ZOC16TC/16Px MULTIPLEXED
ZOC16TC/16Px MUXLESS
DSA3016/16Px

INSTRUCTION and SERVICE MANUAL

04/2005

1722 North Madson Street
Liberty Lake, WA 99019
Tel: (800) 935-5151
(509) 891-9970
Fax: (509) 891-9481
web site: www.scanivalve.com
e-mail: scanco@scanivalve.com

Scanivalve Corp.

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Specifications - ZOC16TC Modules

Inputs (Px):	16
Full Scale Ranges:	10 inch H2O (2.5 kPa) 1,2.5,5,15,50,100,200 and 500 psid (7,17,35,100,350,700,1400, and 3500 kPa)
Accuracy:	± .065%FS
Sensor Excitation:	1.5mA Constant Current
Full Scale Output:	Muxless < 1psi FS - 30mV to 70mV (Each Sensor) > 1psi FS - 75mV to 150mV (Each Sensor) Muxed - Nominal 2.5Vdc (Addressed channel)
Resolution:	Infinite
Operating Temp:	0^{o} to 70 ^{o}C Standard (0^{o} to 125 ^{o}C Optional)
Compensated Range:	0^{o} to 50 ^{o}C
Temp. Sensitivity:	< 1 psi Zero 0.009%FS/^{o}C Span 0.007%FS/^{o}C >1 psi Zero 0.009%FS/^{o}C Span 0.007%FS/^{o}C
Overpressure: (No Damage)	10 inH_2O (2.5 kPa) - 2 psi (13.8 kPa) 1 psid (7 kPa) - 5 psi (35 kPa) 2.5 - 100 psid (17 - 689 kPa) - 400% FS 200 psid (1380 kPa) - 600 psi (4135 kPa) 500 psid (3445 kPa) - 750 psi (5250 kPa)
Max Ref Press:	250 psig (1400 kPa)
Media:	Clean, dry gases compatible with silicon, silicone, Aluminum, and Buna-N
Connector Type:	Amphenol 22221-401(117)
Power Requirements:	+15Vdc @ 100mA -15Vdc @ 25mA +28Vdc @ 1A(Heater Power)
Weight:	4lbs 12oz (2.16kg)

Specifications - DSA3016 Modules

Inputs (Px):	16
Full Scale Ranges:	10 inch H2O (2.5 kPa) 1,2.5,5,15, 30, 50,100,250, 500, 600, and 750 psid (7,17,35,100,205, 350,700,1400,1725, 3500, 4200, and 5250 kPa)
Accuracy:	6 months after calibration
10" H^2O	±0.15% FS
1 psid	±0.10% FS
2.5 to 500 psid	±0.05% FS
501 to 750 psid	±0.08% FS
Sensor Excitation:	1.5mA Constant Current
Full Scale Output:	Nominal 2.5Vdc (Addressed channel)
Resolution:	Infinite
Operating Temp:	0^o to 60 ^oC Standard
Calibrated Range:	10^o to 40 ^oC
Temp. Sensitivity:	< 1 psi Zero 0.009%FS/^{o}C Span 0.007%FS/^{o}C >1 psi Zero 0.009%FS/^{o}C Span 0.007%FS/^{o}C
Overpressure: (No Damage)	10 inH_2O (2.5 kPa) - 2 psi (13.8 kPa) 1 psid (7 kPa) - 5 psi (35 kPa) 2.5 - 250 psid (17 - 1725 kPa) - 200% FS 500 psid (3445 kPa) - 750 psi (5250 kPa) 750 psi (5250 kPa) - 750 psi (5250 kPa)
Max Ref Press:	250 psig (1400 kPa)
Media:	Clean, dry gases compatible with silicon, silicone, Aluminum, and Buna-N
Connector Type:	Amphenol 22221-401(117)
Power Requirements:	+15Vdc @ 100mA -15Vdc @ 25mA
Weight:	4lbs 12oz (2.16kg)

General Description

The ZOC®16TC/DSA3016 is an electronic pressure scanner which can accept up to 16 pneumatic inputs. Each module incorporates up to 16 individual, temperature compensated, piezoresistive pressure sensors. Each pressure sensor is manufactured in a housing designed to facilitate field replacement. No special tools are required to access the sensors.

The sensors are arranged in blocks of 8. Each block of eight sensors has its own individual calibration valve. This valve has four modes of operation: operate, calibrate, purge and leak test. The modes are selected by applying control pressures in a predetermined order. The calibration valve utilizes "ISO-Purge" valve logic where the valve defaults to the operate mode when no control pressures are applied.

The ZOC16TC electronic pressure scanning module is specifically designed for use in applications where long calibration intervals are required. The ZOC16TC temperature compensated pressure sensors are compensated from 0 to 50 deg C. This is further enhanced by the use of a constant current source for sensor excitation.

Figure 1 shows a front and side view of a typical ZOC16TC module.

Figure 1 - Front and Side Views of a typical ZOC16TC

All ZOC16TC modules are powered by ± 15Vdc. They are manufactured in a 16 channel multiplexed model, a 16 channel muxless model, and an 8 channel True Differential multiplexed model. The multiplexed versions are designed to be used with the HyScan® 1000 or HyScan 2000 High Speed Data Acquisition Systems. Both versions may be used in customer designed data acquisition systems or in a "stand alone" configuration.

ZOC16TC/16Px - Multiplexed

This module contains 16 sensors, two calibration valves, two excitation boards, and a multiplexer/amplifier. The sensors are arranged in two groups of eight. Each group of eight sensors may be a different range. The output of the module is ±2.5Vdc corresponding to the channel selected by a 4 bit binary address. This module may be dual ranged.

ZOC16TC/16Px - Muxless

This module contains sixteen sensors, two calibration valves, two excitation boards, and an interface board. The sensors are arranged in two groups of eight. The output of each sensor is output directly from the interface connector to the edge connector. All sensor outputs are within a range of 30 to 150 mVdc depending upon the pressure range. In any module the sensors will be grouped so that the outputs fall within ±20 mV of one another. All sensor zero offsets are normalized to ±3 mVdc. This module may be dual ranged. The pneumatic operation is identical to that of all similar ZOC16TC modules. Figure 6 shows the electrical pinout of this module.

ZOC16TC/8DPx - True Differential

This module contains eight sensors, eight dummy sensors, two calibration valves, two excitation boards, and an interface board. The sensors are arranged in two groups of four sensors and four dummy sensors. The calibration valves are modified to permit the reference side of each sensor to be pressurized through a dummy sensor. The electrical output of the module is a "double read". That is, the pressure for each active channel will be read twice. The operation of the control pressure pneumatics is identical to all other ZOC16TC modules.

DSA3016/16Px

The DSA3016 is a derivative of the ZOC16TC module. It shares most of the physical parts of a ZOC16TC.This module is specifically designed to be used in the DSAENCL3000 or DSAENCL3200 series Ethernet enclosures. The main difference is an installed RTD, a power switch to permit module changes without powering the enclosure down, and an ID chip to identify an individual module to the DSAENCL software..

This module contains 16 sensors, two calibration valves, two excitation boards, and a multiplexer/amplifier. The sensors are arranged in two groups of eight. Each group of eight sensors may be a different pressure range. The output of the module is ±2.5Vdc corresponding to the channel selected by a 4 bit binary address. This module also contains an RTD used to measure the temperature of the sensors. The temperature signal is used by the embedded PC in a DSAENCL 3000 series enclosure for conversion of the analog pressure signal to Engineering Units. For more information, please refer to a DSAENCL 3000/3200 manual and the DSM3000/3200 Series Software Requirements Specification.

ZOC16TC Components

Multiplexer/Amplifier Board

The Multiplexer/Amplifier Board is used only in the ZOC16TC-Multiplexed Module. The Multiplexer/Amplifier board consists of an input/output connector, two multiplexers, an amplifier, and two interface connectors. The board is powered by ± 15Vdc. The address lines select a multiplexer and one of eight sensor inputs for input to the Instrumentation Amplifier. The Instrumentation Amplifier amplifies the low level sensor outputs to ± 2.5Vdc which is output through the I/O connector. The Amplifier output may be set to ±5Vdc or ±10Vdc as an option.

Figures 2, 3, and 4 show the layout and schematic of the ZOC16TC Mux-Amp Board. It is not recommended that the customer attempt to make repairs to the board. The board is a multi-layered board utilizing surface mount technology. Specialized processes are required in order to insure that the board is not damaged during repair. For more information, contract the Scanivalve Corporation Customer Service Department.

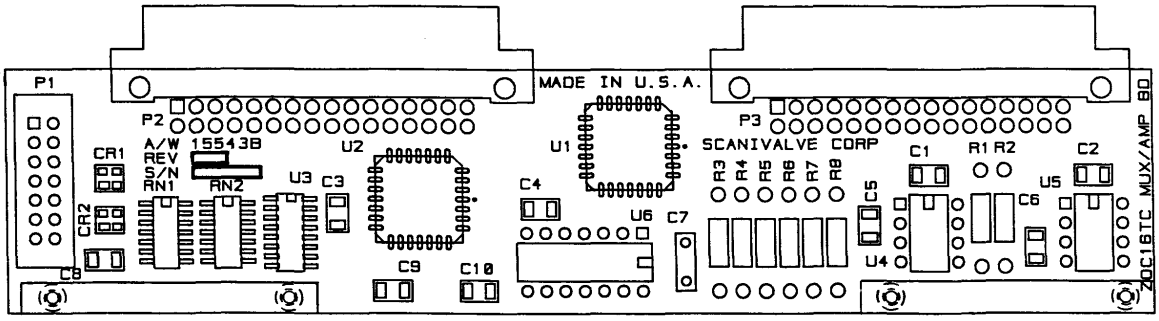

Figure 2 - ZOC16TC Mux-Amp Board

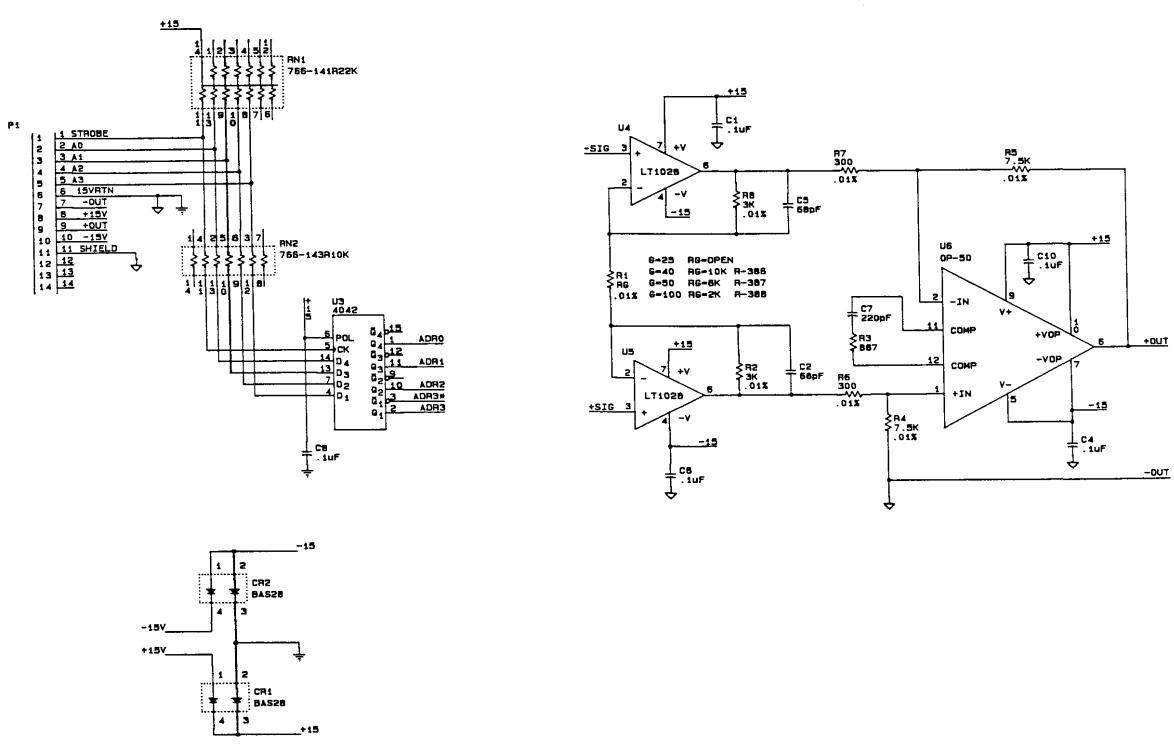

Figure 3 - Mux-Amp Schematic

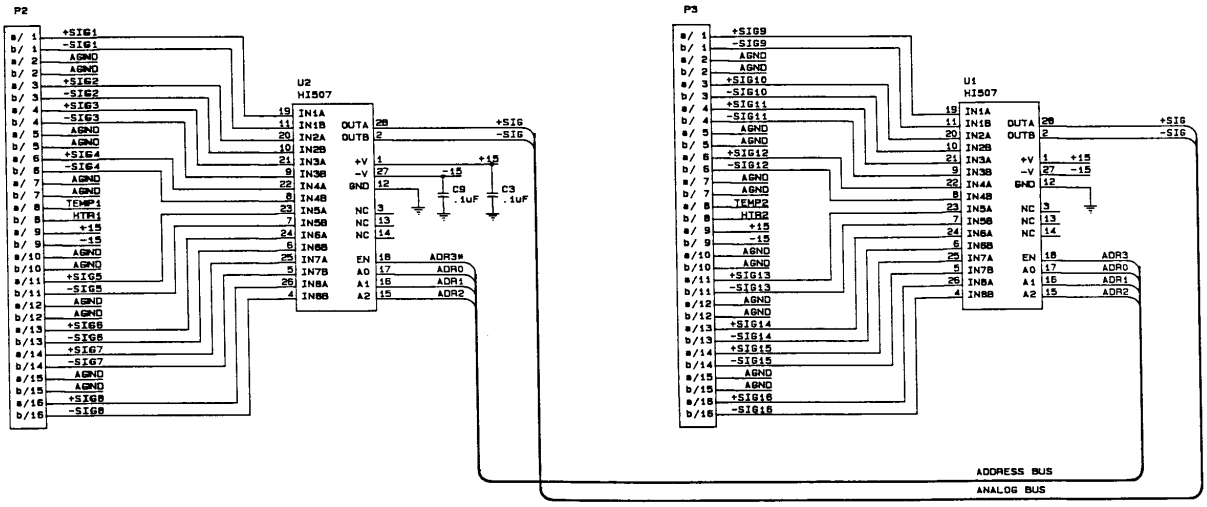

Figure 4 - Analog / Address Bus Schematic

Excitation Board

The Excitation Board is used in all versions of ZOC16TC Modules. The excitation board consists of a precision voltage regulator, eight sockets, eight voltage to current converters(E/I) and an interface connector. The precision voltage regulator is an LT1019A which converts the ±15Vdc inputs to a precision 10.00Vdc reference voltage.The 10.00Vdc is used as a reference voltage for the E/I converters. The E/I converters provide a constant 1.5mA excitation current to the sensors. Each sensor has its own E/I converter.Each block of eight(8) sensors has its own excitation board. The excitation board is installed above the sensor jacket.

Signal outputs from the transducers are routed to the interface connector (J1) where they can be input to an Instrumentation Amplifier or output through the interface board to the module edge connector.

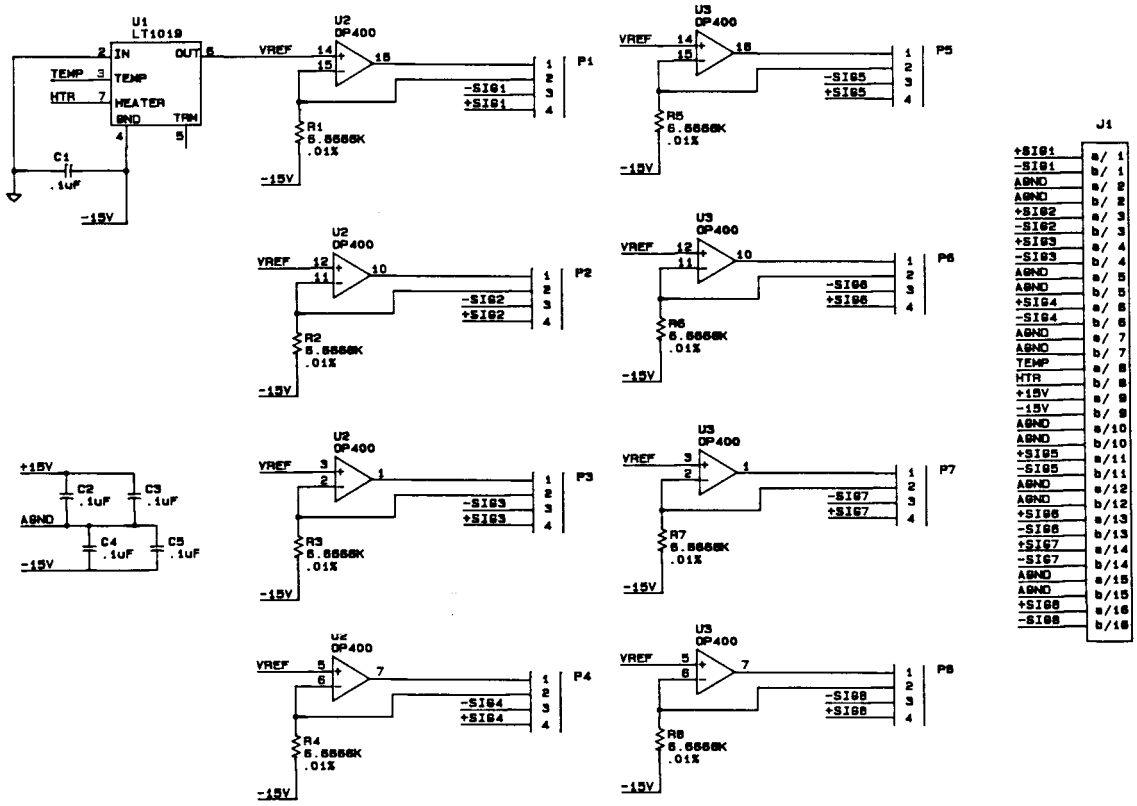

Figure 5 - Excitation Board Schematic

Power and Address Board

Each version of ZOC16TC has its own Power and Address Board.The Power and Address Board is located in the rear of the module. It is the interface between the ZOCENCL2100 backplane and the ZOC16TC module. In the multiplexed versions, the outputs from the Multiplexer/Amplifier and the inputs from the backplane are connected via ribbon cables. Muxless ZOC16TC module have the output from the excitation boards connected to this board via ribbon cables.

Figure 6 shows the Power and Address Board. Electrical pinouts may be found in the Operation and Installation Section of this manual.

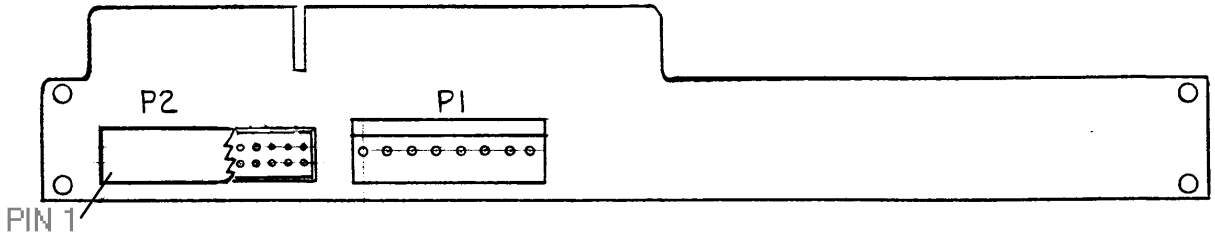

Figure 6 - Power and Address Board

Isolate-Purge Valves

The Isolate-Purge valve adds another set of valving which permits the input lines to be purged at pressures up to 750psi. This permits the safe use of a high pressure purge for low pressure inputs. This is especially useful when the ZOC16TC modules are used in applications where corrosive gasses may be present in the input lines.

Figure 7 is a table which shows the pressure requirements for each mode of the ZOC16TC 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 ZOC valve to the Calibrate mode.
2. Set the Calibration module(s) to the Zero Mode. If Scanivalve Corp Calibrator modules are being used in a HyScan system, Steps 1 and 2 can be implemented by setting the Calibrator Module(s) to the Cal Zero Mode.
3. Set the 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.
2. Switch the valve(s) from the Purge mode by removing the CTLPRG pressure.
3. Switch the valve(s) to the desired mode.

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

Figure 7 - Control Pressure Truth Table

ZOC16TC Operation and Installation

All ZOC16TC modules have been extensively tested prior to shipment. All modules are packed to minimize the chances of shipping damage. However, damage can still occur. The customer must inspect modules and shipping materials for obvious signs of damage. If it is suspected that damage may have occurred, the customer should contact Scanivalve Corp. Technical Services Department immediately.

ZOC16TC modules are designed to function best when used with one of the Scanivalve Corp. HyScan Data Acquisition Systems. They can also be used as a stand alone module, with a customer's data system, or with other High Speed Data Acquisition Systems.

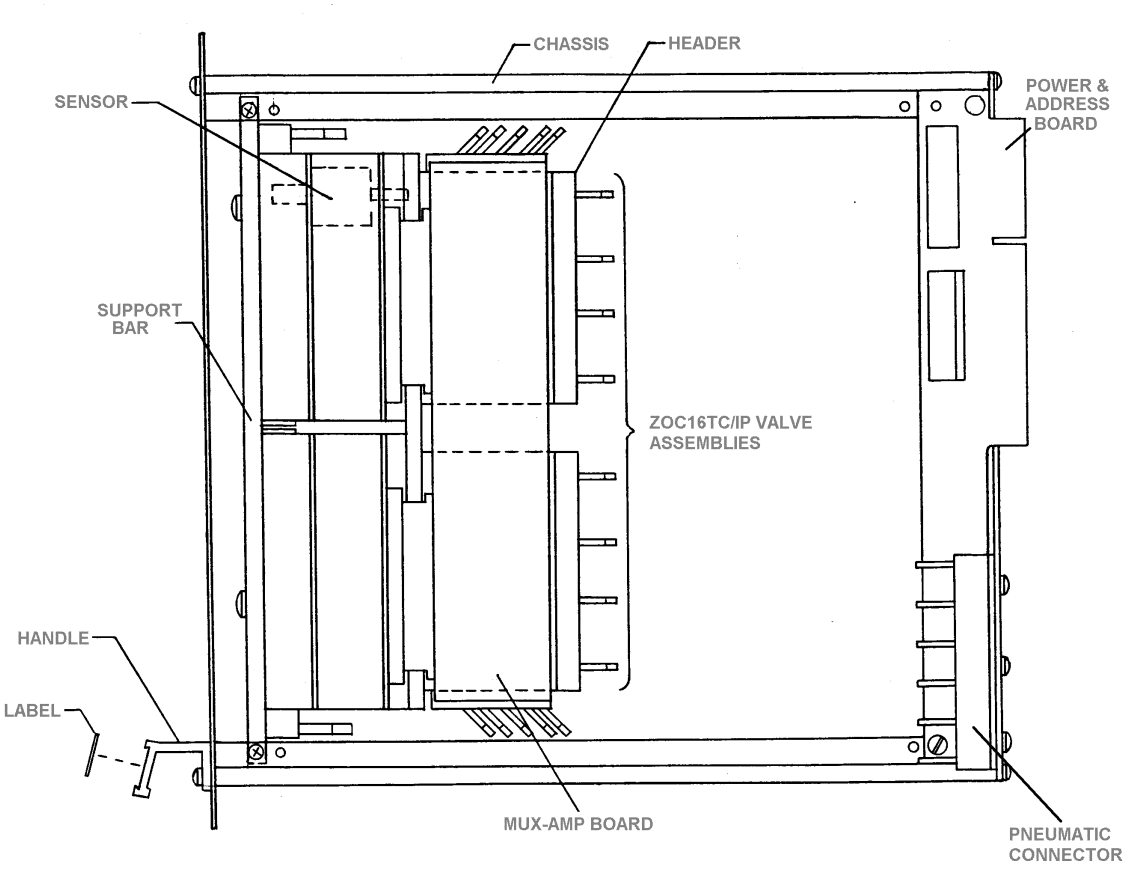

Figure 8 - ZOC16TC/IP Main Components

Electrical Inputs and Outputs

The Electrical Input and Output wiring is completely compatible with all other ZOC modules. The ZOC16TC may be installed into existing HyScan Systems without changing configurations.

Figure 9 shows the Electrical pinouts for a ZOC16TC - Multiplexed Module. Figure 10 shows the Electrical pinouts for a ZOC16TC- Muxless Module.

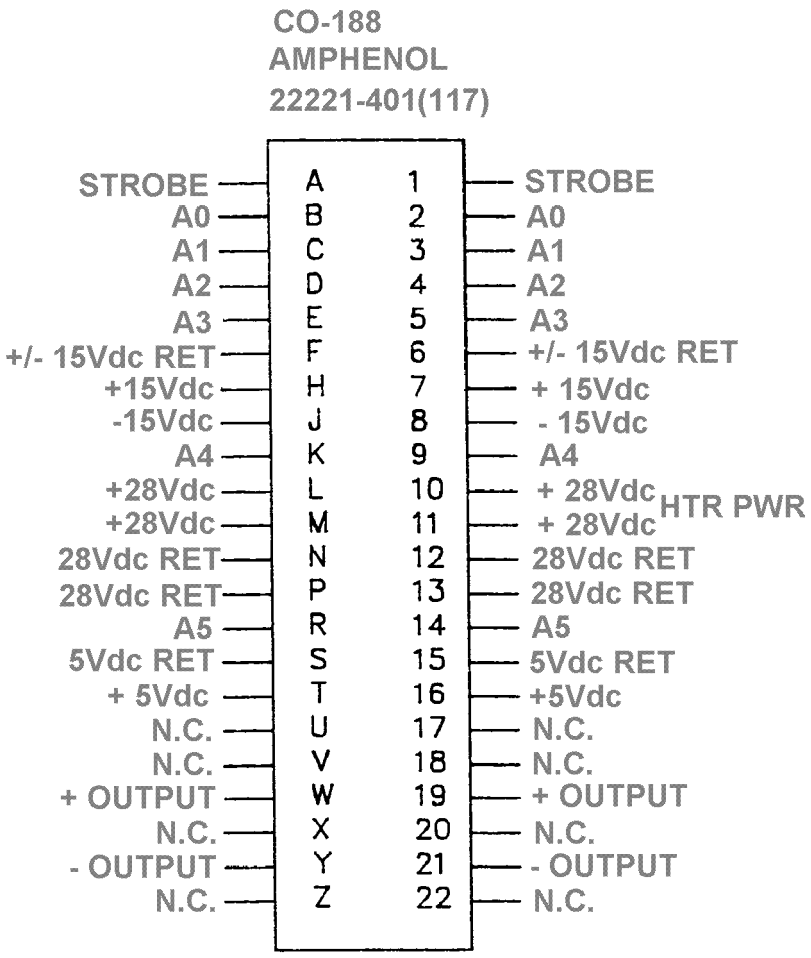

Figure 9 - ZOC16TC - Multiplexed Electrical Inputs/Outputs

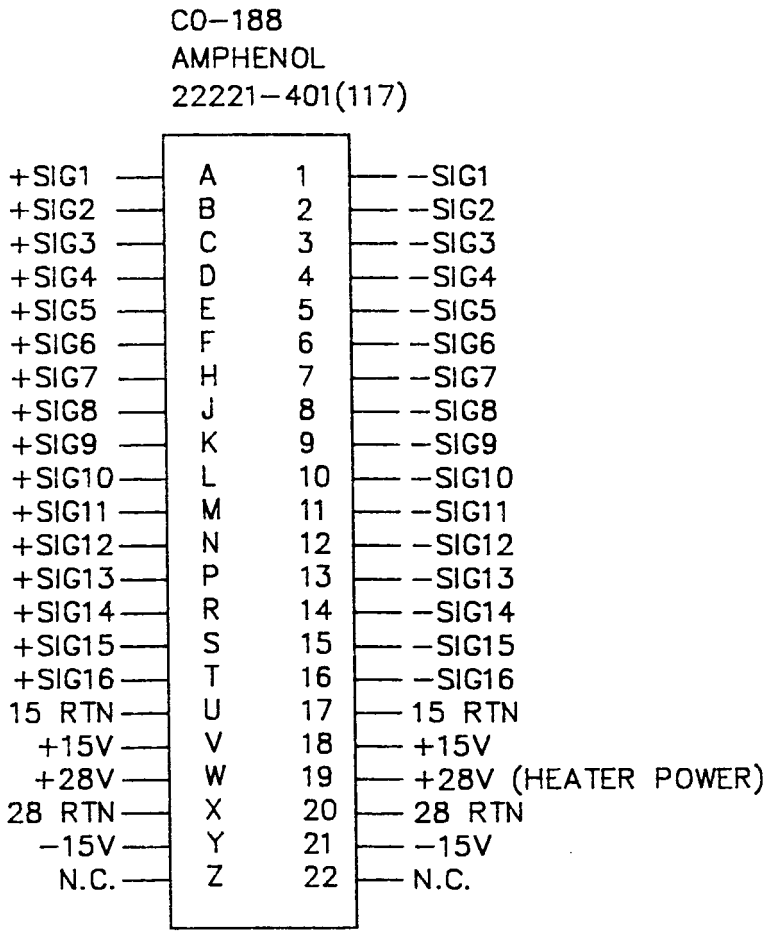

Figure 10 - ZOC16TC - Muxless Electrical Inputs/Outputs

Pneumatic Inputs

Pneumatic inputs consist of: Px Inputs, Control Pressure Inputs(CTL1 & CTL2), and Calibration/Reference Inputs. Each valve block has its own set of pneumatic inputs.

All Px inputs are .063 inch bulged tubulations. These tubulations are designed to accept any .063 inch tubing manufactured by Scanivalve Corp. Each valve block contains eight(8) Px inputs. ZOC16TC modules are capable of measuring pressures up to 500psid.

Control inputs consist of CTL1 and CTL2. 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 but generally within a range of 90 to 110 psi. The ZOC16TC modules require a third control pressure : CTL/PRG. This pressure switches the Isolate/Purge Valve for high pressure purging of input pressure lines.

Calibration/Reference inputs consist of a Calibration input and a Reference input. The Calibration input is an .063 inch O.D. tubulation. It 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 is a .063 inch O.D. tubulation. It provides a point of reference for the transducers. All of the sensors in each block of eight share a single reference.

Figure 11 shows a typical Valve Block Assembly and the location of the pneumatic inputs.

Figure 12 shows a typical True Differential Valve Block Assembly and the location of the pneumatic inputs.

Figures 13, 14, and 15 show the three standard Rear Block Connectors used on ZOC16TC Modules.

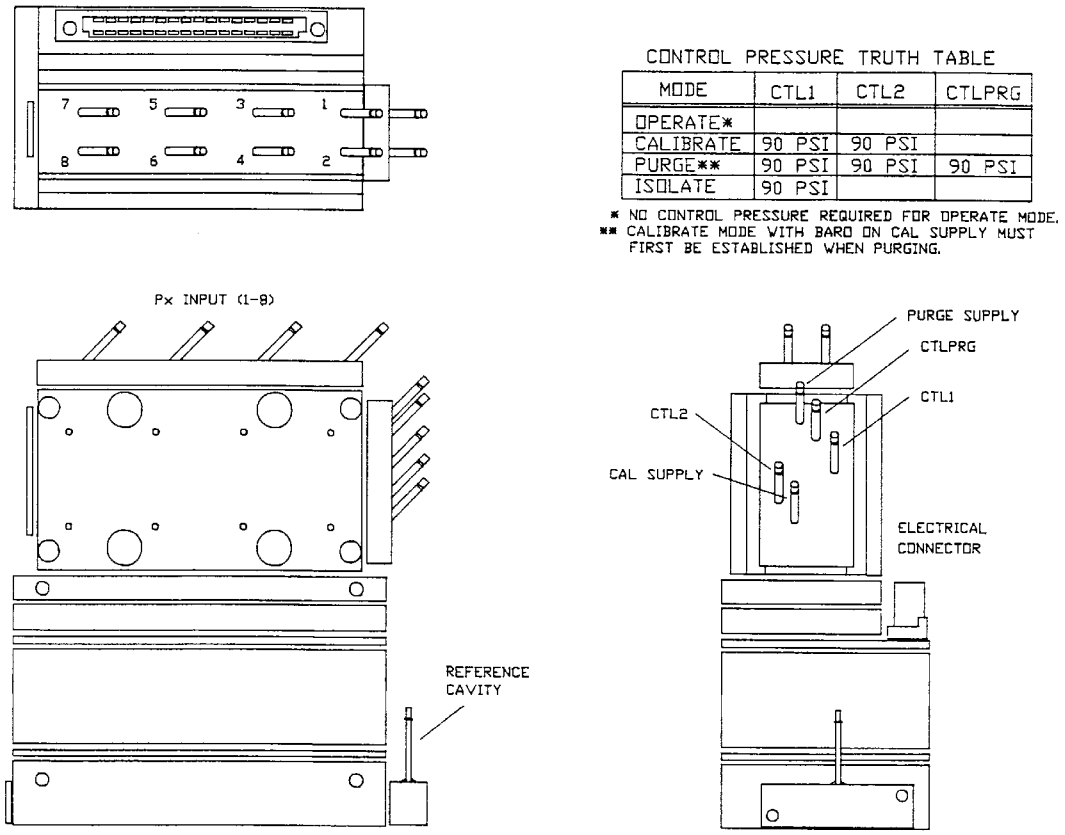

Figure 11 - Typical ZOC16TC/IP Valve Assembly
(one-8 channel block shown for clarity)

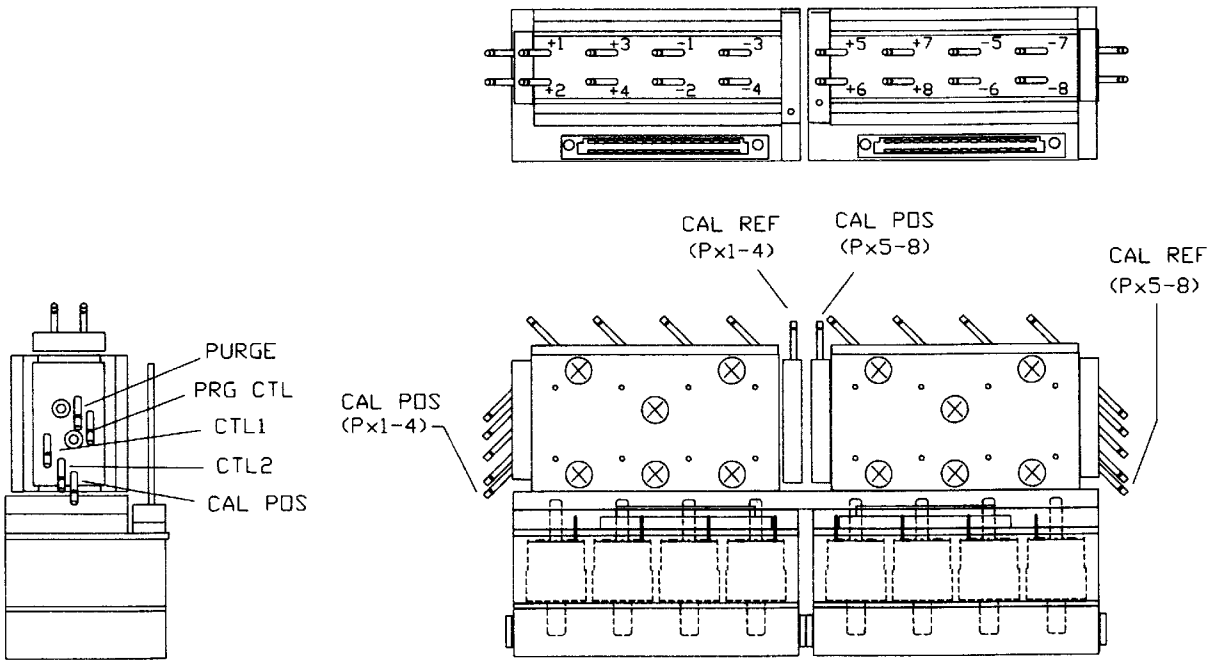

Figure 12 - Typical ZOC16TC/8DPx Valve Assembly

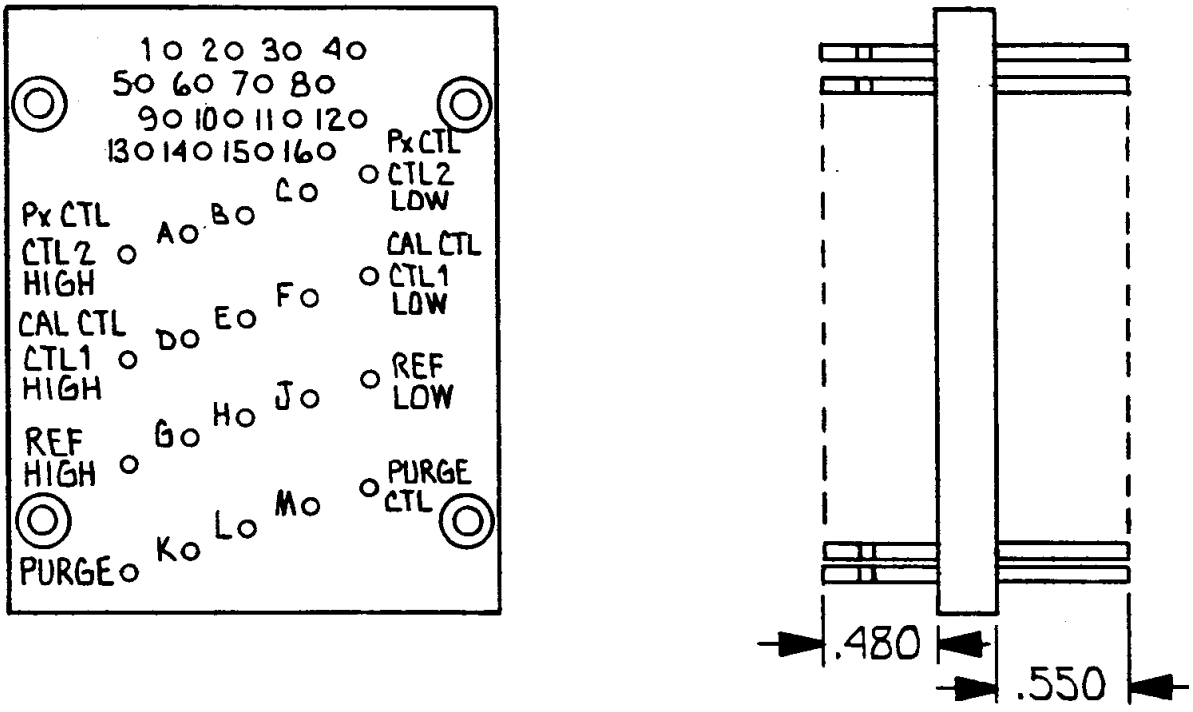

Figure 13 - Universal Back Block Assembly(36 Tubes)

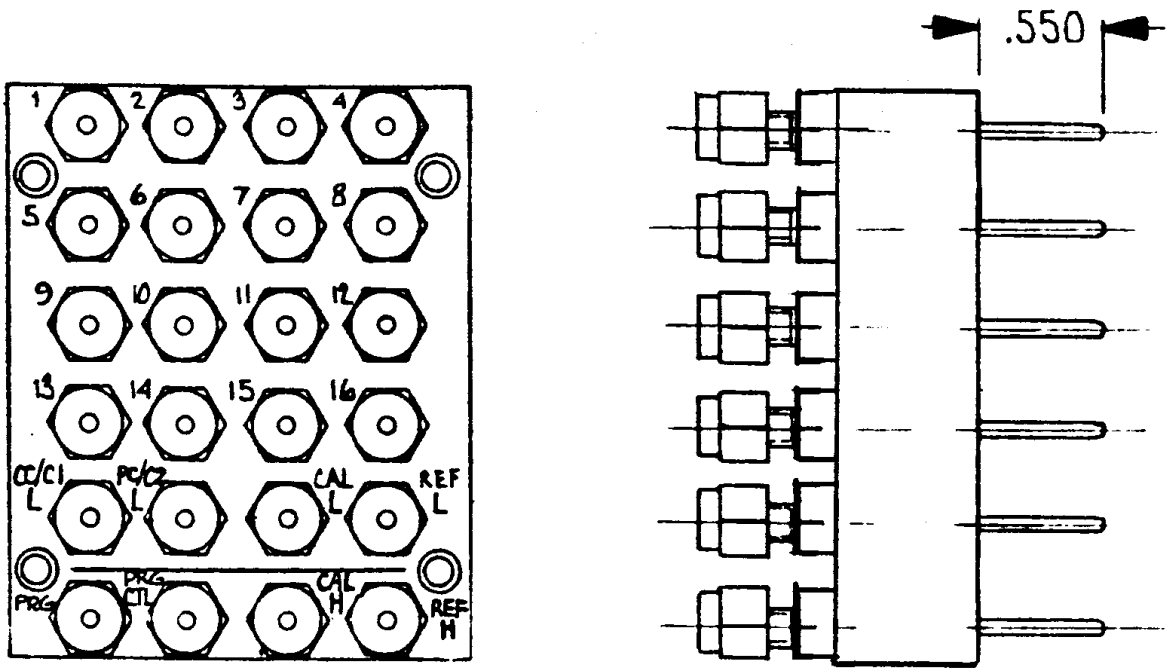

Figure 14 - Back Block Assembly (24 fittings)

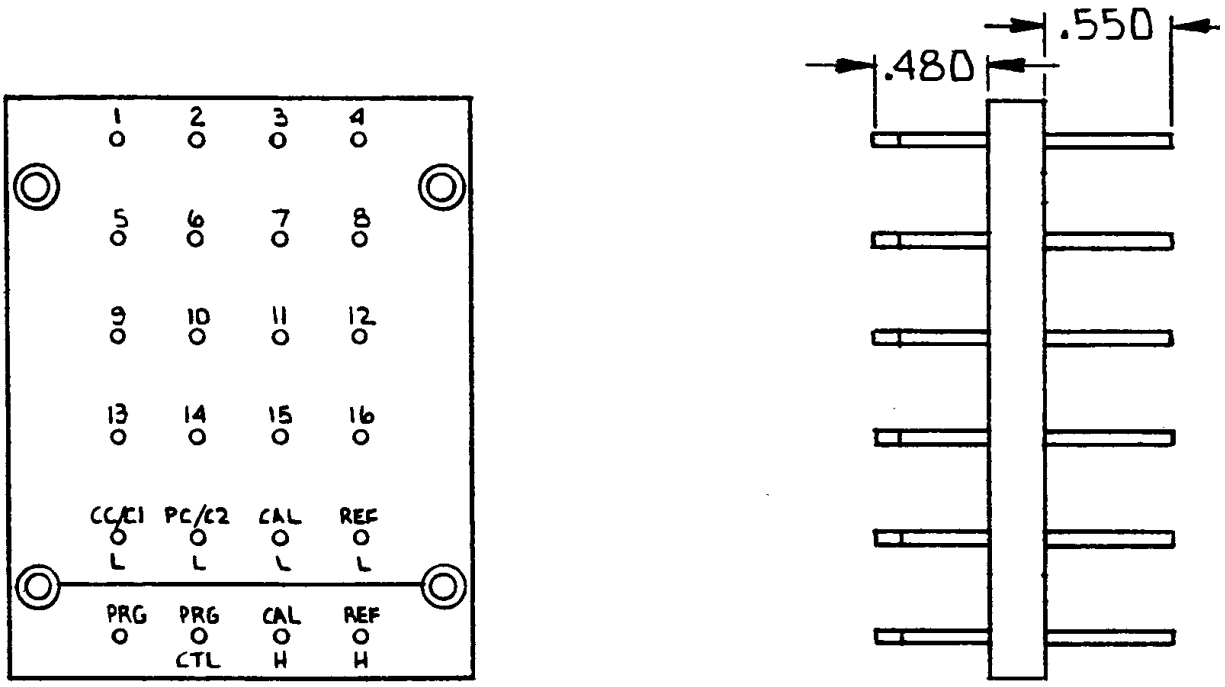

Figure 15 - Back Block Assembly (24 Tubulations)

Sensor Installation

The sensors used in a ZOC16TC module are laser trimmed, temperature compensated sensors. All offsets and spans fall within known limits. This means that a ZOC16TC module can be set up to support any full scale pressure range manufactured by Scanivalve Corp. The sensors are field replaceable by a technician with minimum tools. All sensors are labeled and serialized with a color coded label.The sensors plug into sockets on the excitation board from the bottom of the module. A guide pin is located on the sensor which must be lined up with a clearance hole on the excitation board.

Reference: Figures 9, 16, 17, and 18.

1. Position the module on its side with the edge connector to the right.
2. Remove the side cover and the four screws on the rear panel. Disconnect the ribbon cable from the Interface Board.
3. Remove the two flathead screws that secure the support bar to the front of the module.
4. Remove the valve assembly by sliding it to the rear of the module and rotating it 90 degrees.
5. Position the valve assembly so the tubing is away. Remove the four screws that hold the Mux-Amp board to the valve assembly. These screws are located approximately one inch from the support bar.
6. Remove the Mux-Amp board assembly by first slightly lifting the end closest to the support bar and then sliding it toward the back of the assembly. Set it aside carefully. Be very careful to avoid Electrostatic problems.
7. Remove the support bar.
8. With the valve assembly positioned as shown in figure 16, Remove the two bottom screws and the reference manifold.
9. Remove the sensor jacket assembly from the valve body.
10. Remove the sensors to be replaced.
11. Install the new sensors by aligning the guide pin with the mating hole on the excitation board. The guide pin sockets are set toward surface A. Insert the sensor fully so the shoulder of the case is against the shoulder in the sensor jacket.
12. Reinstall the top jacket , reference manifold, and bottom screws. Do not overtorque the bottom screws.
13. Replace the support bar and Mux-Amp board .
14. Reinstall the valve assembly in the module. Replace the screws that secure the support bar to the module frame. Reconnect the ribbon cable and replace the side cover.
15. Reinstall the module into its enclosure. Perform all operation and leak tests as per the applicable system manual.

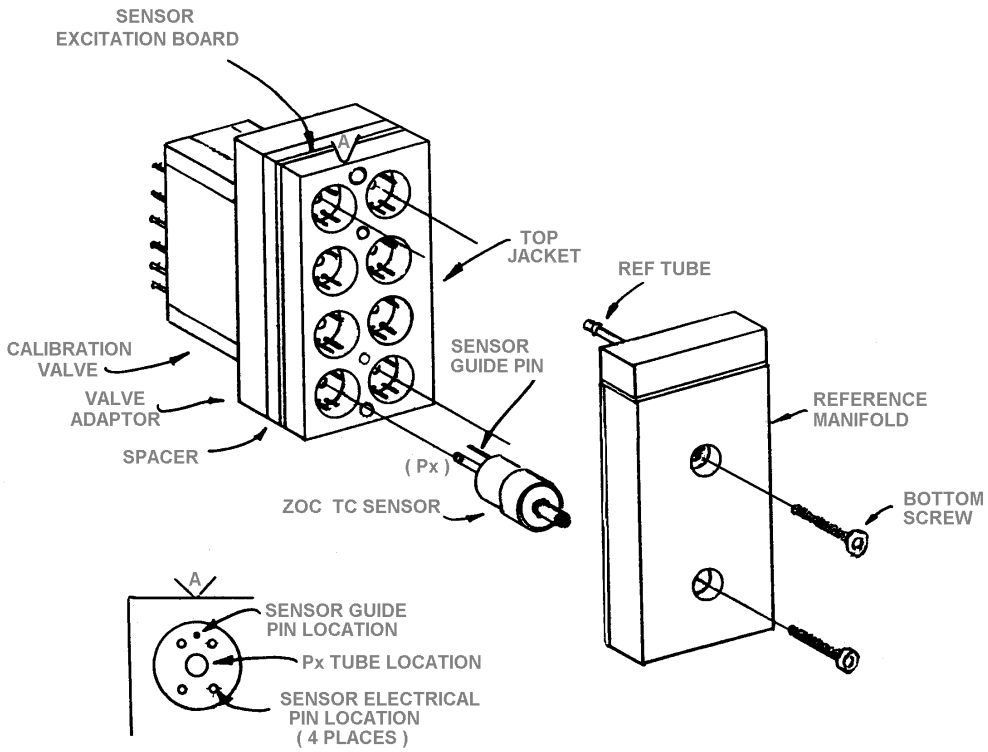

Figure 16 - ZOC16TC Sensor Replacement

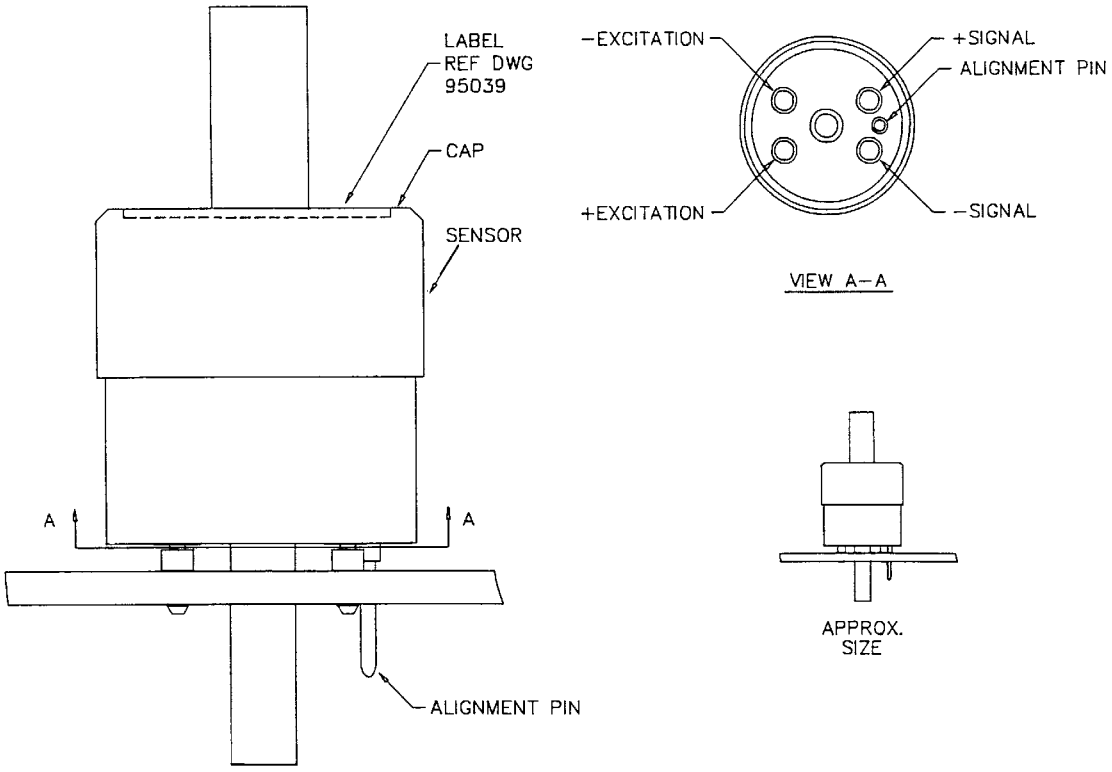

Figure 17 - ZOC Temperature Compensated Sensor

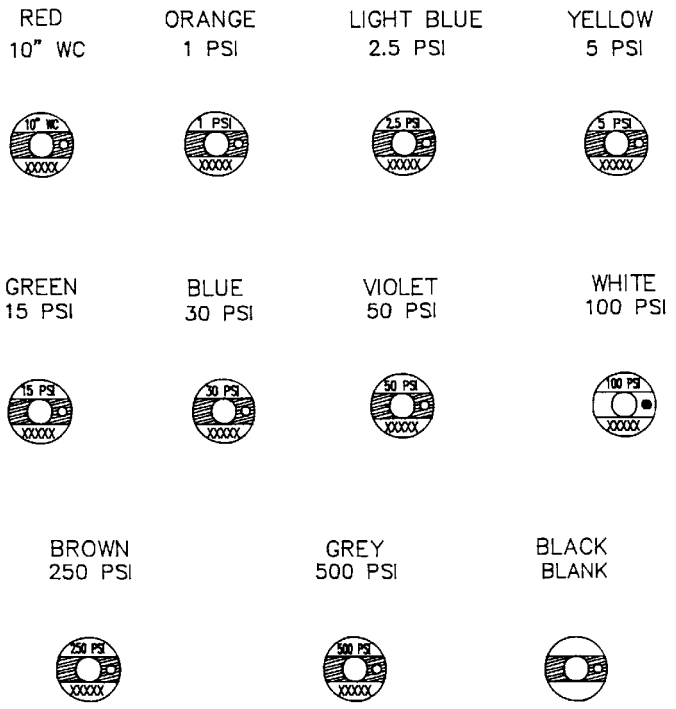

Figure 18 - Identification Labels - ZOC Temperature Compensated Sensors

DSA3016 Modules

A DSA3016 consists of a ZOC16TC with two added features:

1. A 604 ohm Nickel/Iron RTD is added to measure the temperature of the sensors. These temperature data are used in the DSAENCL3000 and DSAENCL3200 series Ethernet enclosures to select the operating temperature plane when the analog signals from the sensors are converted to Engineering Units.

2. A programmable ID chip that will transmit module information to a RAD based DSAENCL3200. This ID chip must be switched off if a DSA3016 will be used in a HyScan 1000 or HyScan 2000 system

For more information, please refer to the DSM 3000/3200 Software Requirements Specification and the DSAENCL3000 or DSAENCL3200 Series Service Manual. Figure 19 shows the modified edge connector wiring. Figure 20 shows the RTD Installation. Figure 21 shows the location of the ID chip and switch. Figure 22 is a table documenting module and enclosure compatibility.

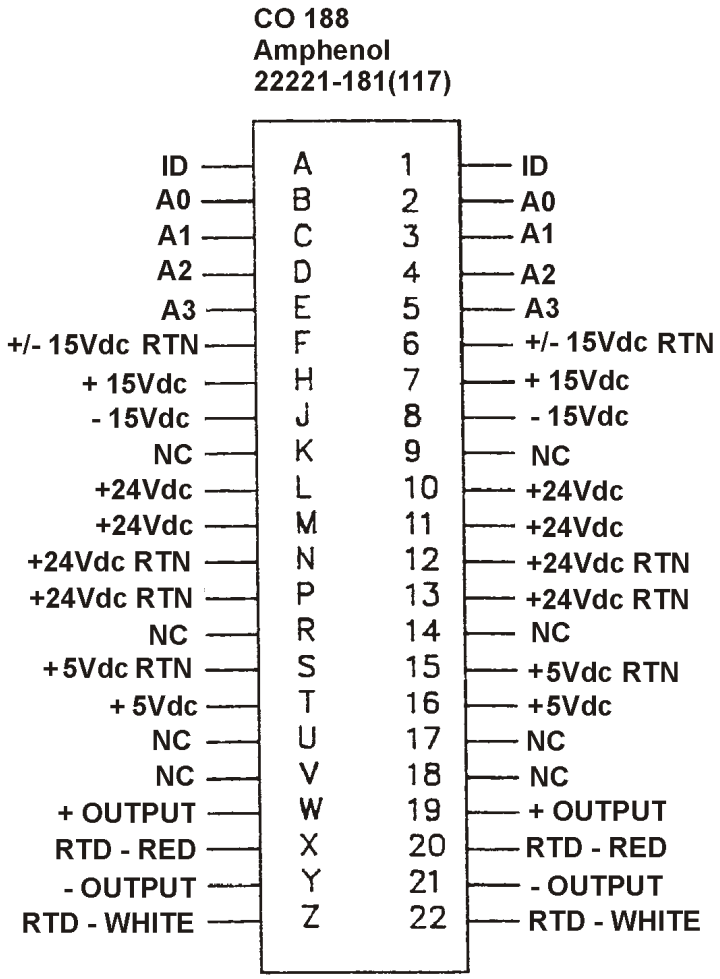

Figure 19 - DSA3016 Edge Connector Wiring

DSA3016 RTD Installation

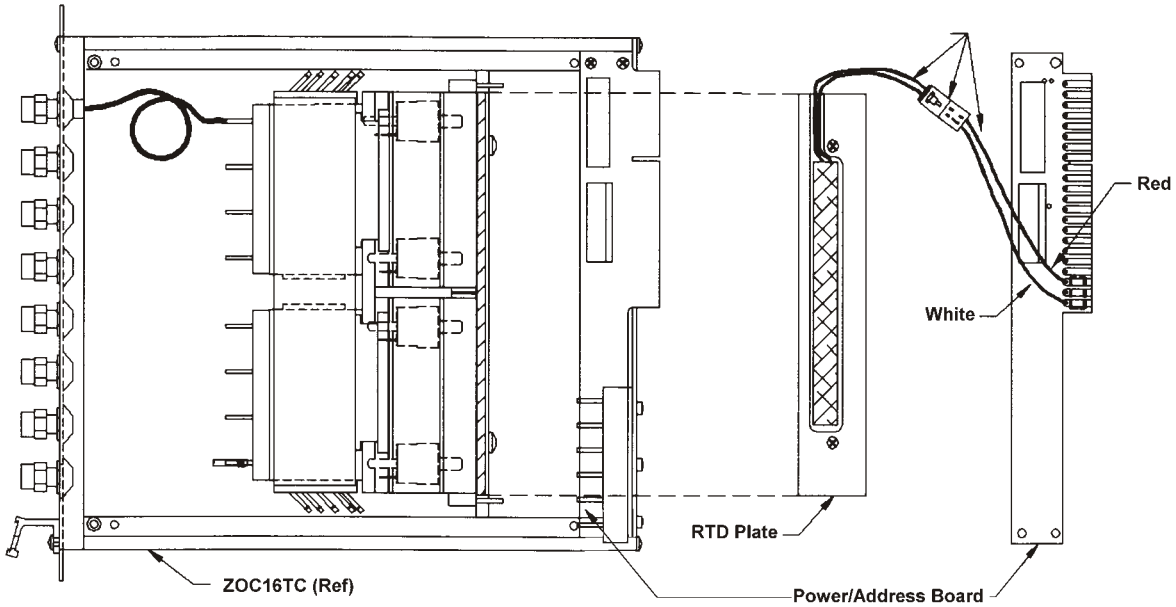

Figure 20 - DSA3016 RTD Installation

DSA3016 ID Chip and ID Switch

All DSA3016 modules manufactured after September 1, 2004 have an ID chip and enabling switch installed. The ID chip is programmed with information describing the module. This feature will make these modules fully compatible with DSAENCL3200 series enclosures. The ID chip ouputs information on the same pins used as the Strobe Line in HyScan systems. The ID Enable switch has two positions, I and S. When the switch is in the I position, the ID chip data will be output to an Enclosure on pins A and 1 on the backplane connector. When the switch is set to the S position, pins A and 1 will be used as a Strobe Line to enable Ring Mode addressing.

All DSAENC3200 Enclosures have an ID Enable switch. These enclosures are shipped with the switch set to the I position. A user must be very careful when installing modules into a DSAENCL3200. Although ZOC16 and ZOC16TC modules can be installed in a DSAENCL3200, the ID enable switch setting may have to be modified. Please refer to Figure 22 and to the DSAENCL3200 Hardware manual for more information on the ID enable switch settings.

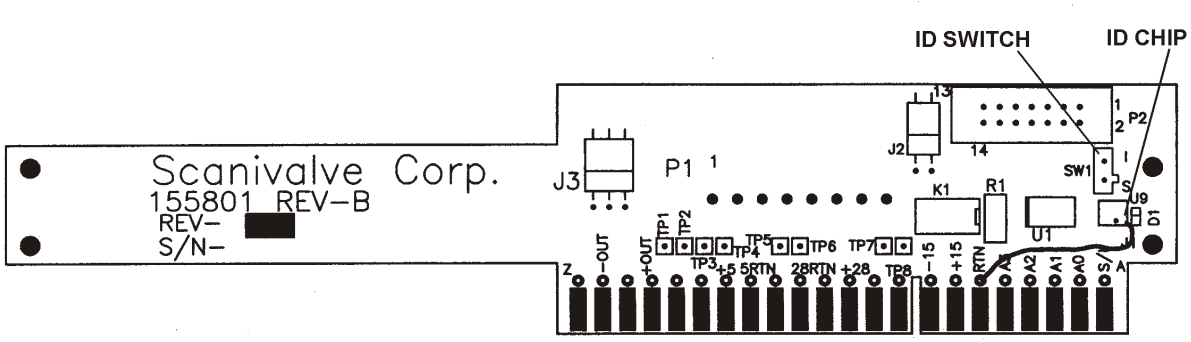

Figure 21 - DSA3016 ID Chip and Switch Location

Module	ENCL2100	DSAENCL3000	DSAENCL3200 IDSW = S	DSAENCL3200 IDSW - I
ZOC16TC	OK	OK	OK	NO
DSA3016 No ID Chip	OK	OK	OK	NO
DSA3016 IDSW = S	OK	OK	OK	NO
DSA3016 IDSW = I	NO	OK	NO	OK
SPC3000	OK	OK	OK	OK

Figure 22 - Module and Enclosure Compatibility Table