

# North American Automatic Shutoff Valves Installation, Operation, Maintenance Instructions

Instructions 1518/1519

## OVERVIEW

North American Automatic Shutoff Valves are used in fuel supply lines on industrial furnaces, ovens, kilns, boilers, and other heating equipment. They shut off fuel automatically and instantly upon any break in electric power or the safety circuit. They cannot be opened until an interlocking safety or control circuit is complete, restoring power to the valve.

They can be suitable for pipe lines carrying a variety of gases and liquids used in processes other than combustion.

**Use Manual Reset Valves** where "manned" operation is required or preferred.

**Specify Motorized Valves** where remote or "unmanned" operation is needed. Not recommended for oil applications where on/off cycling is more than 6 cycles per hour.

1518 and 1519 Valves are for emergency automatic shutdown only--following any shutdown, close manual shutoff valves promptly.

## COMPONENT ARRANGEMENT

NFPA 86 insurance underwriters and other agencies or jurisdictional authorities require main and pilot gas trains to include two (2) automatic fuel safety shutoff valves (SSOV). Some insurance underwriters also require an automatic normally open vent valve between them. The sequence of components, as arranged in Figure 1, should be adhered to.

**Equipment Isolation Valve:** Always use an approved tight-shut-off manual fuel valve located upstream of automatic valves, to shut off fuel during downtimes.

A gas filter or strainer shall be installed in the fuel gas piping to protect the downstream safety shutoff valves.  
- See most current version of NFPA 86

**General Considerations:** *1519 Motorized Valves* open unattended upon being powered. *1518 Manual Reset Valves* should be located so operator is encouraged to confirm main flame ignition after opening valve.

Time lag between valve action and flame response is reduced when valve is located near burner, reducing length and storage capacity of downstream piping.

## INSTALLATION INSTRUCTIONS - MECHANICAL

**Read all instructions before installing or operating.**

Valves are usually installed upright in horizontal piping. Other orientations are acceptable subject to conditions outlined below:

Mount valve so that open/shut window indicator will be visible to your operating personnel. **The open/shut window indicator should never face downward.** With electro-mechanical top assemblies, the motor access side plate should always be vertical to the ground. Valves are usually installed in horizontal piping; however, other orientations are acceptable, subject to the above limitations. The top assemblies of all valves are field rotatable to allow installations involving conflicts with these mounting restrictions. See **Top Assembly Rotation** section for details.

Valves are tolerant of adverse ambient conditions; but, as with any other electrical/mechanical equipment, try to select a location that is cool, clean, and dry.

Exposed metal surfaces of valve are aluminum, cast iron, or cast steel all painted. Cover gasketing material is neoprene, or equal. Any substance in atmosphere harmful to these materials will have an adverse effect on the valve exterior.

**Make no adjustments to the VCS-1 switch. It is factory set as a proof-of-closure switch.**

**Temperature Limitations:** Refer to catalog or nameplate for specific limitations of valve. If necessary, shield valve to protect from heat (including severe solar or radiant exposure). **Do not expect normal valve operation at ambients below freezing if there is excessive moisture in the gas, or if water has been permitted to enter top assembly through a conduit connection, loose housing screws, or gaskets.**

**Pressure Limitations:** Observe nameplate pressure ratings. If inlet pressure to associated gas pressure regulator is greater than valve's catalog rating, additional protection should be provided: see latest version of NFPA 86 for overpressure protection methods.

**Piping Valve:** Body must be oriented in line so flow agrees with arrow on body. Field rotate top assembly **only** if necessary; see instructions below.

*Use of Teflon tape* (if approved locally) increases possibility of thread over-engagement. Use caution, since even steel valve bodies can be cracked under these conditions.

*Good piping practice* dictates that piping be independently supported so valve bodies are not stressed.

Clear fuel line of foreign matter such as line scale, welding beads, metal cuttings, etc.

**Testing Piping:** Follow applicable codes; but, to avoid damage to valve internals, **DO NOT USE WATER** as a test medium.

These valves should **NEVER** be hydrostatically tested with water as it could cause damage to the valve. If water is introduced into the actuator housing the warranty will be voided.

### TOP ASSEMBLY ROTATION

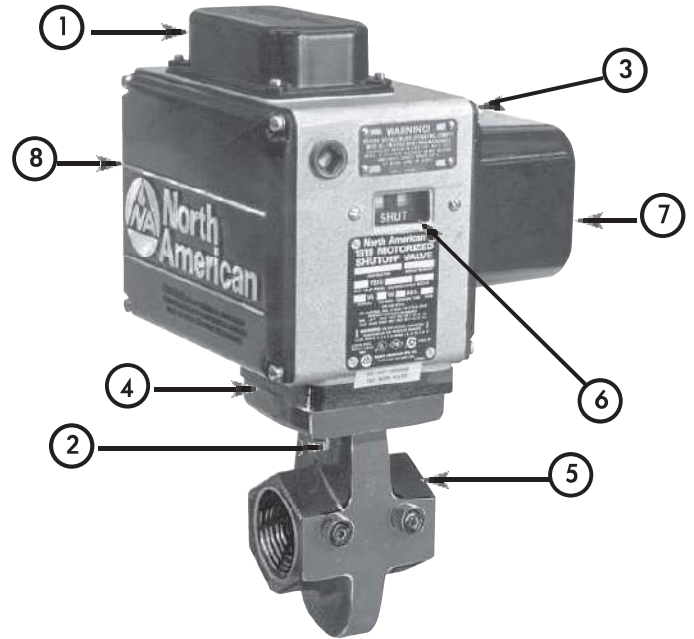
All Automatic Shutoff Valves are shipped as standard in a configuration compatible with conventional piping, but if OPEN/SHUT indicator is not visible when valve is installed, top assembly can be rotated (in 90° increments) by following procedure below for either 1518 Manual Reset or 1519 Motorized Valves.

**NOTE:** OPEN/SHUT indicator ⑥ of these valves should never face downward. Motor endplate ⑦ (motorized valves only) should always be vertical.

### ALL 1518/1519 VALVES EXCEPT -X VERSION

1. Shut off all electrical power to valve and close upstream gas or oil cock.
2. Remove terminal block cover ① and disconnect incoming lead wires (tag carefully for reassembly).
3. Remove conduit and leads.
4. Remove sideplate ⑧ and carefully note position of signal switch wands.

5. Unscrew the actuator bolts ② (two or four depending on valve size) to ¼", with ⅝" 12-point box wrench (⅜" for valves 2" and larger). Do not completely remove. These bolts secure the valve body to the valve's top assembly housing.
6. Gently lift top assembly ③ NOT MORE THAN ¼", just enough to break the seal between valve body ⑤ and the Buna "N" rubber gasket ④.



**WARNING:** Lifting too far may dislodge some small parts inside the top housing, requiring complex reassembly and retesting by trained factory personnel.

7. Remove the two actuator bolts ②, (that were partially removed in step 5).
8. Carefully rotate top assembly ③ about 30° beyond, and then back to the desired position, in a plane parallel to the top of body casting ⑤. This should align OPEN/SHUT indicator with its window and the latch arm roller of operating mechanism with its pedestal.
9. Align screw clearance holes in valve body casting ⑤ with the corresponding tapped holes in the bottom of top assembly ③.
10. Reinsert body screws ②, carefully engaging threads, and tighten securely.
11. Reconnect conduit and electrical leads.

**WARNING:** Do not attempt field repair of valve body, top assembly, or motor drive unit. Any alterations could be dangerous, and will void all warranties.

Insure that signal switch wands have not been disengaged and that interference does not exist at OPEN/SHUT indicator. Failure to do so can result in faulty operation and extensive valve damage.

12. Energize valve and cycle several times from closed, to full-open positions to prove it operates properly.
13. Replace wiring, terminal block cover, and sideplate, and place valve in service after careful operational testing.

### 1519- -X ONLY

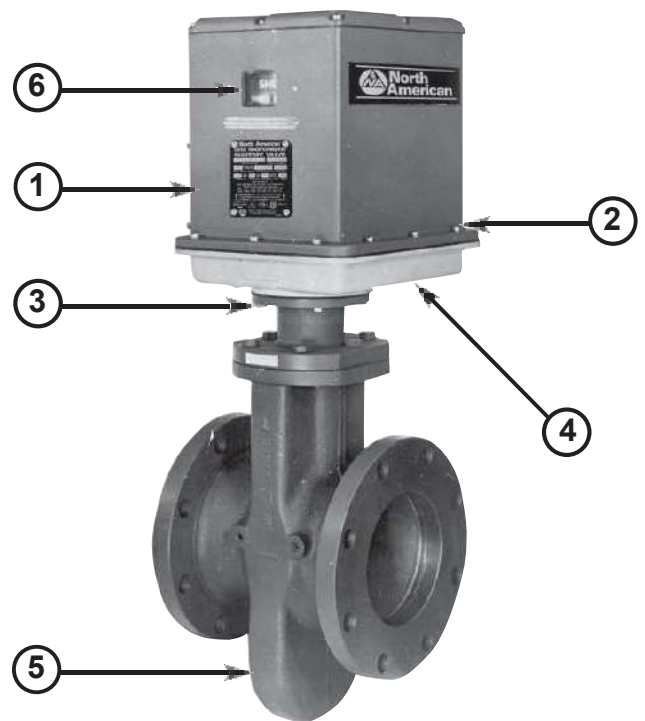
1. Shut off all electrical power to valve and close upstream gas cock.
2. Remove wiring access sideplate ①, disconnect incoming lead wires (tag carefully for reassembly). Then remove top cover screws and complete assembly ②, cutting wire seal if still in place.
3. Remove conduit and leads.
4. Note position of signal switch wands.
5. Unscrew the four acuator bolts ③ with  $\frac{9}{16}$ " box wrench to  $\frac{1}{4}$ ". DO NOT REMOVE. These bolts secure that valve body to the valve top assembly housing.
6. Gently lift top assembly ④ NOT MORE THAN  $\frac{1}{4}$ ", just enough to break the seal between valve body ⑤ and the Buna "N" rubber gasket.

**WARNING:** Lifting too far may dislodge some small parts inside the top housing, requiring complex reassembly and retesting by trained factory personnel.

7. Remove the four actuator bolts ③, (that were partially removed in step 5).
8. Carefully rotate top assembly ④ 30° beyond, and then back to the desired position, in a plane parallel to the top of the body casting ⑤.
9. Align screw clearance holes in valve body ⑤ with corresponding tapped holes in the bottom of top assembly ④.
10. Reinsert body screws ③, engaging threads carefully, then tighten securely.
11. Reconnect conduit and electrical leads.

Insure that signal switch wands have not been disengaged and that interference does not exist at OPEN/SHUT indicator. Failure to do so can result in faulty operation and extensive valve damage.

12. Energize and cycle valve several times from closed, to full-open positions to prove it operates properly.
13. Replace top cover and screws, and place valve in service after careful operational testing. If satisfactory, replace sideplate.



**WARNING:** Do not attempt field repair of valve body, top assembly, or motor drive unit. Any alterations could be dangerous, and will void all warranties.

## INSTALLATION INSTRUCTIONS - ELECTRICAL

**Wiring Valve:** Wiring must comply with all applicable codes and standards. Supply voltage must agree within  $\pm 10\%$  of nameplate voltage. Lower voltage may prevent plunger seating necessary for positive latching. For detailed electrical data and valve internal wiring diagram, refer to catalog and/or diagram in valve cover.

Valves must be electrically interlocked with all safety-limit devices in accordance with applicable codes, standards, and the authority having jurisdiction over safety requirements for the overall installation. See OPERATING Instructions.

Maintain NEMA-4 integrity of upper enclosure; use dust- and water-tight electrical connectors. Use cable sealing grips with strain relief for cord or cable. Consider internal sealing devices.

*1519 Motorized Automatic Shutoff Valves* incorporate an automatic reset temperature-sensitive device that breaks current to motor when winding temperature exceeds about 230°F.

As with any electrical component, auxiliary switches, solenoids, and drive motors may eventually fail. These components can be replaced in the field. See MAINTENANCE section of these instructions.

## OPERATING INSTRUCTIONS

When electrically de-energized, 1518/1519 Valves close almost instantly. Primary power supply is a flame safeguard circuit, which is preceded by all other safety interlocks required by the system design. During start-up, a fault in any safety limit must prevent valves from opening. Conversely, a limit or flame failure during operation must cause valves to close.

*1519 Motorized Valves* begin opening cycle immediately upon being powered; motor runs only until full-open position is reached. Well-defined holding action maintains full-open position.

*1518 Manual Reset Valves* require two positive actions to open: a half-rotation of handle to latch internal mechanism, and a reversed half-rotation of handle to open valve. Valve can be opened fast or slowly, but experienced operators often try to synchronize opening rate with pressure regulator response. Instructions for opening are on operating side of top cover.

Never open valve until all essential allied equipment is operative and combustion enclosure has been purged per NFPA 86 Standards. Failure of valve to open indicates it is not powered. Check power supply first, then check solenoid and motor. Refer to MAINTENANCE section. If any valve does not close when de-energized, remove valve from service.

1518 Manual Valves can be closed manually, but electrical closure is preferred.

**Pre-Start Testing:** Prior to initial start-up and with upstream fuel valve closed, operate valve electrically for 10-15 cycles. This not only provides electrical check, but also can wipe disc and seat free of accumulated foreign matter.

Valve was production-tested when manufactured; if it is inoperative, make sure it is powered properly.

Shutoff valves are endurance-tested far in excess of the most stringent requirements of any approval agency. They are designed for long life and to be as maintenance- and trouble-free as possible.

Every valve is operationally tested and meets the requirements of FCI 70-2, Class VI Seat Leakage when in good operable condition.

**TOP ASSEMBLY** components, including motor of 1519 Valves, require no field lubrication and should never be oiled.

Field repair of body and latching mechanism, or field replacement of body and latch mechanism components, is not recommended. Unauthorized field alteration of valve body, top assembly, switches, or motor drive unit voids all warranties.

**VALVE LEAK TEST**, performed with valve in line as prescribed by jurisdictional authorities, is strongly encouraged and should be done on a regularly scheduled basis. In rare instances where valve appears to be leaking, perform pre-start testing (see other side for instructions). If leakage has not stopped remove valve from service.

Insurance authorities agree...  
...the safety of any industrial fuel burning installation is dependent upon well-trained personnel who are able to follow instructions, and to react properly in cases of emergency. Their knowledge of, and training on, the specific installation are both vital to safe operation.

Safety controls may get out-of-order without operator becoming aware of it unless shutdowns result. Production-minded operators have been known to bypass faulty controls without reporting the trouble.

To counteract dangerous consequences of such by-passing, plant management must carefully develop an exact schedule for regular periodic inspection of all safety controls, insisting it then be rigidly adhered to.

Operating personnel should become familiar with characteristic opening/closing action of the valve. Should operation ever become sluggish, remove valve from service and contact North American for replacement recommendations.

IF THESE VALVES ARE RESOLD, IT IS YOUR OBLIGATION TO ADVISE THE ULTIMATE USER OF THESE CRITICAL REQUIREMENTS.

ANY VALVE USED FOR AUTOMATIC SHUTOFF SHOULD BE CHECKED ON A REGULAR SCHEDULE. NORTH AMERICAN RECOMMENDS CYCLING (CLOSING AND OPENING) 1518 OR 1519 VALVES AS SPECIFIED IN NFPA 86. MORE FREQUENT CHECKING AND CYCLING IS REQUIRED IF THE FUEL GAS IS DIRTY OR IF THE VALVE IS LOCATED INADVERSE (CORROSIVE, DIRTY, ETC.) ENVIRONMENT.

#### LEAK TESTING

Modern gas train design allows a user to perform leak tests on main and blocking valves. Required by NFPA 86, and insurance underwriters, this fixed provision must be on all existing and new gas trains to facilitate periodic leak testing. Proper test procedures should not only check for leaks, but also allow a basic check of the flame safeguard and limit monitoring system, proving shutdown on loss of flame or through faults in other safety interlocks.

#### OPERATION AND TESTING

**WARNING:** Automatic Shutoff Valves, such as North American's 1518 and 1519 series, are furnished for either standard or non-standard fuel service, a maximum pressure, and specific power supply. These and other specifications appear on the main nameplate of each valve. Read them carefully to be sure they apply to your application.

After correct installation and pre-testing, regular operational test including inspection and maintenance are critical to continued good valve operation. When used on dirty fuels, such as coke oven or digester gas, valves should be TESTED for leaks daily. Valves that control clean, dry natural gas might be TESTED less frequently. It is recommended valves be CYCLED regularly as described previously under "PRE-START TESTING".

Frequency of these procedures is best determined by user's experience with the specific fuel and the nature and degree of system controls. If there are any doubts about an appropriate preventive-maintenance schedule, contact North American for assistance.

Automatic Shutoff Valves are not intended for use as permanent fuel shutoff devices. An approved manual tight-shutoff valve must be installed as the permanent shutoff valve (located per Item 1 Fig. 1). During combustion downtimes, this valve MUST be closed.

Inspection, testing, and maintenance should be done on a regular scheduled basis determined by the user.

Operators should be aware of and carefully observe characteristic opening/closing action of the valves. IF OPERATION EVER APPEARS SLUGGISH OR ABNORMAL IN ANY WAY, REMOVE VALVE FROM SERVICE.

Do NOT lubricate any parts of the valve.

Physical inspection of the valve should include assurance that the NEMA-4 integrity of the upper housing is maintained. Make sure all top and sideplate screws and gaskets are intact, and that electrical conduit is installed in a manner that prevents water or condensation from entering housing.

INSURE THAT JUMPER WIRES, OR ANY OTHER DEVICES, ARE NOT USED TO HOLD A VALVE OPEN.



## MAIN ⑤ AND BLOCKING ⑧ VALVES

These valves are always normally closed valves. They can be manual reset or motorized, depending on system design. Valves must be approved for this service. All North American 1518/1519 Valves are FM, UL, and CGA approved/listed and meet insurance underwriter requirements for natural gas, propane, and #2 oil.

## NORMALLY OPEN VENT VALVE

NFPA 86 does not require the use of normally open vent valves. If your insurance underwriter or jurisdictional authority insists that a normally open vent valve be used on your system, we recommend that you give the valve duly required attention. These valves have occasionally stuck open during operation of the combustion system. If this occurs, large volumes of fuel can vent to atmosphere unnoticed. This could be both extremely costly and potentially unsafe. Leak testing devices are not permitted on the vent line. Therefore, your choice of a more expensive normally open vent valve that contains a "proof-of-closure" switch could be advantageous.

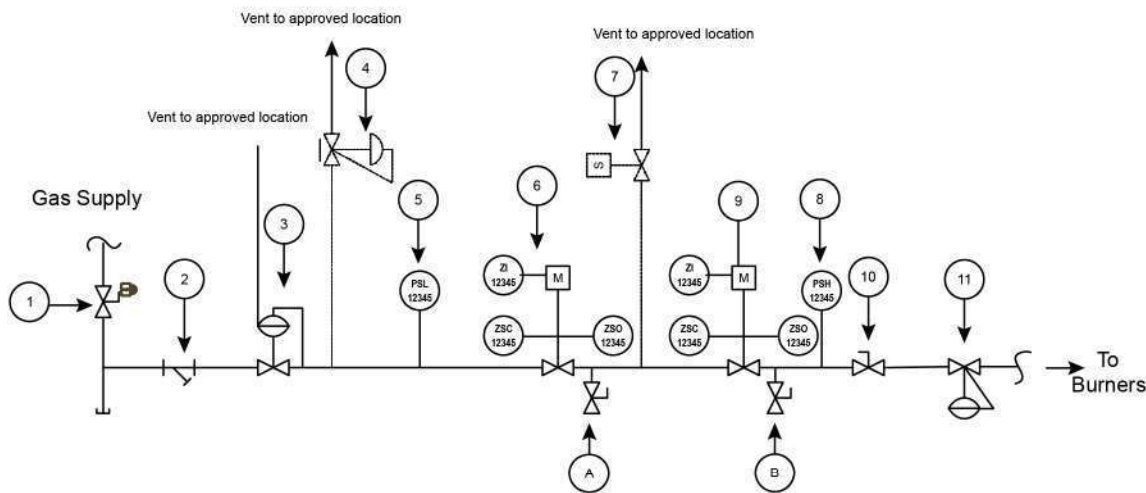


Figure 1. Typical component arrangement showing vent valve.

High ⑧ and low ⑤ gas pressure limit switches must be downstream from high gas pressure regulator.

Equipment should be arranged in this order:

① manual valve, ② gas strainer or filter, ③ high gas pressure regulator, ④ relief valve (if used), ⑤ low gas pressure switch, ⑥ main automatic shutoff valve, A leak test cock, ⑦ normally open vent valve, ⑧ high gas pressure switch, ⑨ blocking valve, B leak test cock, ⑩ manual valve, and ⑪ ratio regulator (if used).

## TEST PROCEDURES

Reference NFPA 86 for leak test procedure. Insurance underwriters prescribe a modified leak test procedure when a normally open vent valve is used.

A licensed electrician can install a simple circuit on existing systems to allow proper leak testing. Procedure should include testing of flame safeguard and all limit monitoring devices. Test cocks with hose nipple adapters are shown as A and B. Also needed are a short length of hose tubing and a clear glass of water. Avoid damage to test cocks. Replace with plugs after testing.

CONTACT YOUR LOCAL AUTHORITY HAVING JURISDICTION, OR NORTH AMERICAN, FOR ANY ASSISTANCE THAT MIGHT BE REQUIRED WITH DESIGN AND USE OF CIRCUITRY TO HELP ATTAIN MAXIMUM SAFEGUARD AND APPROVALS FOR YOUR PARTICULAR SYSTEM.

North American fully agrees with, and refers you to, the latest edition of NFPA 86 for additional information including the need for frequent testing of the entire combustion and limit safeguard system.

This reference also provides an excellent example of preventative maintenance procedures to help you construct and implement your own schedule.

**NOTE: IF BUBBLES CONTINUE AFTER ANY RECOMMENDED LEAK TEST, CLOSE MAIN MANUAL SHUTOFF VALVE ① AND PERFORM CYCLING ROUTINE DESCRIBED UNDER "PRE-START TESTING". RETEST LEAKING VALVE AFTER CYCLING. IF BUBBLES DO NOT STOP, VALVE IS STILL LEAKING. REMOVE LEAKING VALVE FROM SERVICE.**

## MAINTENANCE

Covers all 1518/1519 Valves except 1519-X.

If a manual reset or motorized automatic fuel shutoff valve fails to hold open, a few simple checks can be made by qualified personnel. Extreme care should be taken to avoid electrical shock since these tests are performed with power on.

Always shut off fuel supply using a manual tight-shutoff valve upstream of automatic valves.

### If valve won't hold open, check for:

1. NO VOLTAGE TO SOLENOID COIL: Check L<sub>1</sub> and L<sub>2</sub> and solenoid coil connections. Check back through flame safeguard system and safety limit circuit per panel manufacturer's instructions.
2. LOW VOLTAGE TO SOLENOID COIL: Check L<sub>1</sub> and L<sub>2</sub> and solenoid coil connections.
  - a. Disconnect leads to coil and check for shorts. If faulty, replace coil.
  - b. Check power supply from control panel.

### If motor is inoperative, check for:

1. NO OR LOW VOLTAGE TO MOTOR: Check L<sub>1</sub> and L<sub>2</sub> and motor connections.
2. MOTOR LIMIT SWITCH FAILURE: Replace VOS-2 (valve-open switch).
3. MOTOR BURNED OUT: Replace motor operator. Continuous cycling should not occur (see below).
4. MOTOR GEAR TRAIN BINDING: Replace motor operator. Check for continuous operation (see below).

### If motor operates continuously, check for:

1. VOS-2 (valve-open switch) not being actuated: Bend switch wand slightly upward.

2. VOS-2 (valve-open switch) faulty: Check continuity. If switch VOS-2 does not break circuit, replace switch.

If any valve does not close when de-energized, remove valve from service. After any servicing, always perform prescribed cycling and leak tests before returning valve to service.

**WARNING:** Any valve used for automatic shutoff should be checked on a regular schedule. North American recommends cycling (closing and opening) 1518 or 1519 Valves as specified in NFPA86. More frequent checking and cycling is required if the fuel gas is dirty or if the valve is located in adverse (corrosive, dirty, etc.) environment. For main system shutoff, always use a separate, approved manual fuel valve upstream of a 1518/1519 to shut off fuel during down times.

## PARTS REPLACEMENT

Covers all 1518/1519 Valves except 1519-X.

**NOTE:** Always shut off upstream fuel supply and disconnect electrical power before servicing valve.

Identify part locations from the illustrations. Switches and solenoids are in same location in both manual reset and motorized valves. After servicing, be sure to replace access plate gaskets and all screws to avoid infiltration of dirt or water.

All valves are equipped with one DPDT Valve-Open Switch (VOS-2) and one SPDT Valve-Closed Switch (VCS-1).

## SOLENOID COILS

Faulty solenoid coils are replaced simply by unplugging the wire connectors at the coil, removing mounting screws, placing new coil in position, replacing screws, and reconnecting wires. If wires are replaced to terminal block, follow same routing.

## LIMIT SWITCHES

1. Note activator wand position accurately.
2. Note mounting hole locations on bracket.
3. Remove two mounting screws and lift out switch.
4. Install new wiring, one connection at a time, following original route and placement.
5. Mount new switch only in exact same bracket holes as old switch.

6. Cycle valve; check switch actuation points carefully. Listen for switch to click, and use continuity tester. If necessary, bend wand slightly so switch makes and breaks while valve is closed.
7. Be sure valve wiring and switch action correspond exactly to the schematic and truth table shown in terminal cover and Specifications 1518/1519.

## SWITCH AND COIL LOCATIONS

Covers all 1519 Valves except 1519-X.

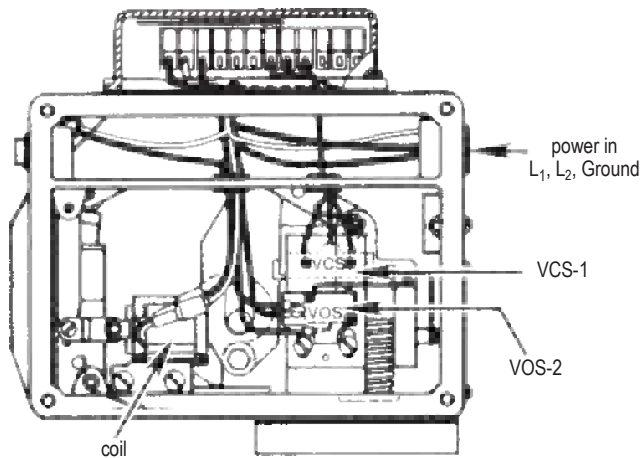


FIGURE 1. Top Terminal Block

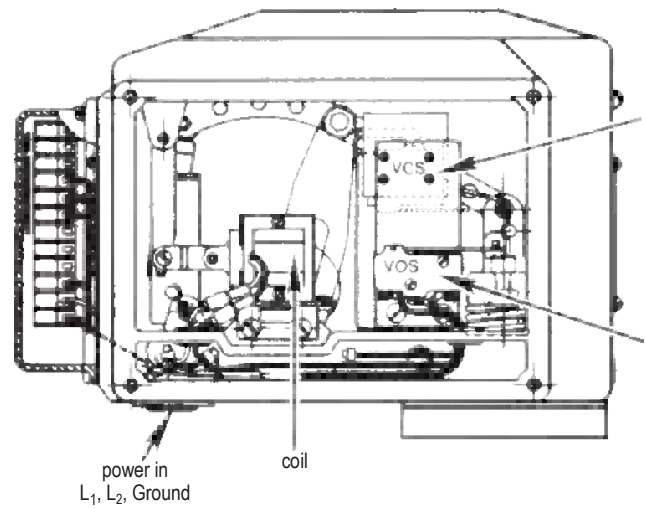
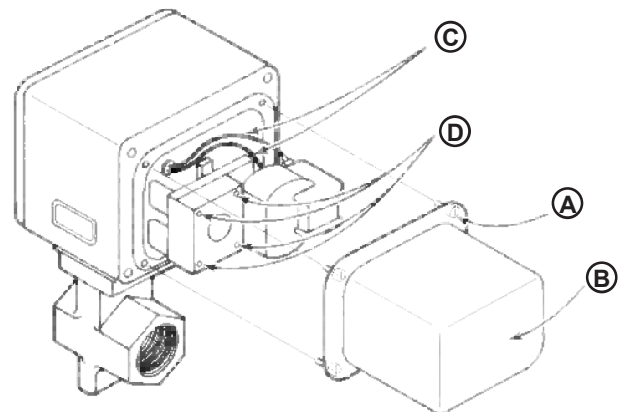


FIGURE 2. Side Terminal Block

## MOTOR/OPERATOR

Covers all 1519 Valves except 1519-X.

1. Shut off all electrical power to valve and close upstream tight-shutoff manual valve.
2. Loosen four fillister head screws (A) and remove motor cover (B).
3. Disconnect wire leads (C) from operator.
4. Loosen four round head screws (D) and carefully remove operator.
5. Carefully align new operator, and complete installation by reversing the above procedure.



**WARNING:** Do not attempt field repair of valve body, top mechanism, or motor operator. Any alterations could be dangerous, and will void all warranties.



**Table 1:** Standard Auxiliary Switches

Valve	Part Numbers	
<b>Manual Reset</b>	<b>VCS-1</b>	<b>VOS-2</b>
1518	R947-1000	R947-1002
1518E	R947-1004	R947-1006
1518-8	R947-1004	R947-1006
<b>Motorized</b>		
1519	R947-1000	R947-1002
1519E	R947-1004	R947-1006

**Standard switches**

VCS-1 is a SPDT "proof-of-closure".  
VOS-2 is a DPDT "proof-of-open".

**Special switches** (120 V ac hermetically sealed or for dc operation) are available at extra cost. Valves with special switches do not carry agency approval labels. Contact North American for these special applications.

**Table 2:** Replacement Solenoid Kits

Valve	Size	115/60	115/50	230/60	230/50
1518 1519	-0 thru -3 All	R947-1101	R947-1102	R947-1103	R947-1104
	-4 thru -6 Except -E	R947-1105	R947-1106	R947-1107	R947-1108
	-5-E thru -7-E All	R947-1109	R947-1110	R947-1112	R947-1113
1518	-8	R947-1109	R947-1110	R947-1112	R947-1113

**Table 3:** Replacement Motor Operators

Valve	Operator number		Opening times	
	115/60/50	230/60/50	60 Hz	50 Hz
1519 Except -E	R947-1200	R947-1205	6 Seconds	7.2 Seconds
1519-E All	R947-1200	R947-1205	6 Seconds	7.2 Seconds
1519-X All	R947-1206	R947-1207	10 Seconds for -7 14 Seconds for -8	12 Seconds for -7 17 Seconds for -8

All valve opening times are nominal, contingent on actual voltage, Hz, temperature, inlet pressure, etc.

**WARNING:** Situations dangerous to personnel and property may exist with the operation and maintenance of any combustion equipment. The presence of fuels, oxidants, hot and cold combustion products, hot surfaces, electrical power in control and ignition circuits, etc., are inherent with any combustion application. Components in combustion systems may exceed 160°F (71°C) surface temperatures and present hot surface contact hazard. Fives North American Combustion, Inc. suggests the use of combustion systems that are in compliance with all Safety Codes, Standards, Regulations and Directives; and care in operation.

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