each sensor and ultimately the temperature plane to be used for Engineering Unit conversions.

Processor Board

The Processor Board is the heart of the module. All of the software and module intelligence resides in this board. It uses a Hitachi RISC processor.

Power Supply Board

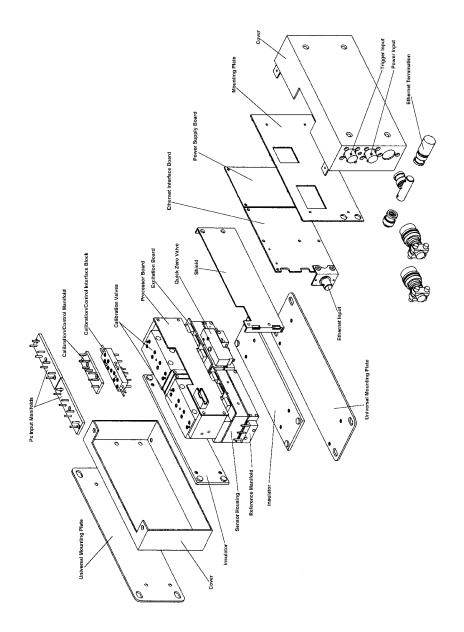
The power supply is a DC to DC converter which converts the +24 Vdc input voltage to +5 Vdc and \pm 15 Vdc outputs.

Analog to Digital Converter Board

This board is used to convert the analog signals from the sensors to a digital signal .

Calibration Valves

The calibration valves are included so a customer can perform a calibration or a data validity check. The valves do not require any special maintenance by a user. They should not be disassembled by a user that has not completed training at the Scanivalve Factory.



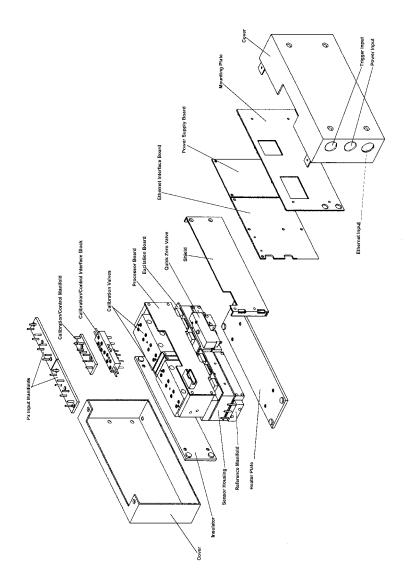


Figure 22 - DSA 3018/3218 Exploded view

SPECIAL PROCEDURES

DSA3017/3018/3217/3218

Sensor Replacement

The sensors used in the Digital Sensor Array modules are field replaceable. Replacement of the sensors must be accomplished by following the procedures in this manual very carefully. If the procedures are not followed, the sensors and/or the modules or both may be damaged. It is very important that the user be very familiar with this procedure before attempting to replace a sensor. For more information or assistance, contact: Scanivalve Corp, Product Support Department at (800) 935-5151.

Please refer to figures 23, 24 and 25.

- 1. Place the module on its side with the connector side down. Remove the six screws on the top and the six screws on the bottom of the case.
- 2. Lift the cover side off and remove the insulation from the sides and bottom.
- 3. Carefully and gently remove the DSA right side cover (with the electronics). Disconnect the cables making certain to note where and how they are connected.
- 4. Remove the brass reference manifolds from each end of the DSA Module. DO NOT disconnect the plumbing.
- 5. Remove the two mounting screws from the quick zero valve base to separate the valve from the DSA housing. **DO NOT** disconnect the nylon tubing. See figure 23.
- 6. Remove the bottom screws from the reference housing where the failed sensors are located. Refer to figure 24.
- 7. Install #6 X 1.5" or similar screws in two of the blind holes in the bottom of the reference housing and gently pull the housing from the DSA module.
- 8. Remove the failed sensor(s) with the sensor removal tool. Insert the new sensor(s). Refer to figure 24.
- 9. When the failed sensor(s) have been replaced, reassemble the module by following this procedure in the reverse order.
- 10. The coefficients for the replacement sensors must be merged into the Module memory. DSALInk3 must be used to complete this task.

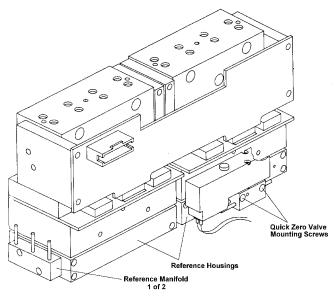


Figure 23 - Quick Zero Valve Mounting

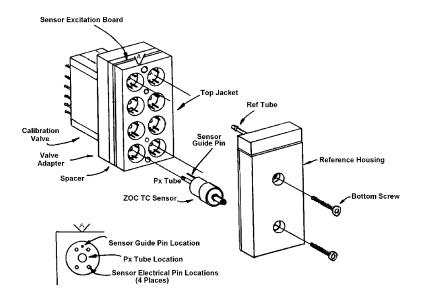


Figure 24 - Sensor Replacement

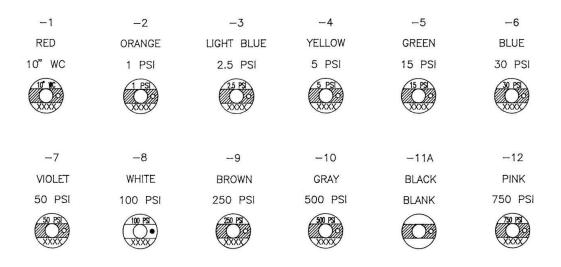
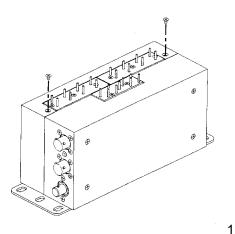


Figure 25 - DSA temperature compensated sensor labels

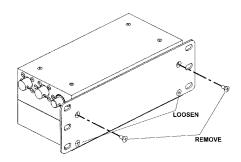
DSA3017/3018 Firmware Replacement

Replacement of the Firmware chip should only be required if the DSA firmware is upgraded. It is not expected that this chip might fail in normal use.

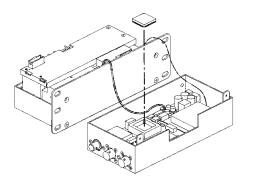
When software upgrades are available, customers will be notified by mail or FAX. Upgraded software will only be made available to customers when requested. It is very important that the replacement procedure be followed very carefully, otherwise damage to the chip or module may result. It is also very important to observe ESD safety procedures while replacing this chip.



Remove the Splash Plate and the top two screws.



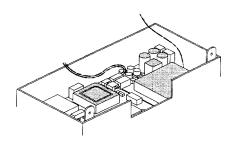
2. Place the module on its side as shown and remove the two upper screws. Loosen but do not remove the two lower screws.



3. Gently separate the housing, as shown.

4. Carefully remove the WSI chip with a PLCC extraction tool (Scanco TL-108 or Techni-Tool #560PR291). The use of any other tool will damage the WSI chip.

5. Install the new chip. Be very careful to note the proper orientation of the flattened corner. Push firmly on the chip to seat it.



6. Reassemble the module in the reverse order. It is very important that the wires be routed around the shaded components.

DSA3217/3218 Firmware Replacement/Upgrade

Firmware replacement or upgrade in DSA3217/3218 modules is by RS232. Please refer to the DSA3200 Series Software Specification for a procedure and RS232 connection information. Notification of possible upgrades will be available on the Scanivalve Corp website. All upgrade software will be sent from the Scanivalve Corp factory.

DSA 3017/3217 Pneumatic Jumpering for "QUICK ZERO"

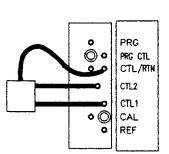
The DSA 3017/3217 series modules permit the use of the "quick zero" function even if the module is being used in a stand alone mode. This is made possible by connecting CTL1, CTL2, and RTN. This pneumatic jumper permits a quick zero without applying external control pressure logic. A single control pressure must be applied to the CTL input. When the "Quick Zero" function is commanded, the logic to switch the valves to the zero mode is generated internally. Refer to the Control Pressure Truth Tables in Figures 11 and 13 for more information. The pneumatic jumper is shown in Figure 26 below.

To Perform a "Quick Zero":

- 1. Insure that the Quick Zero jumper is installed as shown in Figure 26.
- 2. Apply a constant 90 psi pressure to the CTL input.
- 3. Execute a Zero Calibration by calling the CALZ (CALIBRATE ZERO) command.

Full Calibrations may be performed by a user. The recommended procedure is:

- 1. Remove the Quick Zero jumper.
- 2. Cap the RTN and PRG inputs.
- 3. Connect 90 psi pressure toCTL1 and CTL2.
- 4. Execute the CAL(CALIBRATE) Command.
- 5. Remove the caps from RTN and PRG when the Calibration is complete and reconnect the Quick Zero Jumper.



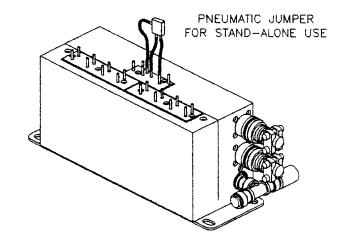


Figure 26 - DSA 3017/3217 quick zero jumpering

DSA 3018/3218 Pneumatic Jumpering for "QUICK ZERO"

The DSA3018/3218 modules permit the use of the "quick zero" function even if the module is being used in a stand alone mode. This is made possible by connecting CTL1, CTL2, and RTN. This pneumatic jumper permits a quick zero without applying external control pressure logic. A single control pressure must be applied to the CTL input. When the "Quick Zero" function is commanded, the logic to switch the valves to the zero mode is generated internally. Refer to the Control Pressure Truth Tables in Figures 11 and 13 for more information. The pneumatic jumper is shown in Figure 27 below.

To Perform a "Quick Zero":

- 1. Insure that the Quick Zero jumper is installed as shown in Figure 27.
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- 3. Execute a Zero Calibration by calling the CALZ(CALIBRATE ZERO) command.

Full Calibrations may be performed by a user. The recommended procedure is:

- 1. Remove the Quick Zero jumper.
- 2. Cap the RTN and PRG inputs.
- 3. Connect 90 psi pressure to CTL1 and CTL2.
- 4. Execute the CAL(CALIBRATE) Command.
- 5. Remove the caps from RTN and PRG when the Calibration is complete and reconnect the Quick Zero Jumper.
- **NOTE**: It is very important that the scan function is **NOT** initiated before the module has stabilized after a **CALZ**. The inputs can be unstable for a period of time that is dependant upon the length of the control pressure lines and the input lines. Generally, a wait of 15 seconds is sufficient, but, the user is advised to perform tests to insure that the delay is sufficient.

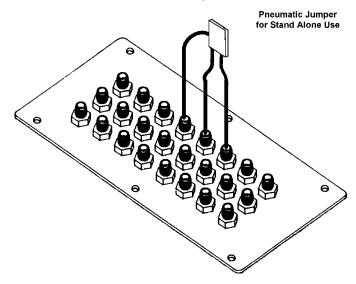


Figure 27 - DSA 3018/3218 quick zero jumpering

DSA 3018/3218 Operations for Freon Applications

When using DSA 3018/3218 modules in Freon Applications special considerations must be taken. In order to prevent premature deformation of the seals within the DSA 3018/3218's valve, it is important to leave the module in the following 'dormant' state.

- Apply CTL2 and PRGCTL pressures
- Ensure no Px pressures are applied
- Freon present must be vaporized

Any time the module will be left inactive for a significant period of time it should be left in this state. Adhering to this procedure will help ensure long life and prevent any premature maintenance requirements.

NETWORK CONFIGURATION

The DSA may be configured in three basic network arrangements:

- Isolated
- Integrated
- Sub-network with gateway

Isolated Network

The isolated DSA network provides the fastest possible data throughput because other network traffic has been eliminated. DSA commands are issued from the network client/host and data is directed to the network client/host in UDP format. Data is removed from the client/host via disk or tape. This configuration is ideal for high speed data transfer with data reduction that is handled by the network client/host.

Integrated with System Network

The integrated DSA provides the most accessible data to all network clients. Any client/host on the network may control any or all of the DSA's. Network throughput (TCP/IP) may be reduced because of other network traffic. This configuration is ideal for systems that can tolerate slower data transfer rates but require easy access by multiple client/hosts to each DSA unit.

Sub-Network with Gateway

The DSA sub-network allows high speed data transfer of the sub-network while allowing access by a larger network. The gateway is most effective as a multi homed client/host that can store the DSA data for later access by client/hosts on the main system network.

CLIENT/HOST OPTIONS

The basic client/hosts are:

- PC / TCP/IP
- PC / UDP
- PC / LabView (Scanco PN 155284 and 155285)
- PC / DSALink3 (Scanco PN 155293-1)
- PC / OPC Server (Scanco PN 155282-1)
- PC / Windows HyperTerminal

PC-TCP/IP

A user may write their own interface. Scanivalve Corp. supplies a Software Specification with each DSA module. This interface should allow the user to:

- Issue commands to any or all DSA modules on the network.
- Display returned information or scan data from the DSA modules.
- Write returned information or scan data to the client/host in TCP/IP format.
- Determine the addresses of all DSA modules on the network.

PC-UDP

A user may write their own interface. Scanivalve Corp. supplies a Software Specification with each DSA module. This interface should allow the user to:

- Issue commands to any or all DSA modules on the network.
- Display returned information or scan data from the DSA modules.
- Write returned information or scan data to the client/host.in UDP format (no handshaking)
- Determine the addresses of all DSA modules on the network.

PC-LabView

Scanivalve Corp. offers a LabVIEW Development kit for users desiring to customize a LabVIEW driver for DSA modules. The Development kit is compatible with LabVIEW 8.2, 8.6 and 2009. A LabVIEW Configuration utility is also offered that gives the user to configure the DSA unit and is based on a LabVIEW 2009 runtime.

PC-DSALink3

Scanivalve Corp. has written a communications program to interface a PC to a DSA module. This program is designed to operate in Windows 2000 or Windows XP. This program permits a user to connect to a DSA module, modify the configuration variables, upload or download coefficients, take data, and save data to a file.

PC-OPC Server

Scanivalve Corp. has written a OPC Server driver to interface a PC running in an OPC environment to a DSA module. This program is designed to operate in Windows 2000 or Windows XP.

PC-Windows HyperTerminal

HyperTerminal is a Windows program. It is provided as part of the Windows 2000, XP and Vista Operating Systems. This program permits a user to connect to a DSA module, modify the configuration variables, upload or download coefficients, take data, and save data to a file. It is a text based command line program.

For more information, contact Scanivalve Corp, the Product Support Department.

DSA NETWORK ADDRESSING

Each DSA module has the capability to accept commands in Unicast (only one DSA accepts command)

Each DSA module has a unique, factory set, 48 bit physical Ethernet address. When running TCP/IP protocol the DSA modules support ARP (address resolution protocol) to enable the client/host to determine the relationship between the IP address and the Ethernet address. The IP address is user assignable.