

General Instructions

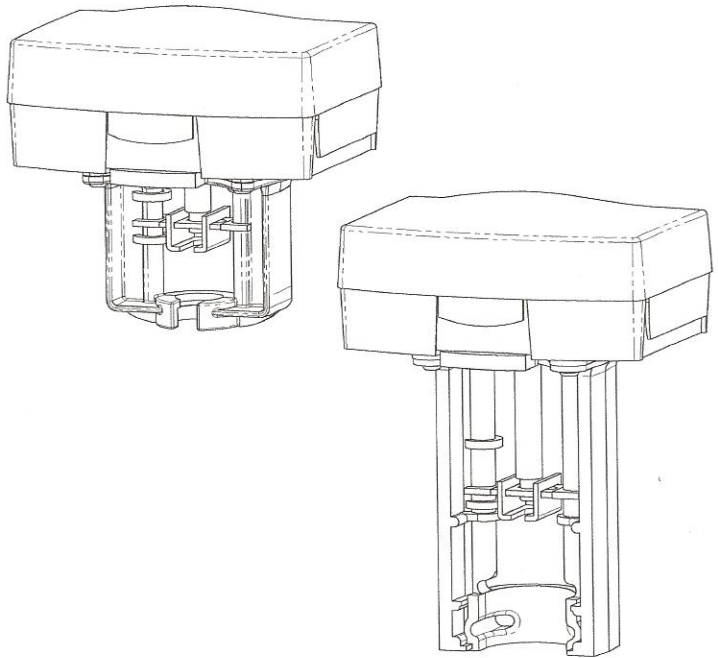
APPLICATION

Forta M400A (VB) / M800A (VB) /M1500A (VB) series Non-Spring Return linear actuators are available in two styles, U-Bolt Mount style, mounts to Schneider Electric globe valves with AV-821 linkage kits for mounting to VB-7xxx valves or AV-822 for mounting to VB-8xxx, or VB-9313-0-5-xx valves. Screw Mount style, screws directly to the bonnet nut on VB-7xxx valves (no adapter required).

Applications include chilled or hot water and steam. Field selectable input signals include reverse and direct acting, Floating or Proportional 0-10, 2- 10 vdc or 4-20 ma with 500 ohm resistor (supplied) plus proportional sequencing input signal ranges.

FEATURES

- Two Mounting Styles, U-Bolt Mx00A or Screw Mx00A-VB
- Floating configuration controlled by a SPDT floating controllers
- Proportional configuration 0-10, 2-10 vdc or 4-20 mA with the addition of a 500 ohm resistor included
- Direct/Reverse action switch selectable
- 90 lbf (400N) linear force
- 180 lbf (800N) linear force
- 337 lbf (1500N) linear force
- 24 Vac or 24 Vdc Powered
- Die-cast housing with plenum rated plastic cover for NEMA 2 (IP54 vertical mount only) applications
- Manual override to allow positioning of valve
- Electronic valve sequencing and Electronic flow curve (equal percentage or Linear) selection.
- Torque overload protection throughout stroke
- Easy "One Touch" input signal/stroke calibration



Screw Mount Style Forta (Left) and U-Bolt Style Forta (Right)

APPLICABLE LITERATURE

- Forta/VB-7xxx Selection Guide, F-27490
- Forta/VB-8xxx, VB-9xxx Selection Guide, F-27491
- AV-800 Series Linkage Adapters for Competitors Valves, F-27470
- AV-821 Linkage VB-7xxx, F-27701- U-Bolt Style Only
- AV-822 Linkage VB-8xxx, VB-9xxx, F-27702 U-Bolt Style Only

SPECIFICATIONS

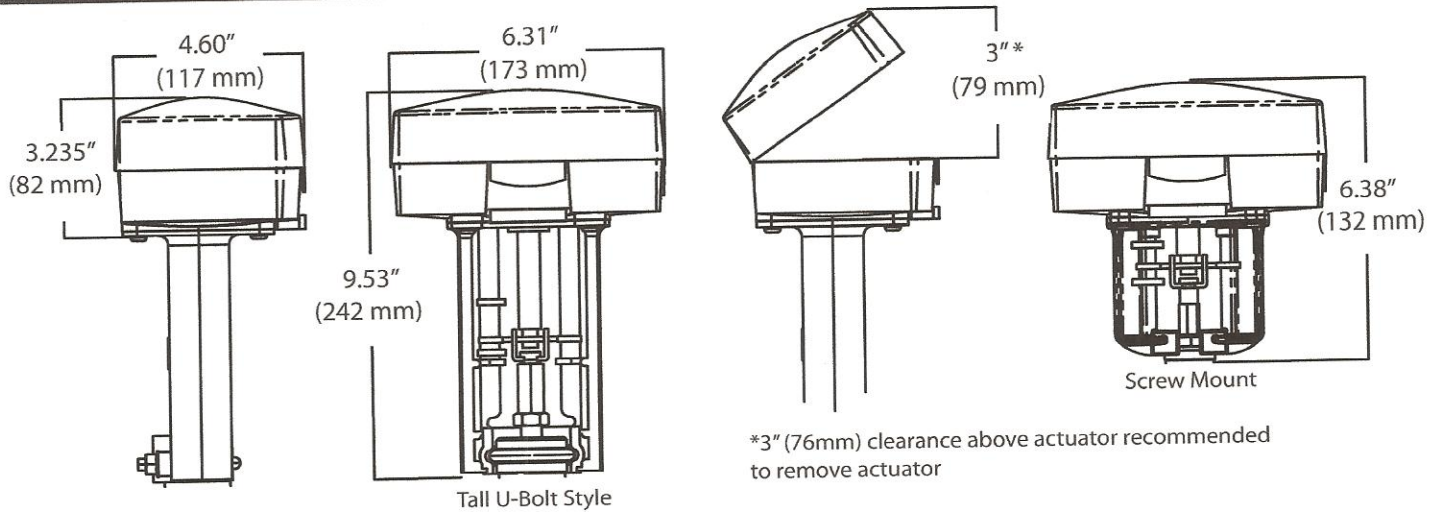
U-bolt Style	M400A	M400A-S2	M800A	M800A-S2	M1500A	M1500A-S2
Screw Mount Style	M400A-VB	M400A-S2-VB	M800A-VB	M800A-S2-VB	M1500A-VB	M1500A-S2-VB
AC Power	24 Vac +- 10% 50-60 Hz					
DC Power	20 - 29 Vdc 20 W				20 - 29 Vdc 30 W	
Running VA	6		15		24	
Transformer Size VA	30		50		50	
Floating Control	Yes					
Proportional Control	0 to 10 Vdc, 2 to 10 Vdc or 4 to 20mA with 500 ohm resistor					
Feedback	2 to 10 Vdc					
Force	90 lbf (400 N)		180 lbf (800 N)		337 lbf (1500 N)	

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SPECIFICATIONS CONTINUED

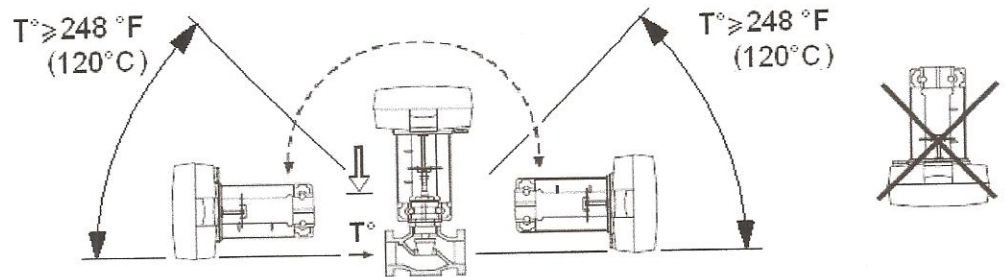
Stroke	
M800, M1500	U-Bolt style: >3/8" to 2" (9-52mm)
M800-VB, M1500 VB	Screw Mount Style >3/8" to 1 7/8" (9-48mm)
M400, M400-VB	U-Bolt and Screw Mount Style >3/8" to 1 1/4" (9-48mm)
Stroke Timing	Floating: 60 or 300 sec selectable, Proportional: 15 sec @1/2" stroke
Feedback AO	2 to 10 Vdc
Power Supply Type	Half Wave
Motor Type	Brushless DC
Enclosure	NEMA 2 (IP 54, vertical mount only) with both conduit connectors used. NEMA 1 IP40 with one connector used.
Sound Power Level	Maximum 32 dba
Ambient Temperature Storage	-13 °F to 149 °F (-25 to 65 °C) ambient
Ambient Temperature Operational	122 °F (50 °C) For chilled water applications 113 °F (45°C) ambient at 281 °F (138°C) fluid temperature 107 °F (42 °C) ambient at 300 °F (149 °C) fluid temperature 100 °F (38 °C) ambient at 340 °F (171°C) fluid temperature 90°F (32°C) ambient at 366 °F (186 °C) fluid temperature
Minimum Operating Temperature	14 ° to 150 ° F (-10 ° to 50 ° C)
Ambient Humidity	15 to 95 % RH non-condensing
Housing Material	Die-Cast Aluminum

DIMENSIONS



MOUNTING

The actuator may be mounted horizontally, vertically and in any position in between, but not upside down, Please note that to maintain NEMA 2 (IP54) rating the actuator must be mounted vertical.



FUNCTION

The actuator

The brushless DC-motor of the actuator turns a screw via a gear wheel. When the motor receives a control signal from the controller, the screw moves in a linear motion, moving the stem of the valve.

Control signal

The M400A (VB)/ M800A (VB)/ M1500A (VB) Series can be controlled by a SPDT floating control, Triac source controller or a proportional input signal.

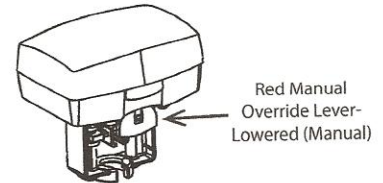
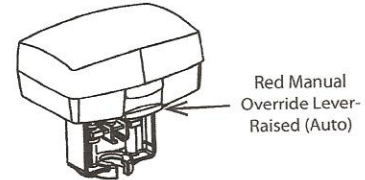
Manual operation

There is a red manual operation handle on the actuator. When it is lowered, the motor stops. Then the actuator can be operated manually if the handle is turned.

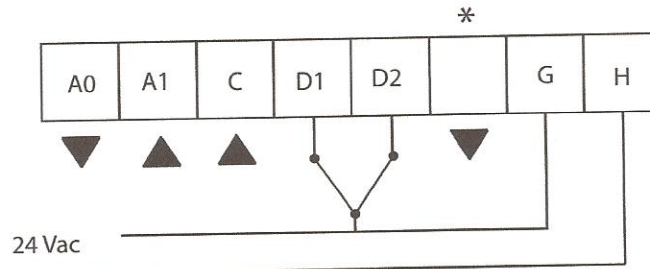
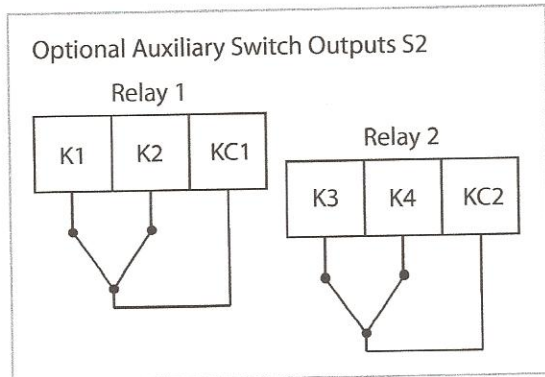
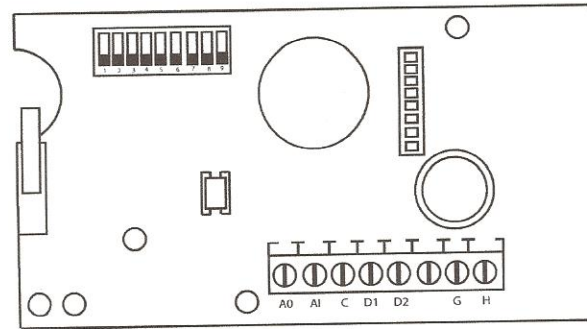
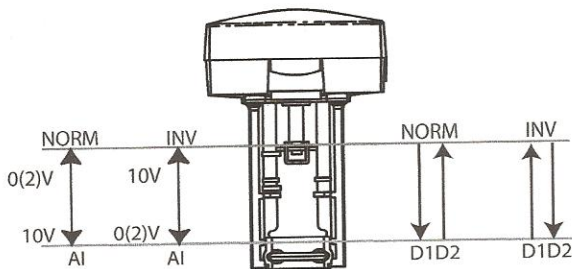
Note: Actuator is shipped with manual override lowered (MAN). For normal operating, the handle must be raised (AUTO).

Position feedback

M400A (VB), M800A (VB), and M1500A (VB) actuators are equipped with a 2-10 Vdc position feedback.



CONNECTIONS



Note: For floating input signals the cables between the controller and the Forta should not exceed 328' (100m) (16 AWG) with the cables connected to one actuator. When installed with 3 conductors with very long lengths (floating control), where control signal reference is connected to G, the motor current of the actuator will cause varying voltage loss in the cable and thus in the reference level. Forta which has a highly sensitive control signal input, will detect the varying signal and follow it, which makes it difficult for the actuator to find a stable position.

Cable Lengths: The wires to G, H should be max of 328 ft (100m). min AWG 16, all other proportional input signal input wires should be a max of 656 ft (200m) min AWG 20.

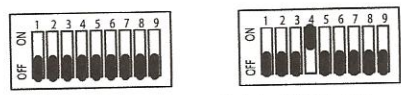
Please refer to the Wiring Examples for wiring instructions.

Block	Function	Description
G	24 Vac or 24 Vdc Com	Power
H	24 Vac or +24 Vdc	Power
AI	+	Input Signal
C	-	Signal Common
D1	Floating	Extend/Retract**
D2	Floating	Extend/Retract**
A0	+	Feedback Signal

** Exact Operation will vary based on the settings of DIP switch #1 and #7.


WIRING EXAMPLES

PROPORTIONAL CONTROL WIRING DIAGRAMS



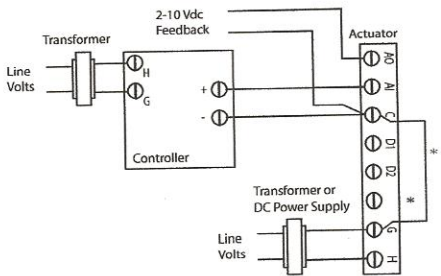
Switches 2 & 4 OFF
0-10V
Proportional operation

Switches 2 OFF & 4 ON
2-10V
Proportional operation

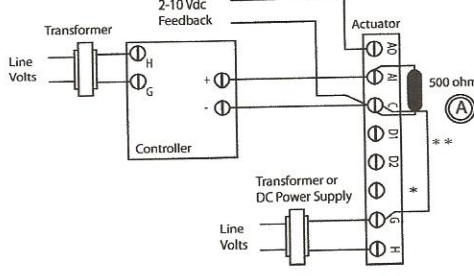


Switches 2 OFF & 4 ON
4-20mA with 500 ohm resistor
Proportional operation

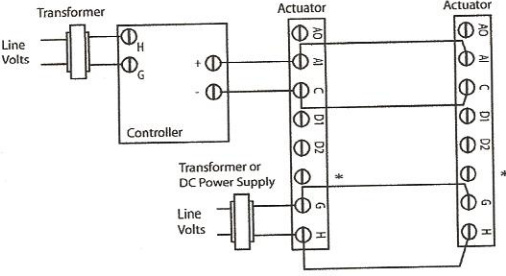
TRANSFORMER OR DC POWER SUPPLY TO BE SIZED FOR RECOMMENDED VA REQUIREMENTS PER CONTROLLER/ACTUATOR PRODUCT DATA SHEETS



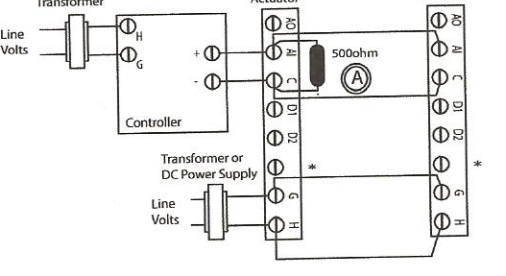
0-10/2-10Vdc Proportional Application
* Provides 16 Vdc, 25mA output source
** Optional Ground connection



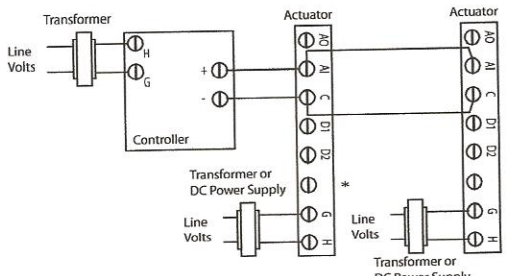
4-20mA Proportional Application
* Provides 16 Vdc, 25mA output source
** Optional Ground connection



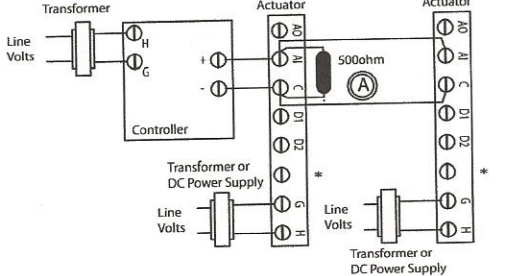
0-10/2-10Vdc Proportional Multiple Actuators powered from single source.
* Provides 16 Vdc, 25mA output source



4-20mA Proportional Multiple Actuators powered from single source.
* Provides 16 Vdc, 25mA output source

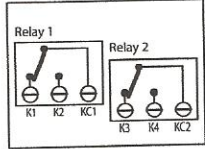


0-10/2-10Vdc Proportional Multiple Actuators powered from separate sources.
* Provides 16 Vdc, 25mA output source



4-20mA Proportional Multiple Actuators powered from separate sources.
* Provides 16 Vdc, 25mA output source

Ⓐ 500 ohm resistor (included w/actuator) is required.
For 4-20mA input Dip Switches 2 OFF and 4 ON



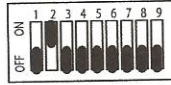
OPTIONAL S2 AUXILIARY SWITCH

Caution: This product contains a half-wave rectifier power supply and must not be powered off transformers used to power other devices utilizing non-isolated full-wave rectifier power supplies.

Refer to EN-205, Guidelines for Powering Multiple Devices from a Common Transformer, F-26363 for detailed information

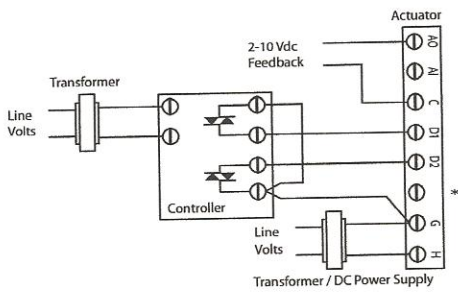
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FLOATING CONTROL WIRING DIAGRAMS

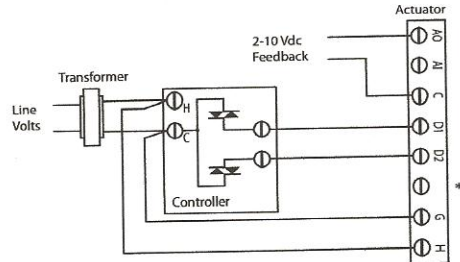


Switch 2 ON for floating operation

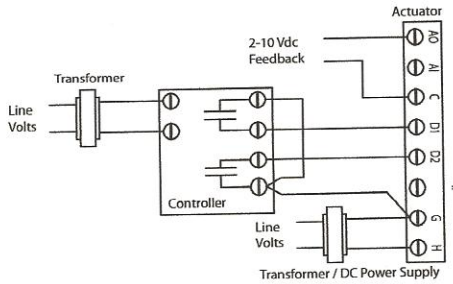
TRANSFORMER OR DC POWER SUPPLY TO BE SIZED FOR RECOMMENDED VA REQUIREMENTS PER CONTROLLER/ACTUATOR PRODUCT DATA SHEETS



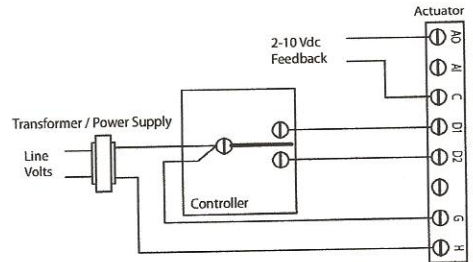
TRIAC SINK Application
Two power sources
* Provides 16 Vdc, 25mA output source



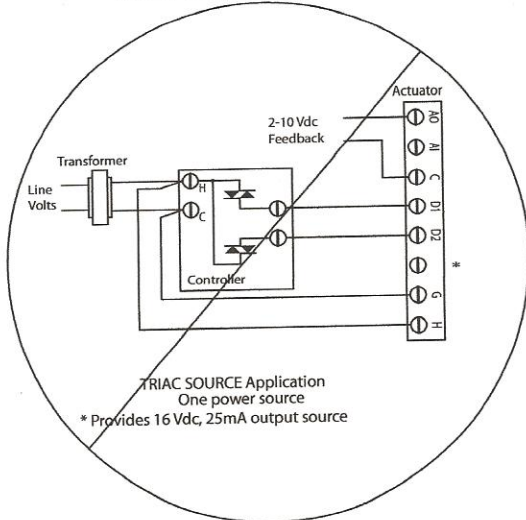
TRIAC SINK Application
One power source
* Provides 16 Vdc, 25mA output source



RELAY SINK Application
Two power sources
* Provides 16 Vdc, 25mA output source

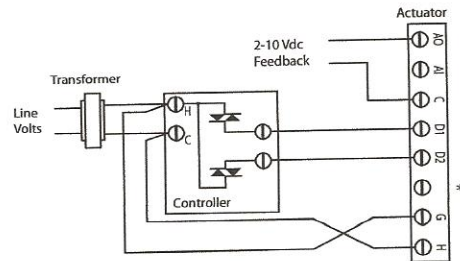


RELAY SINK Application
One power source
* Provides 16 Vdc, 25mA output source



TRIAC SOURCE Application
One power source
* Provides 16 Vdc, 25mA output source

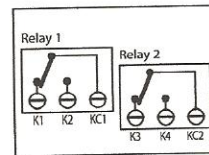
DO NOT WIRE AS SHOWN



TRIAC SOURCE Application
One power source
* Provides 16 Vdc, 25mA output source

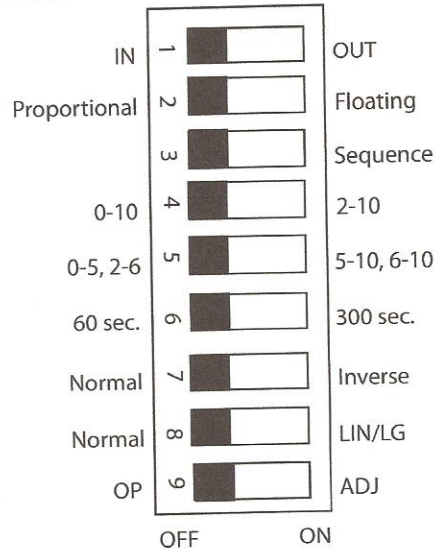
Note:

If AC polarity cannot be determined, a separate transformer must power each controller and actuator.



OPTIONAL S2 AUXILIARY SWITCH

PROGRAM SWITCH SETTINGS FOR THE FORTA NON-SPRING RETURN ACTUATORS



Switch Setting	Description	Off Position ¹	On Position
1	Valve closing screw direction	After power up, actuator will retract fully before the input control signal takes control. This switch will change the proportional or floating input signal to direct or reverse action similar to switch 7.	After power up, actuator will extend fully before the input control signal takes control. This switch will change the proportional or floating input signal to direct or reverse action similar to switch 7.
2	Control mode	Proportional signal	Floating signal
3	Sequence operation ²	Normal operation	SW 2 off, SW 3 on, SW 4 select base range (0-10 or 2-10) SW 5 select sequence range
4	Input voltage range	0 to 10 Vdc	2 to 10 Vdc
5	Working voltage range ³	0 to 5 Vdc or 2 to 6 Vdc	5 to 10 Vdc or 6 to 10 Vdc
6	Running time (floating control only)	60 sec	300 sec
7	Direction of movement	This switch will change the proportional or floating input signal to direct or reverse action similar to switch 1.	This switch will change the proportional or floating input signal to direct or reverse action similar to switch 1.
8	Linearization	Normal	Used to adjust the actuator's linear or logarithmic characteristics. With this setting, the characteristics of an equally modified percentage valve can be modified to almost linear and a linear valve can operate with "quick open" characteristics based on the application requirements.
9	Input signal/ Stroke Calibration	Normal	Used to calibrate the input control signal and the valve stroke. With the actuator powered, turn switch nine on, then off. The actuator will match the control input signal to the valve stroke. Note: Switch 9 must be in the off position for normal operation.

1 Units are shipped with all nine switches in a default "off" position.
 2 Switch 3 must be in the off position if sequence control is not used.
 3 Switch 5 is only active if switch 2 is off and switch 3 is on.

Note: For the actuator to register new settings of the switches, the supply voltage must be removed by cutting power to the actuator or lowering the manual override lever, then change any of switches one through eight as required and then restore power to the actuator or raise the manual override level.

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ACTUATOR VALVE SELECTION FOR THE FORTA NON-SPRING RETURN ACTUATORS

Select Valve/Actuator Combination Having Sufficient Close off for Application

Valve Body ^a			Close-off Ratings, psi (kPa)		
Two-Way Valves	P Code	Size	M400A (VB)	M800A (VB)	M1500A (VB)
VB-7211-0-3-P	-01, -02, -03, -04	1/2" (15 mm)	250 (1712)	250 (1712)	—
VB-7211-0-4-P	-05, -06	3/4" (20 mm)	198 (1356)	250 (1712)	—
VB-7212-0-4-P					
VB-7213-0-4-P	-07, -08	1" (25 mm)	92 (630)	207 (1418)	—
VB-7214-0-4-P					
VB-7215-0-4-P	-09	1-1/4" (32 mm)	56 (384)	130 (890)	—
VB-7221-0-4-P	-10	1-1/2" (40 mm)	37 (253)	88 (603)	177 (1212)
VB-7222-0-4-P					
VB-7223-0-4-P					
VB-7224-0-4-P					
VB-7225-0-4-P	-11	2" (40 mm)	19 (130)	48 (329)	98 (671)
VB-7253-0-4-P					
VB-7263-0-4-P					
VB-7273-0-4-P					
VB-7283-0-4-P					
VB-8213-0-5-P ^b	-12, -13, -14, -15, -16	2-1/2" to 6"	Do not use	Do not use	125 (856)
VB-8223-0-5-P ^b					
Three-Way Valves	P Code	Size	M400A (VB)	M800A (VB)	M1500A
VB-7312-0-4-P	-02, -04	1/2" (15 mm)	250 (1712)	250 (1712)	—
VB-7313-0-4-P	-06	3/4" (20 mm)	198 (1356)	250 (1712)	—
VB-7314-0-4-P	-08	1" (25 mm)	92 (630)	207 (1418)	—
VB-7315-0-4-P					
	-09	1-1/4" (32 mm)	56 (384)	130 (890)	—
	-10	1-1/2" (40 mm)	37 (253)	88 (603)	—
	-11	2" (40 mm)	19 (130)	48 (329)	—
VB-7323-0-4-P	-04, -06, -08, -09, -10, -11	1/2" to 2"	250 (1712)		Do not use
VB-8303-0-5-P ^b	-12, -13, -14, -15, -16	2-1/2" to 6"	Do not use	Do not use	35 (241)
VB-9313-0-5-P ^b	-12	2-1/2"	Do not use	29 (199)	61 (418)
	-13	3"	Do not use	19 (130)	42 (288)
	-14	4"	Do not use	10 (68)	22 (151)
	-15	5"	Do not use	Do not use	14 (96)
	-16	6"	Do not use	Do not use	9 (62)

a. Not all bodies are available for all port codes.

b. Requires U-Bolt mounting style.

PROGRAMMING FORTA NON-SPRING RETURN ACTUATORS

VB 72x3 and 82x3 Two-Way Globe Valve, Forta Non-Spring Return, Proportional Control Setup Reference

Valve Type	Program Switch Position			Power Up Position ^a	Input Signal Action	Desired Valve Operation	
	Switch 1	Switch 2	Switch 7			Low end of signal input range	Feedback Signal Action
Valve position at low signal input							
VB-x223 stem up closed	OFF	OFF	OFF	Retract No Flow	DA	Retract No Flow	2 Vdc No Flow 10 Vdc Full Flow
VB-x223 stem down open	OFF	OFF	ON	Retract No Flow	RA	Extend Full Flow	10 Vdc Full Flow 2 Vdc No Flow
VB-x223 stem up closed	ON	OFF	ON	Extend Full Flow	DA	Retract No Flow	10 Vdc No Flow 2 Vdc Full Flow
VB-x223 stem down open	ON	OFF	OFF	Extend Full Flow	RA	Extend Full Flow	2 Vdc Full Flow 10 Vdc No Flow
VB-x213 stem up open	ON	OFF	ON	Extend No Flow	RA	Retract Full Flow	10 Vdc Full Flow 2 Vdc No Flow
VB-x213 stem down closed	ON	OFF	OFF	Extend No Flow	DA	Extend No Flow	2 Vdc No Flow 10 Vdc Full Flow
VB-x213 stem up open	OFF	OFF	OFF	Retract Full Flow	RA	Retract Full Flow	2 Vdc Full Flow 10 Vdc No Flow
VB-x213 stem down closed	OFF	OFF	ON	Retract Full Flow	DA	Extend No Flow	10 Vdc No Flow 2 Vdc Full Flow

VB-73x3 or VB-9313 Three-Way Globe Valve, Forta Non-Spring Return, Proportional Control Setup Reference

Valve Type	Program Switch Position			Power Up Position ^a	Desired Valve Operation	
	Switch 1	Switch 2	Switch 7		Low end of signal input range	Feedback Signal Action at Port B
Valve position at low signal input						
VB-x313 stem up Open B to AB	OFF	OFF	OFF	Retract-Full Flow B to AB	Retract-Full Flow B to AB	2 Vdc Full Flow 10 Vdc No Flow
VB-x313 stem down Closed B to AB	OFF	OFF	ON	Retract-Full Flow B to AB	Extend-No Flow B to AB	10 Vdc No Flow 2 Vdc Full Flow
VB-x313 stem up Open B to AB	ON	OFF	ON	Extend-Full Flow A to AB	Retract-Full Flow B to AB	10 Vdc Full Flow 2 Vdc No Flow
VB-x313 stem down Closed B to AB	ON	OFF	OFF	Extend-Full Flow A to AB	Extend-No Flow B to AB	2 Vdc No Flow 10 Vdc Full Flow
VB-7323 stem up flow B to AB	OFF	OFF	OFF	Retract-Full Flow B to AB	Retract-Full Flow B to AB	2 Vdc Full Flow 10 Vdc No Flow
VB-7323 stem down flow B to A	OFF	OFF	ON	Retract-Full Flow B to AB	Extend-No Flow B to AB	10 Vdc No Flow 2 Vdc Full Flow
VB-7323 stem up flow B to AB	ON	OFF	ON	Extend-Full Flow B to A	Retract-Full Flow B to AB	10 Vdc Full Flow 2 Vdc No Flow
VB-7323 stem down flow B to A	ON	OFF	OFF	Extend-Full Flow B to A	Extend-No Flow B to AB	2 Vdc No Flow 10 Vdc Full Flow

a. Upon power up, actuator will stroke to the power up position before the input signal takes control.

VB-8303 Three Way Globe Valve, Forta Non-Spring Return, Proportional Control Setup Reference

Valve Type	Program Switch Position			Power up position ^a	Desired Valve Operation	
	Switch 1	Switch 2	Switch 7		Low end of signal input range	Feedback signal action @ Port B
Valve position with D2 powered						
VB-8303 stem up Open B to AB	OFF	OFF	OFF	Retract-Full Flow B to AB	Retract-Full Flow B to AB	2 Vdc Full Flow 10 Vdc No Flow
VB-8303 stem down Closed B to AB	OFF	OFF	ON	Retract-Full Flow B to AB	Extend-No Flow B to AB	10 Vdc No Flow 2 Vdc Full Flow
VB-8303 stem up Open B to AB	ON	OFF	ON	Extend-Full Flow A to AB	Retract-Full Flow B to AB	10 Vdc Full Flow 2 Vdc No Flow
VB-8303 stem down Closed B to AB	ON	OFF	OFF	Extend-Full Flow A to AB	Extend-No Flow B to AB	2 Vdc No Flow 10 Vdc Full Flow

a. Upon power up, actuator will stroke to the power up position before the input signal takes control.

VB-72x3 or VB-82x3 Two Way Globe Valve, Forta Non-Spring Return, Floating Control Setup Reference

Valve Type	Program Switch Position			Power up position ^a	Power to D2 input terminal	Desired Valve Operations		
	Switch 1	Switch 2	Switch 7			Feedback signal	Power to D1 input terminal	Feedback signal
Valve position with D2 powered								
VB-x223 stem up closed	OFF	ON	OFF	Retract-No Flow	Retract-No Flow	2 Vdc	Extend-Full Flow	10 Vdc
VB-x223 stem down open	OFF	ON	ON	Retract-No Flow	Extend-Full Flow	10 Vdc	Retract-No Flow	2 Vdc
VB-x223 stem up closed	ON	ON	ON	Extend-Full Flow	Retract-No Flow	10 Vdc	Extend-Full Flow	2 Vdc
VB-x223 stem down open	ON	ON	OFF	Extend-Full Flow	Extend-Full Flow	2 Vdc	Retract-No Flow	10 Vdc
VB-x213 stem up open	ON	ON	ON	Extend-No Flow	Retract-Full Flow	10 Vdc	Extend-No Flow	2 Vdc
VB-x213 stem down closed	ON	ON	OFF	Extend-No Flow	Extend-No Flow	2 Vdc	Retract-Full Flow	10 Vdc
VB-x213 stem up open	OFF	ON	OFF	Retract-Full Flow	Retract-Full Flow	2 Vdc	Extend-No Flow	10 Vdc
VB-x213 stem down closed	OFF	ON	ON	Retract-Full Flow	Extend-No Flow	10 Vdc	Retract-Full Flow	2 Vdc

VB-73x3 or VB-9313 Three Way Globe Valve, Forta Non-Spring Return, Floating Control Setup Reference

Valve Type	Program Switch Position			Power up position ^a	Power to D2 input terminal	Desired Valve Operations		
	Switch 1	Switch 2	Switch 7			Feedback signal	Power to D1 input terminal	Feedback signal
Valve position with D2 powered								
VB-x313 stem up Open B to AB	OFF	ON	OFF	Retract-Full Flow B to AB	Retract-Full Flow B to AB	2 Vdc	Extend-No Flow B to AB	10 Vdc
VB-x313 stem down Closed B to AB	OFF	ON	ON	Retract-Full Flow B to AB	Extend-No Flow B to AB	10 Vdc	Retract-Full Flow B to AB	2 Vdc
VB-x313 stem up Open B to AB	ON	ON	OFF	Extend-Full Flow A to AB	Extend-No Flow B to AB	2 Vdc	Retract-Full Flow B to AB	10 Vdc
VB-x313 stem down Closed B to AB	ON	ON	ON	Extend-Full Flow A to AB	Retract-Full Flow B to AB	10 Vdc	Extend-No Flow B to AB	2 Vdc
VB-7323 stem up Flow B to AB	OFF	ON	OFF	Retract-Full Flow B to AB	Retract-Full Flow B to AB	2 Vdc	Extend-No Flow B to AB	10 Vdc
VB-7323 stem down Flow B to A	OFF	ON	ON	Retract-Full Flow B to AB	Extend-No Flow B to AB	10 Vdc	Retract-Full Flow B to AB	2 Vdc
VB-7323 stem up Flow B to AB	ON	ON	OFF	Extend-Full Flow B to A	Extend-No Flow B to AB	2 Vdc	Retract-Full Flow B to AB	10 Vdc
VB-7323 stem down Flow B to A	ON	ON	ON	Extend-Full Flow B to A	Retract-Full Flow B to AB	10 Vdc	Extend-No Flow B to AB	2 Vdc

VB-8303 Three Way Globe Valve, Forta Non-Spring Return, Floating Control Setup Reference

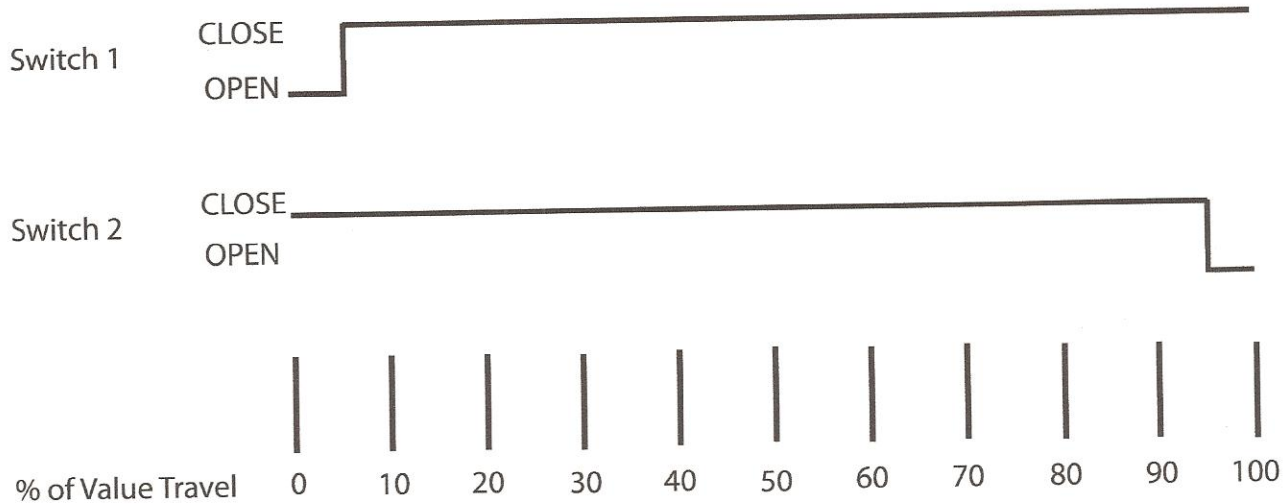
Valve Type	Program Switch Position			Power up position ^a	Power to D2 input terminal	Desired Valve Operations		
	Switch 1	Switch 2	Switch 7			Feedback signal	Power to D1 input terminal	Feedback signal
Valve position with D2 powered								
VB-8303 stem up Open B to AB	OFF	ON	OFF	Retract-Full Flow B to AB	Retract-Full Flow B to AB	2 Vdc	Extend-No Flow B to AB	10 Vdc
VB-8303 stem down Closed B to AB	OFF	ON	ON	Retract-Full Flow B to AB	Extend-No Flow B to AB	10 Vdc	Retract-Full Flow B to AB	2 Vdc
VB-8303 stem up Open B to AB	ON	ON	OFF	Extend-Full Flow A to AB	Extend-No Flow B to AB	2 Vdc	Retract-Full Flow B to AB	10 Vdc
VB-8303 stem down Closed B to AB	ON	ON	ON	Extend-Full Flow A to AB	Retract-Full Flow B to AB	10 Vdc	Extend-No Flow B to AB	2 Vdc

a. Upon power up, actuator will stroke to the power up position before the input signal takes control.

Note: The switch positions on pages eight and nine are the base programming configurations, in the base configurations all other switches should be switched off. Once the base programming configuration has been set up you may wish to add additional programming features and functions that are listed below.

DA = Full open, full flow, 10vdc output / Full closed, no flow, 2vdc output
 RA = Full open, full flow, 2vdc output / Full closed, no flow 10vdc output

AUXILIARY SWITCH SETUP



With the actuator powered and being controlled by the input signal the optional auxiliary switches only transfer contacts as follows, driving from full retract to full extend the auxiliary contacts transfer when the actuator is about 95% of full extend travel. When the actuator drives from full extend to full retract the contacts will transfer when the actuator is about 95% of full retract travel.

Optional Auxiliary Switch Function (S2)

	Example A		Example B		Example C		Example D	
Auxiliary Switches 2- SPDT	Program Switch 1 OFF Powered Retracted		Program Switch 1 ON Powered Extended		Program Switch 1 OFF Powered Retracted		Program Switch 1 ON Powered Extended	
	Closed	Open	Closed	Open	Closed	Open	Closed	Open
KC1-K1		X	X			X	X	
KC1-K2	X			X	X			X
KC2-K3	X			X	X			X
KC2-K4		X	X			X	X	
Floating Control or Proportional Control	Program switches 1 off, 7 off		Program switches 1 on, 7 on		Program switches 1 off, 7 on		Program switches 1 on, 7 off	
High Input Signal or D1 Action	Extends		Extends		Retracts		Retracts	
Low Input Signal or D2 Action	Retracts		Retracts		Extends		Extends	

Note: This table shows the auxiliary switch action based on the dip switch 1 and 7 settings. You should program the dip switches on the actuator based on the application requirements, once programmed review this chart to determine the action of the auxiliary switches and wire the switches accordingly. IF YOU CHANGE EITHER DIP SWITCH 1 or 7 TO GET A DIFFERENT CONTACT CLOSURE YOU WILL CHANGE THE EXTEND/RETRACT MOVEMENT OF THE ACTUATOR.

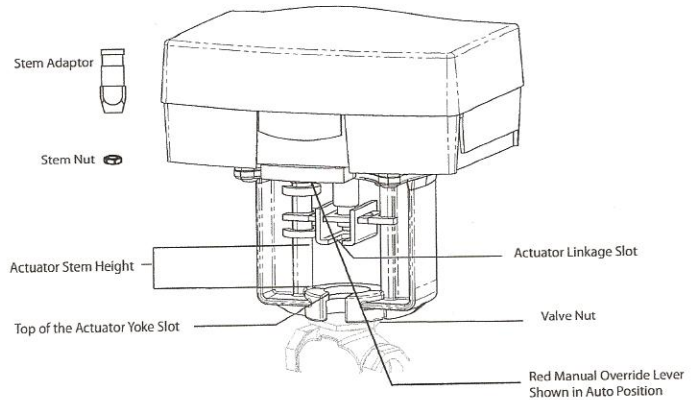
ACTUATOR INSTALLATION

Short, Threaded Forta Valves Installation on a 1/2" - 2" VB-7000: Valve Installation

Required Tools:

- M-370 1 5/8" open end wrench
- 7/16" open end wrench
- 5/16" open end wrench

1. Confirm that the factory set dimension from the bottom of the actuator linkage slot to the top of the mounting boss is 7/8". If the actuator is not set at this dimension please adjust the actuator to obtain this 7/8" dimension by placing the Red Manual Override Lever in the down position and rotating it to obtain required position.
2. Pull up the valve stem.
3. Screw the stem adapter jam nut (provided with the actuator) to the bottom of the valve stem threads.
4. Screw the stem adapter (provided with the actuator) all the way on to the valve stem to the jam nut, using the 5/16" and 7/16" open end wrenches and tighten.
5. Slide the groove of the stem adapter in to the actuator linkage slot and position the actuator on to the valve.
6. Engage the large valve nut several turns on to the actuator yoke by hand (the valve stem may be pushed into the valve during this process).
To create plug and seat clearance before final assembly tightening, lower the Red Manual Override Lever and rotate clockwise five turns (looking from the bottom of the actuator). If you skip this step, you may have trouble getting the valve tight onto the actuator and risk damaging internal components of the valve.
7. Fully tighten the large valve nut to the actuator yoke using the M-370 1 5/8" open end wrench.
8. Raise the Red Manual Override Lever to allow actuator operation.



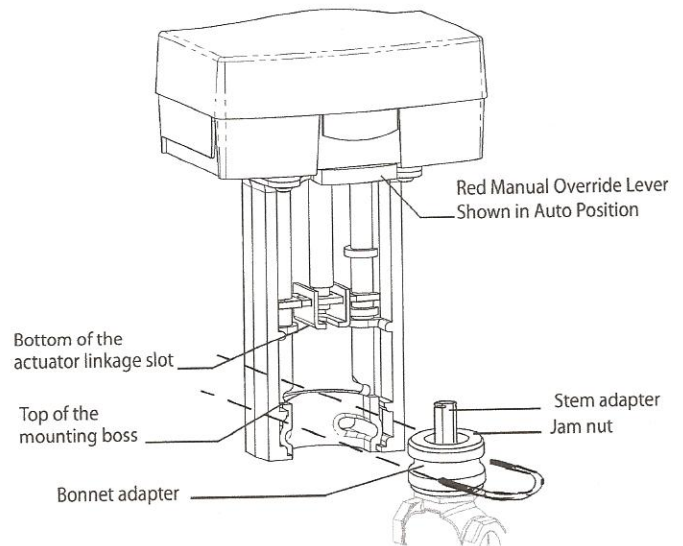
Screw-Mount Forta

Note: Clockwise and Counter-Clockwise directional orientation in the installation instruction is described from the underside of the actuator, not from the view above.

U-Bolt Mount (Tall) Forta: Valve Installation

- | | |
|------------------------------|------------------------------|
| 1/2" - 2" VB-7000 | 2 1/2" - 6" VB-8000/9313 |
| AV-821 (Purchase Separately) | AV-822 (Purchase Separately) |
| Required Tools: | Required Tools: |
| M-370 1 5/8" open end wrench | 3/4" open end wrench |
| 7/16" open end wrench | 5/8" open end wrench |
| 5/16" open end wrench | 13 mm wrench |
| 13 mm wrench | Pipe wrench |

1. Confirm that the factory set dimension from the bottom of the actuator linkage slot to the top of the mounting boss is 2 1/4". If the actuator is not set at this dimension please adjust the actuator to obtain this 2 1/4" dimension with the Red Manual Override Lever in the down position turn as required. Raise Red Manual Override Lever after re-positioning.
2. Pull up the valve stem.
3. Screw the stem adapter jam nut, provided with the AV-82x, 1/2" down the valve stem threads.
4. Screw the stem adapter, provided with the AV-82x kit, on to the valve stem to the jam nut, tighten with wrenches.
5. Install the AV-82x bonnet adapter all the way on the valve, and tighten with appropriate wrenches.
6. Slide the groove of the stem adapter in to the actuator linkage slot and position the actuator onto the valve aligning the groove of the bonnet adapter with the U-Bolt mounting holes in the actuator yoke.
7. Install the U clamp and the two 13mm U clamp mounting nuts and tighten with the 13mm wrench.



U-Bolt Forta mounted on VB-7000 valve

GLOBE VALVE/FORTA COMPATIBILITY

Connection	Part Number	VB-7000 1/2" to 2" Bronze Direct Mounted	VB-7000 1/2" to 2" Bronze Requires AV-821 Linkage Purchased separately	VB-8000 2-1/2" to 6" Iron Requires AV-822 Linkage Purchased separately	VB-9313 2-1/2" to 6" 3 way mixing Iron Requires AV-822 Linkage Purchased separately
Screw-Mount	M400A-VB	Yes ^a	—	—	—
	M400A-S2-VB				
	M800A-VB				
	M800A-S2-VB				
	M1500A-VB				
	M1500A-S2-VB				
U-Bolt Mount	M400A	—	Yes ^a	—	—
	M400A-S2				
	M800A				
	M800A-S2			2 1/2 to 4" only	
	M1500A			Yes	Yes
	M1500A-S2				

a. M1500A actuators should not be used on VB-7323 Three Way Diverting Valves

ELECTRICAL CONNECTIONS

The switches on the circuit board should be set before the actuator is installed. There are no other switches or potentiometers that should be set or adjusted. Actuator travel adjustment must be set as follows upon commissioning: Actuator and valve linked, manual override lever raised (AUTO), power on, move switch 9 (OP/ADJ) ON and then OFF. Forta closes the valve and opens it fully. The adjustment is finished by the actuator closing the valve again; the electronic circuitry then adjusts the stroke. It also scales the actuator input signal, output feedback signal, and optional auxiliary switch outputs to match the valve's travel. The set values are stored in the EEPROM of the actuator so that they will remain after a loss of voltage. When the end position adjustment is complete, the actuator starts to control the valve according to the control signal.

Note: Switch 9 (OP/ADJ) must be in the off position for normal operation.

ACCESSORIES

U-Bolt Mounting Style Only (M400A, M800A, M1500A Only):

AV-821 VB-7xxx series globe valve linkage kit required for M400A, M800A, and M1500A actuator mounting. Order separately, F-27701.

AV-822 Globe valve linkage kit required for mounting M800A actuators to 2-1/2 to 4 inch VB-9313 and the M1500A actuators to either the 2-1/2" to 6" VB-9313 series globe valves and the 2-1/2" to 6" VB-8000 series globe valves. Order separately, F-27702.

U-Bolt or Screw Mount Styles (M400A (VB)/M800A (VB)/M1500A (VB) Styles):

AV-800 series globe valve adapters (competitor valves). F-27470

APPROVALS

FEDERAL COMMUNICATION COMMISSION (FCC)

Note: This equipment has been tested and found to comply with the limits for class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in residential installations. This equipment generates, uses, and can radiate radio frequency energy and may cause harmful interference if not installed and used in accordance with the instructions. Even when instructions are followed, there is no guarantee that interference will not occur in a particular setting-Which can be determined by turning the equipment off and on-the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/television technician for help.

CANADIAN DEPARTMENT OF COMMUNICATIONS (DOC)

Note: This class B digital apparatus meets all requirements of the Canadian Interference Causing Equipment Regulations Cet appareil numérique de la classe respecte toutes les exigences du règlement sur le matériel brouilleur du Canada.

EUROPEAN STANDARD EN 55022

Warning: This is a class B digital (European Classification) product in a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

CAUTION: Avoid locations where excessive moisture, corrosive fumes, vibration, or explosive vapors are present.