

Valve Communication Terminals (VCTs)

StoneL VCT platforms feature fully sealed, solid state, modular electronic systems warranted for a full five years. A solid state magnetic resistive sensor provides continuous position feedback in the C-Module used in the Axiom platform. Dual inductive position sensors provide feedback for the Dual Module used in the Eclipse, Prism and Quartz platforms.

On-board microprocessors, position sensors, output controllers and more are included to consistently operate the valve-actuator assembly and precisely communicate parameters to the plant's control system.



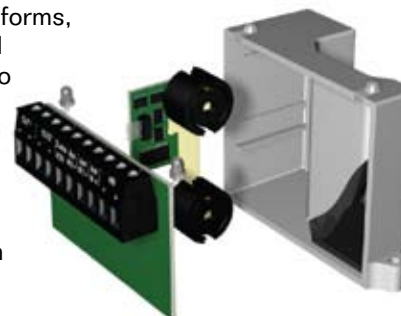
C-Module

Used in the Axiom platform, the C-Module (Continuous sensing) integrates a magnetic resistive sensor system to monitor exact valve position throughout the rotational range. Push button or remote Open and Closed position setting along with microprocessor based operation make this state of the art system convenient, reliable, and smart.



Dual Module

Used in the Eclipse, Prism, and Quartz platforms, the Dual Module (Dual sensing) integrates two inductive sensors to directly monitor Open and Closed valve positions. Settings are made by adjusting cams with stainless steel targets for simple and reliable operation.



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Position Sensing →

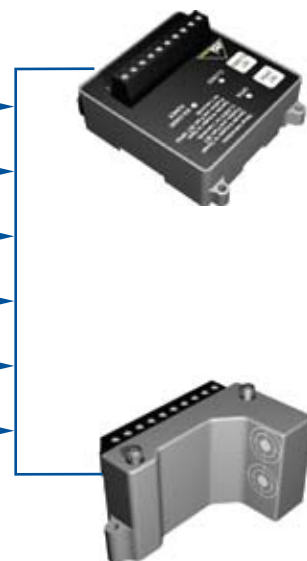
Communication →

Control Outputs →

Diagnostics →

Power Outputs →

Auxiliary Inputs →



DeviceNet Dual Module

DeviceNet Protocol

DeviceNet dramatically cuts installation costs by integrating up to 62 devices on a 4-wire trunk network. DeviceNet interfaces directly with many popular PCs and PLCs including Allen Bradley, GE Fanuc and others. The DeviceNet protocol is based on CAN (Controller Area Network) technology originally developed for automotive applications and extensively used throughout that industry.

DeviceNet. DeviceNet enables you to directly attach simple discrete and complex analog devices. Power is carried over two wires with data on another bundled two wires making up the four wire bus. DeviceNet has been designed for, and proven in, mission critical applications such as anti-lock brakes and air bags. It also has high noise immunity, making it suitable for industrial and process environments.

DeviceNet VCTs feature an electronic data sheet (EDS), which includes a definition of the device's configured parameters and public interfaces to those parameters. ODVA (Open DeviceNet Vendors Association) and StoneL maintain a directory of the EDS files for you to download from our Web Site.

System Benefits

- Save over 30% on installation costs.
- Power and communication supplied over 4-wire bus.
- Install up to 62 devices on the same bus network.
- Cycle count for automated valve and other diagnostics available.
- Electronic Data Sheet provides for rapid commissioning of devices.
- Auxiliary bus-powered 4 to 20 mA input attaches conventional analog devices for more wire savings.
- Open/Closed sensor inputs and 2 power outputs available to handle all On/Off automated valve applications.
- Hot insertion of devices may be done without dropping bus power (non-hazardous applications.)

Economic Analysis

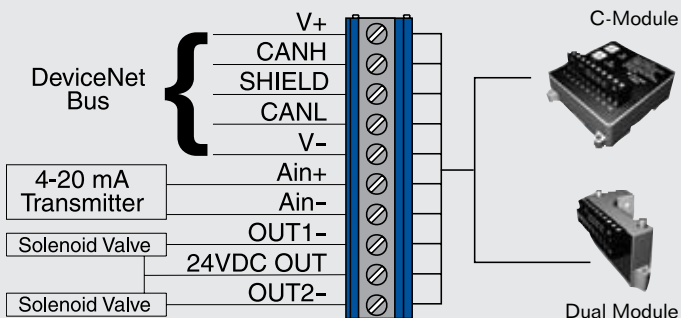
	Conventional	DeviceNet
VCT with Solenoid	\$ 500	\$ 680
Conduit & Wiring (\$8/ft)	\$1,200	\$ 300
I/O Cards; DeviceNet Scanner	\$ 30	\$ 100
Power Supply	\$ 10	\$ 10
Total Installed Cost (per VCT)	\$1,740	\$1,090

A \$650 or 37% savings has been demonstrated using DeviceNet over conventional systems. This analysis is based on 20 VCTs in a hazardous area. More savings may be realized for design time reduction, space savings, wiring flexibility and additional devices on the same network.

Network Specifications

Topology	Trunk line with drop and branch lines, trunk terminators required		
Cabling	Two separate shielded twisted pairs contained in one shielded cable (DeviceNet Specifications.)		
Number of Devices	62 per network		
Data Delivery	8 bytes of data for I/O; can be unlimited if using fragmentation services		
Current Carrying Capacity	8 Amps @ 24 VDC (Thick cable)		
Cable Length (Thick cable)	Dependent on bus transmission rate (see table below)		
Transmission	Drop Length		
Rate	Trunk Length	Maximum	Cumulative
125 kb/s	500m (1,640ft)	6m (20ft)	156m (512ft)
250 kb/s	250m (820ft)	6m (20ft)	78m (256ft)
500 kb/s	100m (328ft)	6m (20ft)	39m (128ft)
Communication Method	Master/Slave, multi-master and peer-to-peer polling		
Data Signal	Non-Return to zero with bit stuffing		
Error Detection	Automatic retransmission of corrupted messages and autonomous switching off of defective nodes		

VCT Wiring Diagram (92)



VCT Specifications (92)

Configuration	(2) Discrete Inputs (Open & Closed) (2) Power Outputs (Solenoids) (1) 4-20 mA Auxiliary Input, 8 Bit Resolution; No Additional Power Source Required
Baud Rates	Software Selectable 125K, 250K or 500K baud
Messaging Outputs	Polling, Cyclic & Change of State Max. Current 160mA, Both Outputs Combined (Current Limited to 250mA)
Max. Power Outputs, Voltage	4 Watts, Both Outputs Combined 24 VDC
Temperature Range	-40° to 82°C (-40° to 180°F)

DeviceNet is a trademark of the Open DeviceNet Vendor Association, Inc.

AS-Interface VCT

Actuator Sensor Interface Protocol

Up to 31 VCTs (96) or 62 VCTs (97) may be linked on a single pair of wires using the AS-Interface protocol. Power and control is supplied to solenoid valves over the AS-Interface two wire network.

The AS-Interface (Actuator Sensor Interface) protocol is becoming a worldwide standard for discrete apparatus and now offers analog input capabilities. The AS-Interface network is simple, reliable and field proven. It is suitable for both general purpose and hazardous area process environments.



AS-Interface is designed to complement higher level bus networks. It is well suited to directly gateway into existing networks using

Modbus or Modbus+, which have become de facto standards for SCADA in the process industries. AS-Interface also conveniently gateways into PROFIBUS, DeviceNet and Ethernet.

System Benefits

- Cut installation costs by over 40%.
- Suitable for both hazardous and general purpose environments (nonincendive and explosion proof.)
- Simple electronics for robust performance.
- Two wire unshielded cable for both power and data delivery is very low cost.
- High tolerance to electromagnetic interference.
- Easy to install and understand.
- Free choice of network topology.
- Gateways seamlessly to higher level networks.
- Offers diagnostic capabilities with the Axiom series (see page 7)

Economic Analysis

	Conventional	AS-i
VCT with Solenoid	\$ 500	\$ 580
Conduit & Wiring (\$8/ft)	\$1,200	\$ 240
I/O Cards; Gateway (AS-i)	\$ 30	\$ 100
Power Supply	\$ 10	\$ 50
Total Installed Cost (per VCT)	\$1,740	\$ 970

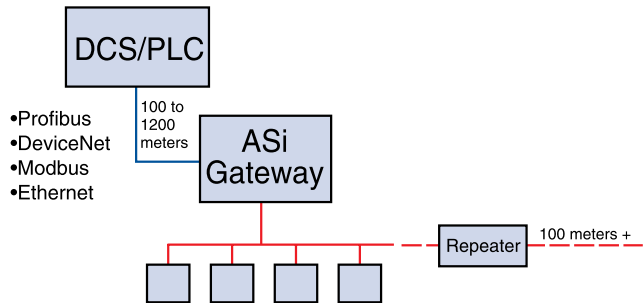
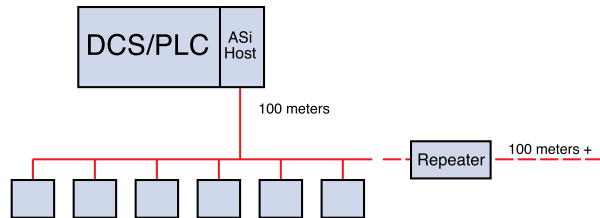
A \$770 or 44% savings has been demonstrated using AS-Interface over conventional systems. This analysis is based on 10 VCTs in a hazardous area. More savings may be realized for space savings, wiring flexibility and additional devices on the same network.

Network Specifications

Topology	Linear, Star, Tree or Ring
Devices per Network	62, maximum
Addressing	AS-i Master or Handheld
Cabling	Unshielded 2-wire for Data & Power (30VDC up to 8 Amps) Standard Round or AS-i Flat
Cable Length*	100 meters per master or 300 meters with two repeaters
Transmission Rate	167 Kbits/second
Signal Coding	Manchester type with Alternating Pulse Modulation
Cycle Time	10 msec. max. with 62 Devices
Data per Message	4 bit bi-directional
Access Procedure	Master/Slave
Error Detection	1 parity bit + signal quality monitoring

*Cable length may be extended beyond 300 meters by wiring parallel repeaters.

Typical AS-Interface Configurations



AS-Interface VCT

VCT Specifications (96)

Configuration	(2) Discrete Sensor Inputs (2) Auxiliary Discrete Inputs (2) Power Outputs (Solenoids)
Max. Current	160mA, Both Outputs Combined (Current Limited to 200mA)
Auxiliary Inputs	24 VDC @ 120 mA (Self Powered)
Outputs, Max. Power	4 Watts, Both Outputs Combined
Outputs, Voltage	25 to 30 VDC
Temperature Range	-40° to 82°C (-40° to 180°F)
Configuration Code	F4; User Defined 4 in/2 out
AS-i Version	2.1
Devices per Network	31

VCT Specifications with Extended Addressing (97)

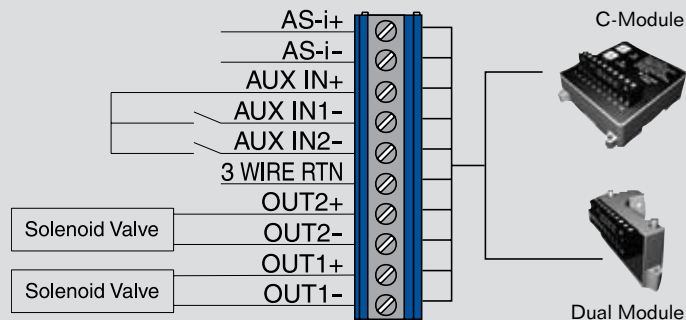
Configuration	(2) Discrete Sensor Inputs (2) Auxiliary Discrete Inputs (1) Power Output (Solenoid)
Max. Current	100mA
Output, Max. Power	2.4 watts
Output, Voltage	25 to 30 VDC
Temperature Range	-40° to 82°C (-40° to 180°F)
Configuration Code	A4; User Defined 4 in/1 out
AS-i Version	2.1
Devices per Network	62

AXIOM C-Module Only

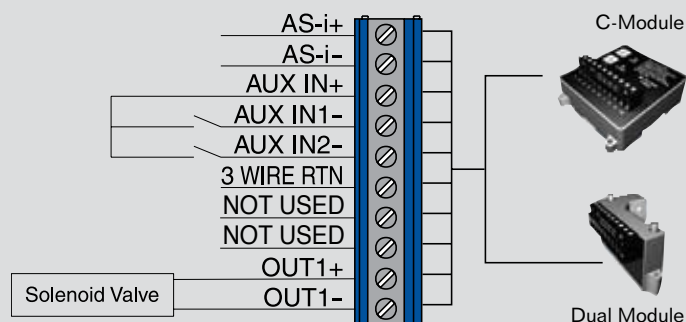
VCT Specifications (96) with Diagnostics (D) Capabilities

Protocol	AS-Interface (AMI96) Version 2.1 or greater
Input Voltage	26.5 to 31.6 VDC (AS-i power supply)
Devices per Network	31
Input Configuration	(1) Open & (1) Closed (1) Low Supply Pressure (1) Bad Solenoid Coil or Stuck Spool/Pilot Valve* (1) Stuck Process Valve/Actuator
Output Configuration	(1) Solenoid Power 0.5 W @ 24VDC (1) Wink Operation (1) Remote Set Open (1) Remote Set Closed
Pressure Accuracy	± 2 psi (0.13 bar)
Supply Pres. Default	40 psi (2.7 bar) minimum
System Interface	AS-i 2.1 master or greater required

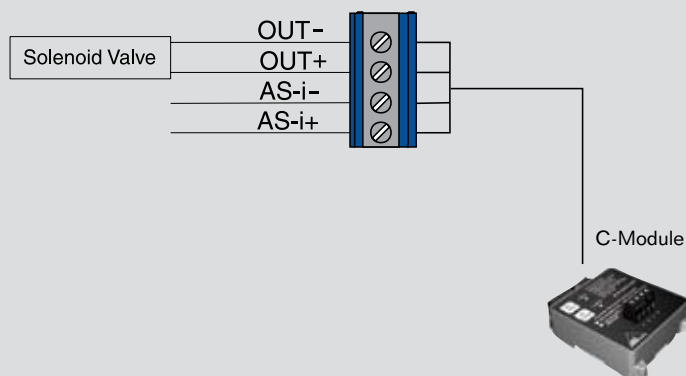
VCT Wiring Diagram (96)



VCT Wiring Diagram with Extended Addressing (97)



VCT Wiring Diagram (96) with Diagnostics (D) Capabilities



FOUNDATION Fieldbus VCT

FOUNDATION Fieldbus™ Protocol

Designed for use in the process industries, FOUNDATION fieldbus offers multi-drop capabilities, long trunk length, and is fully compatible with intrinsic safety circuits. FOUNDATION fieldbus H1 level has been designed as the ideal digital bus replacement for the 4 to 20 mA analog standard in the process industries.



FOUNDATION fieldbus has a unique user layer that features Device Description (DD) and a set of communication blocks. The DD is a standardized description of the functions in a device. It enables the

host device to learn about capabilities of other devices on the network even though some capabilities may have never been seen before. Function blocks, one type of communication block in the user layer, describe the control and I/O behavior of the device in object form. By interconnecting function blocks, the user may construct PID control loops and other process control algorithms.

The physical layer of FOUNDATION fieldbus has been designed to operate with intrinsically safe wiring. It is standardized by ISA, S50.02-1992 and IEC 1158.2.

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System Benefits

- Same bus may be used for both analog and discrete process instrumentation.
- Intrinsic safety wiring option for hazardous environments.
- Standardized function block descriptions represent process variables and speed control setup. (Multiple function blocks may reside in a single device.)
- Long bus length of 1900m (6,175ft) and spurs up to 120m (390ft) span most process systems.
- Bus wiring may be the same as standard 4 to 20 mA wiring to further reduce wiring costs.
- FF is a worldwide standard for use in the process industry and is supported by many of the world's process instrumentation suppliers.
- FF dual module offers separately powered (isolated from bus) power outputs, or bus powered outputs.

Economic Analysis

	<u>Conventional</u>	<u>FF</u>
VCT with Piezo	\$ 500	\$ 990
Conduit & Wiring (\$8/ft)	\$1,200	\$ 200
I/O Cards; FF Master	\$ 30	\$ 100
Power Supply	\$ 10	\$ 10
Total Installed Cost	\$1,740	\$1,300

FOUNDATION fieldbus VCTs offer a \$440 wiring savings over conventional monitors. This analysis is based on 10 VCTs in a hazardous area. More savings may be realized for space savings, wiring flexibility and additional devices on the same network or by IS wiring.

Network Specifications

Topology	Bus/tree, terminators required
Cabling	Shielded twisted pair
Bus Power	Typically 20mA/device at 9 to 32 VDC
Number of Devices	2 to 16 per network typical
Data Delivery	Unlimited
Max. Cable Length	1900 meters, 120 meters/spur
Transmission Rate	31.25 kbits/second
Cycle Time	Link Active Scheduler determines priority
Communication Method	Delegated token passing with cyclic and acyclic option
Data Signal	Manchester Biphase-L decoding with synchronous serial signaling
Error Detection	Frame check sequence comparison

FOUNDATION Fieldbus VCT

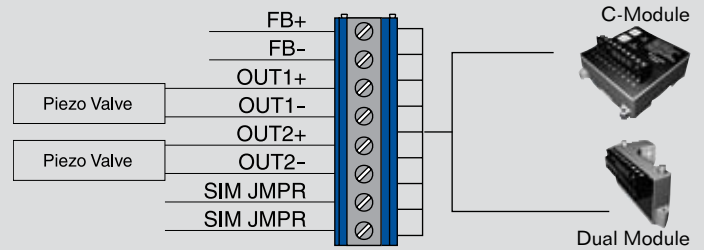
VCT Specifications (93) Bus Powered (uses piezo)

Configuration	(2) Discrete Inputs, DI (Open & Closed)
	(2) Discrete Outputs, DO (Piezo Valves)
Outputs	2mA @ 6.5 VDC each; Current Limited to 2mA (Bus Powered)
Temperature Range	-40° to 82°C (-40° to 180° F)
Other Features	Stores Number of Actuations Stores Date of Last Service Predetermined Output Fail State

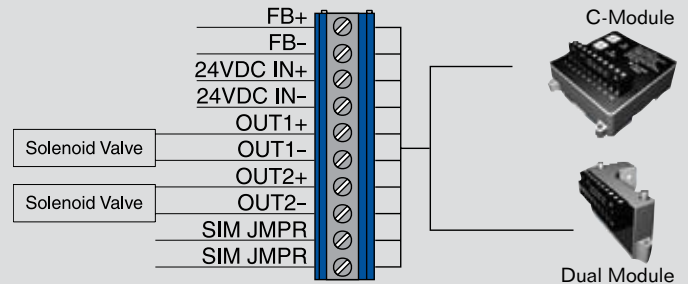
VCT Specifications (94) Externally Powered

Configuration	(2) Discrete Inputs, DI (Open & Closed)
	(2) Power Outputs, DO (Solenoids)
Outputs	4 watts total @ 24VDC Both outputs combined (Current Limited to 200mA) (externally powered)
Temperature Range	-40° to 82°C (-40° to 180° F)
Other Features	Stores Number of Actuations Stores Date of Last Service Predetermined Output Fail State

VCT Wiring Diagram (93) Bus Powered



VCT Wiring Diagram (94) Externally Powered



Piezo Ultra Low Power Valve for use with (93) Bus Powered FOUNDATION Fieldbus

Use either the 0.5 Cv or the 1.3 Cv Namur mount pneumatic valve with StoneL FOUNDATION Fieldbus Bus Powered VCTs. These are Ultra Low Power valves that use piezo technology to actuate, utilizing just 2mA @ 7.5VDC to operate either device. Both of these 5-Way 2 position, spring return pneumatic valves are designed to meet the Namur standards for actuator pad mount solenoid valves.



0.5 Cv (443015)



1.3 Cv (443016)

Piezo Specifications 0.5 Cv and 1.3 Cv Models

Configuration	Piezo Operated 5-way spool valve, 2 position, spring return
Operating Pressure	36 to 120 psi (2.5 to 7.5 bar)
Media	Dried / filtered air (30 micron)
Manual Override	External
Operating Life	1 million cycles
Operating Temperature	-10° to 60° C (14° to 140° F)
DC Coil Power	2mA@6.5VDC
Operating Voltage	5.5 to 9 VDC
Mounting	2 Screws (M5) per Namur standards
Connection	Plug to DIN 43650B
Electrical Protection	EEex ia IIC T6

Namur Mount 0.5Cv (443015)

Flow Rating	Cv - 0.5 (Kv - 7.1)
Manifold Porting	G 1/4" (BSP)
Exhaust Porting	G 1/4" (BSP)

Namur Mount 1.3Cv (443016)

Flow Rating	Cv - 1.3 (Kv - 18.5)
Manifold Porting	G 1/4" (BSP)
Exhaust Porting	G 1/4" (BSP)



Modbus VCTs

Modbus Protocol

Modbus has been the de facto standard for interfacing field I/O systems to the DCS in the process industries for the

MODBUS

past 15 years. Many plants are currently using

Modbus based field networks. This enables rapid connection into the existing control architecture using existing software drivers.

The Modbus protocol uses either an RS232, RS422 or an RS485 serial interface for its physical layer (wiring topology and electrical connections). For field use RS485 is the preferred serial interface featuring a long trunk length (over 1200 meters) and 32 drops to individual field devices. Since RS485 does not carry power, an additional 24 VDC power supply wire pair is recommended to power the field devices.

System Benefits

- Same bus may be used for both analog and discrete process instrumentation.
- Interfaces readily into most DCS systems and software.
- Install up to 32 devices on the same trunk network.
- Long bus length of up to 1200m (4,000 ft).
- Separately powered outputs supply up to 4 watts.
- Voltage regulator keeps output for powering auxiliary solenoids at 24 VDC with supply levels as low as 10 VDC.
- Modbus Dual Module accepts a standard 4 to 20 mA input from conventional analog instrumentation.

Economic Analysis

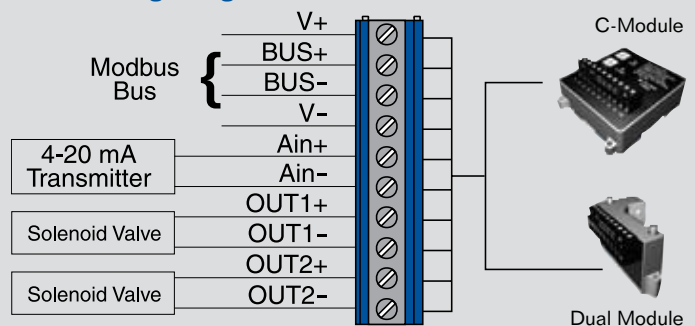
	<u>Conventional</u>	<u>Modbus</u>
VCT with Solenoid	\$500	\$680
Conduit and Wiring (\$8/ft)	\$1,200	\$200
I/O Cards; Modbus Interface	\$30	\$20
Power Supply	<u>\$10</u>	<u>\$10</u>
Total Installed Cost	\$1,740	\$910

Modbus VCTs offer an \$850 wiring savings over conventional monitors. This analysis is based on 10 VCTs in a hazardous area. More savings may be realized for space savings, wiring flexibility and additional devices on the same network.

Network Specifications

Topology	Bus/tree, terminators required
Cabling	One shielded twisted pair for signal and one pair for 24 VDC supply.
Bus Power	Must have auxiliary 24 VDC supply
Max. Number of Devices	32 per network
Data Delivery	Unlimited
Max. Cable Length	1,200 meters (4,000 feet)
Typical Data Access	Cyclic Polling using Query-Response Method
Transmission Rate	1.2 to 115 kbits/second
Approximate Cycle Time	74 msec for 32 field devices @ 38.4 kbits/second
Error Detection	Cyclic Redundancy Check

VCT Wiring Diagram (95)



VCT Specifications (95)

Configuration	(2) Discrete Inputs (Open and Closed) (2) Power Outputs (Solenoids) (1) 4-20mA Auxiliary Input, 10 Bit Resolution
Input Impedance	250 Ω
Outputs	4 Watts @ 24 VDC Both Outputs Combined (Current Limited to 200mA)
Outputs, Max. Power	4 Watts, Both Outputs Combined
Outputs, Volt. Supply	24 VDC (Regulated with range from 10 to 24 VDC)
Transmission Rate	Software selectable for 9.6, 19.6 or 38.4 kbits/sec
Transmission Mode	RTU (Remote Terminal Unit)
Temperature Range	-40° to 82° C (-40° to 180° F)
Other Features	Predetermined Output Fail State