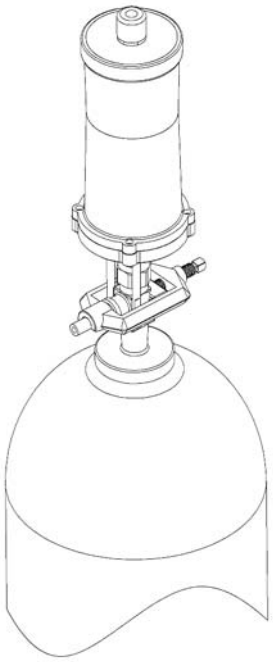
HALOGEN VALVE SYSTEMS, INC.

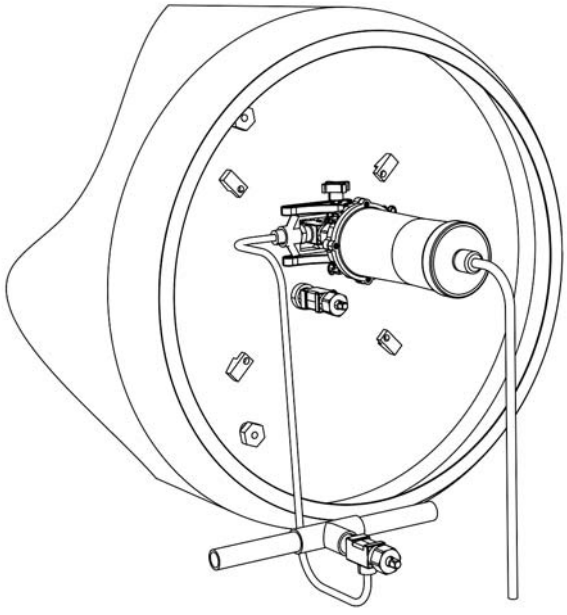
Your Partner in Chlorine Safety

Terminator™ Actuator with Gemini™ Controller

Emergency Valve Shutoff System

Installation, Operation and Maintenance Manual





For Chlorine Cylinders
& Ton Containers

These instructions generally describe the installation, operation and maintenance of **Halogen Valve System's,** automatic **Terminator Actuator** ™ safety system. **Halogen Valve Systems** reserves the right to make engineering refinements that may not be described herein. Any questions that cannot be answered by these instructions should be directed to **Halogen Valve Systems** or your local sales representative.

Halogen Valve Systems takes all possible precautions in packaging each item to prevent shipping damage. Carefully inspect each item and report damages to the shipping agent, **Halogen Valve Systems,** or your local sales representative. Inspect all packing materials before discarding to prevent loss of accessories, mounting hardware or instructions.

Halogen Valve Systems or your local sales representative can provide technical consultation and personnel training on the installation and operation of this system.

For more information concerning procedures for the handling of chlorine cylinders and ton containers, refer to *The Chlorine Manual* published by The Chlorine Institute, Washington, DC.

HALOGEN VALVE SYSTEMS, INC.

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I. Introduction

A. General

The *Halogen Valve Systems* **Terminator™ Actuator** and **Gemini™ Controller** are designed to be used on standard 150 lb. cylinder and ton container valves approved for chlorine service by *The Chlorine Institute. DO NOT USE ON OTHER VALVE TYPES WITHOUT FIRST CONSULTING FACTORY TO INSURE COMPATIBILITY*. The Terminator Actuator is an automatic valve closer that supplements the manual operation of these valves by providing for powered valve closure in case of an emergency. No modification of existing cylinder or ton valve is required to install the system.

B. Equipment

Standard

The Terminator/Gemini emergency shutoff system consists of the following major components and accessories:

Major Components

1. Gravity or clamp mount **Terminator Actuator** which mounts directly to the valve or yoke assembly.

2. **Gemini Controller** with actuator power supply designed to be mounted adjacent to the cylinder or ton container.

3. **Power cable assembly** to provide a flexible two-wire connection between the controller and actuator.

Included Accessories

1. Storage bracket for each actuator to provide temporary storage of the actuator during cylinder or tank change, testing, and maintenance.

For Clamp Mount

For Gravity Mount

2. One (1) remote mountable Emergency Shutoff Switch (*Normally Open, momentary contact*). For additional switches, order P/N 6430.00 and specify Normally Open or Normally Closed contacts.

Additional Elements Required for Installation

1. 115 VAC or 230 VAC electrical source for battery charging circuit (dedicated disconnect).

2. Corrosion resistant conduit and fittings.

3. Suitable anchors for mounting controller, storage brackets and emergency shutoff switch.

Options

1. **Relay Interface Module (RIM)**
   P/N 4500.05
   Dry contact output relay with latching capability to indicate when an emergency close operation has been performed. Rated 5A@115/230V (see pages 4, 14, 15).

2. **Relay Reset Button Assembly**
   P/N 4500.06-A
   External manual relay reset button on controller. Converts momentary relay to latching.

C. Specifications

Emergency torque: 40 ft-lbs (55 Nm)
Motor speed: 1600 RPM
Charge current @ 115/230 VAC: 0.9 amp max
Charge current (solar) @ 12 VDC: 0.34 amp max
Battery Type: 12V, 8.0 amp-hr. High Rate
Battery backup power: Up to 5 days
Standard cable length: Gravity Mount: 7 ft.
Clamp Mount: 15 ft.
Valve: C.I. ** DWG's 110,113
Yoke: C.I.** DWG's 189,131

The C.I. (Chlorine Institute), Wash., DC torque specified : Emergency Close 40-50 ft-lbs

**Compatible with C.I. and CGA (Compressed Gas Association) No. 820, 820C Yokes.

II. Operation

A. General

Halogen Valve System's **Terminator Actuator** provides an electric powered closure for a 150 lb. chlorine cylinder or ton container valve. The valve must be opened manually with a chlorine valve wrench and process connections checked for leaks prior to installing the actuator. During an emergency, the actuator will close the cylinder or container valve when triggered by a gas leak detector, remote switch, or any combination of automatic or manual controls.

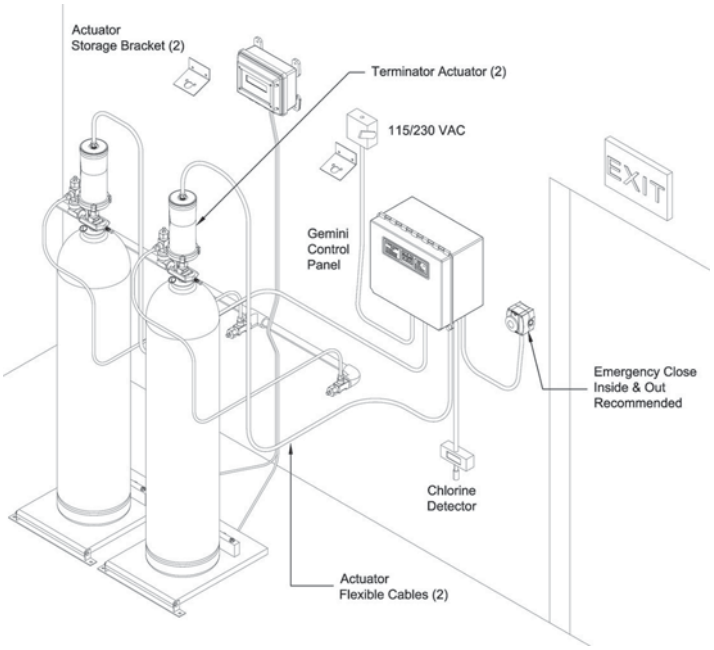
NOTE
The Terminator Actuator is a CLOSE ONLY device. Opening the valve must be accomplished manually.

The **Terminator Actuator** is constructed of specific materials selected for liquid or dry chlorine gas service. Three Viton O-rings in the Xenoy plastic alloy housing seal and protect the motor and drive section against harsh environments. One is in the bearing and two are between Xenoy surfaces.

Power for the **Terminator Actuator** is provided by a 12-volt battery and charger that are located within the **Gemini Controller.** A microprocessor in the controller insures the battery is always at optimal charge. Battery condition and system status are continuously monitored and displayed on the controller's panel. The controller uses 115/230 volt AC for the charging circuit. In the event of a loss of AC power, the battery will continue to provide system power for up to five days. If during a prolonged AC power outage the battery capacity falls to a critical level, the controller will automatically initiate the valve closing sequence to protect against an unguarded system, followed by an output relay signal alerting that a valve shutoff operation was performed.

The recommended installation includes a remote mountable emergency shutoff switch. One switch is provided per controller as a standard accessory. This switch should be located within easy reach of operating personnel, along the primary exit path from the cylinder or ton container area. It is also recommended that additional emergency shutoff switches be located at all exits and also on an exterior wall for access outside the confined chlorine area.

NOTE
For the typical chlorine valve that is open one full turn, the actuator will close the valve many times faster (in 3 seconds or less) than can be done manually with a wrench.



Typical Dual Cylinder Installation

III. Installation

A. General

The controller enclosure and fittings (MAX-LOC® cord grip), along with the actuator and cable are NEMA 4X rated to insure durability in a chlorine environment. It is recommended though that all components be located indoors, or within a weather-protected gas cabinet or shelter.

Installing the Terminator/Gemini system in accordance with the following instructions and in their order presented will insure a properly installed system with minimal installation time.

CAUTION

Do not connect AC power to the controller or battery leads to battery terminals until instructed to do so. All other connections should be completed first. Connecting AC power to the improper terminal block will damage the controller.

B. Gemini™ Controller

Installation of the controller should be performed by a professional electrician in accordance with applicable electrical codes.

Mount Controller

The Gemini controller enclosure is gasket sealed and rated for installation in a corrosive chemical environment. The controller should be rigidly mounted to a wall or other permanent structure within the length of the electrical cable and convenient to the cylinder or ton valve and the actuator storage bracket. Installation of the controller should be performed by an electrician in accordance with applicable electrical codes.

Gemini Controller

Maximum distance from actuator to controller must not exceed 17 ft (5.2m). *See Actuator Cable Extension info on page 18.*

The back of the Gemini enclosure is equipped with tapped screw holes for mounting tabs. The tabs and attach screws are taped to the inside of the enclosure door for shipping. Attach tabs to enclosure using screws and tapped holes. Fasten the controller to a wall or structure using the mounting tabs and proper anchors for the material. The controller should be mounted in a location which allows its status lights to be easily viewed by operators when working on the ton container or cylinder.

Mounting Tabs

It is recommended that 115 / 230 VAC power to the controller be supplied from a dedicated circuit with disconnect switch. Wiring should be through rigid PVC or liquid tight flexible PVC coated conduit. Connections and terminations should only be made in enclosures rated for the corrosive environment encountered in chlorine facilities (NEMA 4X). All controller entry fittings should be of the proper size and type to insure the gas-tight integrity of the enclosure is not broken at cable or conduit entrances. Molex Woodhead MAX-LOC® or similar fittings are preferred.

C. Actuator Storage Bracket

An actuator storage bracket is provided for each actuator. Install bracket on a wall or other structure in a location convenient to the cylinder or ton container and within reach of the actuator cable. The bracket helps prevent damage to the actuator and cable when not in use and during tank or cylinder change.

Gravity Mount Actuator Storage Bracket

Clamp Mount Actuator Storage Bracket

D. Actuator Cable

The actuator is shipped with an electrical cable pre-wired to the actuator. This cable cannot be disconnected from the actuator in the field. If longer cable lengths are necessary, see acceptable method for cable extension on page 18, and consult the factory.

Cable Entry Fittings

Connect actuator cable to the actuator terminal block inside the Gemini Controller (*see image and drawing on page 11 and 13).* For proper polarity, the actuator wire color must match the color labeled on the terminal. *Red = positive, black = negative*.

E. Contact Closure Input Wiring
(Emergency Shutoff Switch, Gas Detector)

WARNING
Do not apply any source of power to Input Terminal Block TB1. Applying power to this terminal block will damage the system.

Connect wires from remote shutoff switch and/or gas detector to the contact closure input terminal block "TB1" shown on pages 11 and 13. **Use 24 AWG twisted and shielded wire, such as Belden 9501 or equivalent.** Input can be configured for either normally open or normally closed contacts via the remote input jumper setting, JP1, on the controller mainboard shown on page 11 and 13. The controller default setting is normally open since the supplied emergency shutoff switch is a normally open switch. This default setting will cause all attached valves to close any time the input circuit is closed via switch or gas detector relay. See more info on pages 16 & 17.

F. Output Relay Wiring

CAUTION
Do not install unauthorized relays or other devices inside the Gemini controller box. Doing so may damage the controller and will void the Warranty.

The standard low voltage relay output is rated at a maximum of 1 amp @ 24V AC/DC. After the completion of an emergency shutoff sequence, this relay will close for approximately 3 seconds. The relay can be wired as Normally Open or Normally Closed but cannot be configured as latching.

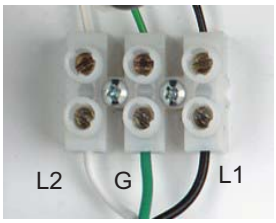
Optional Relay Interface Module (P/N 4500.05)

The optional **Relay Interface Module (RIM)** when ordered, takes the place of the standard low voltage relay. The Relay Interface Module provides a dry contact (K1) rated 5A @ 250VAC. Relays K2 and K3 on the Relay Interface Module are not factory configured for use but can be in the field if required. Contact factory for instructions.

G. 115 / 230 VAC Power

CAUTION
AC power must be OFF when connecting power wires to controller. Do not apply AC power to controller until battery has been connected.

After the controller is mounted and all I/O connections are made, connect wires for 115 / 230 VAC power. Connect 115 / 230 VAC wires to the terminal block labeled "115/230VAC", "WHT" (L2, low side), "GRN" (G, ground) and "BLK" (L1, high side). *See drawing on page 13.* Conduit and fittings should be rated NEMA 4X to maintain a gas and liquid-tight seal for the controller.



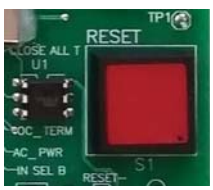
Terminal Block

H. Battery

WARNING
- **Battery MUST be connected for system to operate.**
- **To protect system, always connect battery first, then AC charging power. Always disconnect AC charging power first, then disconnect battery.**
- **Do not connect battery leads until AC power is also available. This will prevent excessive discharge of the battery which could damage the battery.**
- **If the polarity of the battery connection is accidentally reversed, the circuit board will be damaged.**

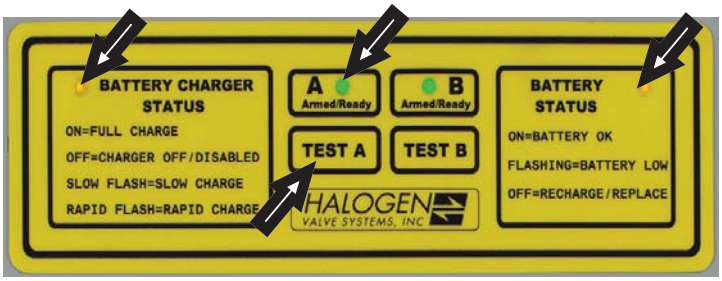
The battery is included, but not pre-installed in the Gemini controller. Install battery inside controller, securing with yellow bracket.

1. Connect the **Red** controller wire to the positive terminal of the battery. Connect the **Black** controller wire to the negative terminal of the battery.
2. Press the microprocessor **RESET** button on the mainboard inside the controller to insure initiation of the control program *(see board image on page 11 for button location).*



NOTICE
Pushing the mainboard "RESET" button is required whenever a new battery is installed or if the battery connection is interrupted during control system set-up.

I. Status Lights



With the battery connected, the **Armed/Ready** panel light should be flashing green for each Terminator Actuator that is attached to the controller. *If **Armed/Ready** light is OFF and actuator is connected to controller, attempt to reset controller by pressing and holding the **TEST B** key until **BATTERY STATUS** light turns OFF (+/- 6 seconds), then release. Controller will reboot.* ***This reset is required after every emergency activation but is not required after a test activation.***

Apply 115 / 230 VAC power to the Gemini Controller.

With the battery and AC power connected, the amber **BATTERY CHARGER STATUS** panel light will flash slow or fast indicating the amount of charge current being applied to the battery. A steady (solid) ON light indicates battery is fully charged.

If the amber **BATTERY STATUS** panel light is flashing after AC power is applied, the battery may have discharged during storage or transit. It should change to steady ON after a few minutes. **Do not proceed with the remainder of the installation until BATTERY STATUS light is steady ON.** If required, see the troubleshooting section of this manual for battery test or replacement procedures.

J. System Connection Check

The electrical system must be checked during installation for proper polarity and status indication. This is done by test running each actuator *BEFORE* placing the actuator on a cylinder or tank valve.

WARNING
Do not place actuator on valve until the following test is complete!

TEST PROCEDURE:

WARNING
During test, drive busing will rotate. Keep clear of drive bushing to prevent injury.

1. Place actuator in the storage rack or hold in a manner where drive bushing can be observed.
2. Depending on actuator being observed, press either **TEST A** or **TEST B** key on Gemini panel and observe rotation of bushing.
3. Confirm that the actuator shaft and drive bushing rotate in the closing direction when motor turns.

IMPORTANT
The actuator cables and controls are connected with proper polarity when the actuator motor drives the shaft and bushing in the direction that closes the valve (counter clockwise when viewed from the bottom of the actuator).

4. The actuator motor should run for about 3 seconds and then shut off automatically.
5. **If the bushing does not turn, or turns in the opening direction, DO NOT USE and contact factory!**
6. Repeat above **TEST PROCEDURE** for each actuator.
7. When the system successfully passes the polarity test, you may proceed to "**Mounting to a Cylinder Valve**", Section IV, or "**Mounting to a Ton Container Valve",** Section V, for further testing of the system.

IV. Mounting to a Cylinder Valve
Gravity Mount Model

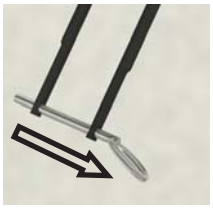
Follow these procedures:

1. Make sure all piping connections are in accordance with *The Chlorine Manual* or local procedures. The CGA 820 yoke and adapter assembly is the standard connection used to connect process tubing to the cylinder valve outlet. **Always install a new gasket between the valve face and the CGA 820 yoke connection each time the connection is made.**

2. Tightening the yoke bolt (in picture) will compress the gasket and secure the yoke rigidly to the valve by coupling the valve outlet flange to the process tubing or piping with a CGA 820 connection.

3. After checking for leaks at the connections, and with the valve opened no more than one (1) full turn of the valve stem, the **Terminator Actuator** can now be placed on the valve.

4. Remove the retention pin that extends through the end of both rods of the actuator.



5. Align the actuator shaft and drive bushing with the valve stem. With the actuator rods parallel to the sides of the valve, let the actuator slide down on the valve while rotating the drive bushing by hand to align the bushing with the flats on the valve stem (Fig. 1)

6. The drive bushing should fully engage the wrench flats on the valve stem.

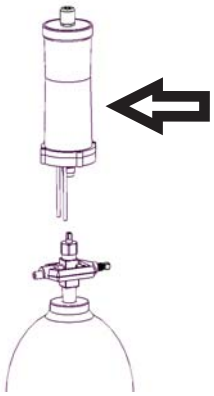


Fig. 1

7. The **Terminator Actuator** mounting rods are designed to straddle and loosely grasp the valve on either side of the outlet as shown in figure 2. The two rods on the actuator will fit inside the standard yoke and fit loosely on either side of the valve nozzle after the drive bushing is seated as shown in Figure 3.

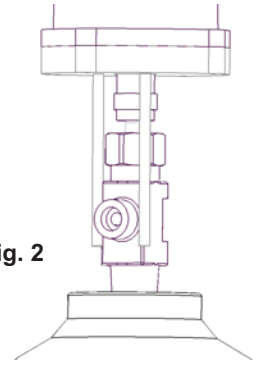


Fig. 2

8. Confirm proper alignment of the actuator and the valve stem by visually checking the actuator drive bushing and valve shaft.

9. Reinstall the retention pin. When properly installed, the pin should slide just under the valve outlet and extend through both rods. With the pin in place, the **Terminator** should not be able to be lifted up and off of the valve.

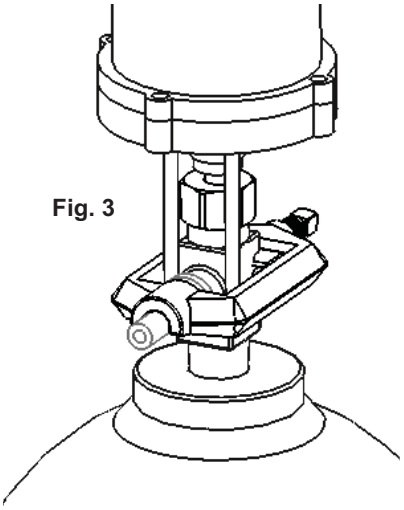


Fig. 3

10. The **Terminator Actuator** is designed to fit loosely and rest directly on the cylinder valve stem. When activated, the actuator will make a loud ratcheting noise and move around slightly during the closing of the valve**.**

11. The **Terminator Actuator** weighs about 8 pounds. Gravity, along with a secure fit on the cylinder valve, will keep the actuator in place during activation. The retention pin provides additional security.

12. Follow instructions for **In-Service Testing** in Section VI, Page 8 - ***Placing System In Operation.***

V. Mounting to a Ton Container Valve

The clamp mounting system for the Terminator valve actuator is designed for use with the Chlorine Institute recommended CGA 820 yoke connection assembly. Adapters are available that allow the clamp mount Terminator to also be used with direct mount vacuum regulators that do not employ the standard CGA 820 yoke connection. Special adapters can also be provided for unusual regulator or tubing connection devices. Consult the factory for engineering assistance.

A. Ton Containers On a Pressure Manifold

For chlorination systems using a pressure manifold (feeding under pressure), the clamp mount Terminator attaches directly to the CGA 820 yoke.

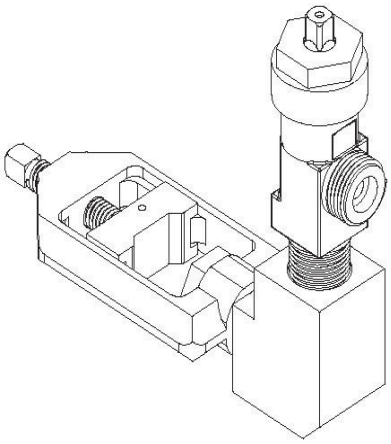
CGA 820 Open Style Yoke
Halogen Part No.5151.00

Yoke to Pigtail Adapter
Halogen Part No. 6888.00

For pressure systems not using a CGA 820 yoke, both yokes and yoke to pigtail adapters are available from Halogen Valve Systems.

B. Ton Mounted Vacuum Regulators

Direct mount vacuum regulators (VR's) are designed to mount directly to the ton container valve and vary widely in weight and configuration from one manufacturer to another.



Auxiliary Valve Adapter
Halogen Part No. 2202.00

An auxiliary valve adapter allows the clamp mount Terminator to be used with most ton container mounted vacuum regulators that do not employ the CGA 820 yoke connection.

Some direct mount vacuum regulators require the use of a VR Extension, P/N. 6303.00. The extension creates additional clearance between the vacuum regulator and the actuator. Contact your local Halogen Valve Systems representative or factory for assistance with vacuum regulator compatibility.

C. Ton Container Mounting Procedures

1. Make sure all piping connections are in accordance with *The Chlorine Manual* or local procedures. The CGA 820 yoke and adapter assembly is the standard connection used to connect process piping to the container valve outlet. **Always install a new gasket between the valve face and the CGA 820 yoke connection each time the connection is made.**

2. Tightening the yoke bolt will compress the gasket and secure the yoke rigidly to the valve thereby coupling the valve outlet flange to the process tubing or pipe using the CGA 820 connection.

WARNING
The yoke must be tightened adequately to the valve to insure that the torque reaction from the actuator closing does not unseat the lead gasket.

3. After checking for leaks at the connections, and with the valve opened no more than one (1) full turn of the valve stem, the **Terminator Actuator** can now be placed on the valve.

4. The actuator mounting clamp arms are designed to straddle and grasp the yoke firmly. Align the actuator shaft and drive bushing with the valve stem. With the actuator clamp arms

open and parallel to the sidebars of the yoke, rotate the drive shaft by hand to align the bushing with the flats of the valve stem and place bushing over valve stem.

5. The spring-loaded drive bushing at the base of the actuator shaft should fully engage the wrench flats on the valve stem and the clamp arms should straddle the sides of the yoke.

6. Tighten the clamp knob finger tight while rocking the actuator slightly back and forth. This will assist in parallel alignment of the actuator with the sides of the yoke, and the actuator shaft will be concentrically aligned with the valve stem. The horizontal position of the ton container valve requires careful attention to the alignment of the actuator with the valve stem.

7. **The clamp knob is only required to be finger tight. This will securely hold the Terminator in place on the yoke and allow no rocking movement.**

8. Check visually for proper alignment of the actuator and the valve. If alignment appears to be incorrect, loosen the clamp knob slightly and adjust the alignment of the actuator then retighten the clamp knob.

VI. Placing System In Operation

A. Opening the Valve

Before opening any chlorine valve, make sure that the yoke or regulator clamp is tightened firmly. Never reuse a gasket that has been previously compressed. **It is recommended that all pressure connections be made and tested as described in The Chlorine Manual before operating the valve actuator.** This will insure that the valve can be operated manually and that leak testing has been completed prior to installing the actuator.

B. In-Service Testing

With the system pressurized and the flow of chlorine established, the emergency shutoff system may be tested under actual conditions. This test is recommended each time the actuator is installed on a new cylinder or ton container to insure actuator has been correctly installed, and that the operating condition of the valve will permit proper closing of it by the Terminator/Gemini system.

Confirm that the Gemini controller panel lights are in the following normal conditions:

LIGHT	COLOR	CONDITION
ARMED/READY	GREEN	FLASHING
BATTERY CHARGER STATUS	AMBER	STEADY ON
BATTERY STATUS	AMBER	STEADY ON

If an **Armed/Ready** light is OFF but the actuator is connected to controller, attempt to reset controller by pressing and holding the **TEST B** key until the **BATTERY STATUS** light turns OFF (+/- 6 seconds), then release. The system will reboot after which all status lights should indicate a normal condition. **This reset is required after every emergency activation but is not required after a TEST key activation.**

If other lights are not properly indicating, see TROUBLESHOOTING, Section XIII, on page 12.

With lights indicating a normal condition, depending on the actuator you wish to test, press the **TEST A** or **TEST B** key. The actuator will immediately activate and close the valve. A loud ratcheting noise from the actuator during closure is normal. The **Armed/Ready** lights will rapidly flash alternately ON and OFF for approximately 10 seconds then return to slow, synchronized (if two actuators connected) flashing when ready for another close cycle.

Remove actuator from valve, check that all process connections are secure, reopen the valve no more than one full (1) turn, and check for leaks.

The force required to reopen the valve should confirm that the actuator applied enough torque to completely seat the valve stem. If valve does not appear to have been properly closed, do not place actuator in service!

C. Corroded Valves

WARNING
If the valve cannot be readily operated both manually and by the actuator, the cylinder or container should not be placed in service under any circumstances.

Cylinder or ton containers left in dispensing service for extended periods may develop corrosion or fouling of the valve body, packing, packing nut, and stem. This can substantially increase the amount of torque required to close the valve**. In severe cases, the increase in the torque required could exceed the capacity of the actuator to close the valve.**

To reduce the potential for fouling, implement the following policies and procedures**:**

1. Test cycle the actuator system at least once per month when in service.

2. Specify that the chlorine supplier provide only cylinders or ton containers equipped with Chlorine Institute approved Teflon valve packing. This greatly reduces friction between the packing and stem. In the past, graphite-impregnated, split packing rings were the only approved packing system for cylinder and container valves. These require greater gland nut tightness to seal, resulting in higher friction between the valve stem and packing. Friction is increased even more when the stem is corroded or fouled. The solid, non-split Teflon packing seals better, with less gland pressure, and requires less force to open or close even if the stem is corroded. New seal kits are available for suppliers to convert existing valves to the new Teflon packing at nominal cost.

3. Wet chlorine is the primary cause of corrosion of the internal components of these valves. This may be due to poor quality control during the refilling of containers by the supplier. Additionally, moisture and/or other contaminants may not be fully evacuated from the chlorine container before refilling. Moisture can also enter the valve and cylinder through "suck-back" from the dispensing piping or atmosphere. This problem is the result of temperature changes or other design deficiencies.

4. Consult with your supplier concerning their refilling equipment and techniques as well as valve reconditioning and repackaging. Detailed procedures are covered in the Chlorine Institute (C.I.) Pamphlet # 17, *Cylinder and Ton Container Procedure for Chlorine Packing,* to insure high quality, dry chlorine and contaminant free valves that turn freely and easily (less than 10 ft-lb. of torque).

5. Consider the installation of equipment that dispenses chlorine gas with a vacuum regulator.

VII. Maintenance

This can eliminate "suck-back" and the intrusion of atmospheric moisture. Your Halogen Valve Systems representative can provide information on devices engineered to dispense chlorine while precluding the introduction of contaminants.

A. Operational Testing

The system test sequence described in **In-Service Testing**, (section B on page 8) should be performed each time a tank or cylinder change-out is done. For cylinders or ton containers kept in extended service, this system test should be performed at least once per month, and preferably once a week. The battery capacity is not appreciably affected by one or even several test cycles of the actuator when normal AC charging power is available.

B. Gas Detector & Emergency Shutoff Switch Testing

If a leak detector senses chlorine gas from a leak or from residual released during tank or cylinder change-out and triggers the Gemini Controller to close the chlorine valve, make sure that the room is completely clear of chlorine gas before resetting the Gemini Controller (RESET: *Press and hold **TEST B** key until **BATTERY STATUS** light turns OFF, +/- 6 seconds, then release).* Otherwise, the gas sensor will still be detecting residual chlorine in the room causing an emergency close signal to be sent the Gemini controller, immediately activating another emergency close sequence.

Test Procedure

The testing or calibration of a gas leak detector, emergency shutoff switch or any remote input to the controller may be checked by the following procedure. This procedure also provides a check of the electrical continuity of the entire system.

1. Place actuators in storage brackets.

2. Expose the gas leak detector sensor to a calibration gas, press an emergency close switch, or activate any other input device you wish to test.

3. After the controller receives an input signal, each actuator should run for about 3 seconds, indicating that the controller received the signal correctly.

4. The **Armed/Ready** lights will alternately flash, then turn off until system is reset.

5. To reset controller, press and hold the **TEST B** key until **BATTERY STATUS** light turns OFF (+/- 6 seconds), then release. System will reboot and all lights should then indicate normally.

WARNING
If the BATTERY STATUS light is flashing, the actuator may not operate even with charge power connected. If the battery is fully discharged, it will not recover regardless of charging time. The battery must then be replaced.

NOTE: This procedure is similar to In-Service Testing outlined previously except that the triggering signal originates with a leak detector or emergency shutoff switch rather than the controller panel **TEST** key. Since the actuators are not on valves during this test, this procedure may be repeated at 15 second intervals for numerous sensor calibrations or input tests without the need to reopen the cylinder or ton container valve after each cycle. Additionally, there will be no impact noise and the battery will not discharge as quickly since there is less load on the drive motor.

C. Battery

NOTICE
Factory recommends annual replacement of battery. Contact representative or factory for replacement battery.

1. Operating Characteristics

Expected life of the system battery is 2 to 3 years under normal conditions. However, due to differences in environmental factors and use, the capacity reduction rate of each battery varies. Because of this, **it is recommended that the battery be replaced annually with a factory new battery to insure system warranty and reliability of torque application.**

The **BATTERY STATUS** light flashes when the Gemini microprocessor detects a voltage of less than 12.5 volts across the battery. During activation or system test, the **BATTERY STATUS** light may flash intermittently. This is due to the high current draw of the actuator motor during the closing and seating of the valve. As long as the **BATTERY STATUS** light is on and steady, the battery has sufficient charge.

A fully charged battery has the capacity to power the actuator through ten cycles, under load, in a five minute period. Thereafter, allow five to ten minutes for cooling and recharging. After a test cycle, be sure that the **BATTERY STATUS** light is on and steady before proceeding with the next test. Discharging below about 9 volts can damage the battery. At that point, the **BATTERY STATUS** light goes off and the battery cannot be recharged and must be replaced.

2. Storage

Spare batteries, when not supplied a sustaining charge, have a shelf life of approximately one year if stored in a cool, dry place. Periodic recharging of spare batteries through a regular service rotation will extend shelf life.

3. Battery Replacement

WARNING
FACTORY APPROVED BATTERY ONLY!
Use of non-approved battery may prohibit system from operating correctly or damage system.

a) Disconnect AC power.

b) Open controller door and disconnect the BLACK battery lead, then the RED battery lead from the battery terminals.

c) Loosen the two knurled thumb screws on the battery crossbar and remove crossbar.

d) Remove the battery.

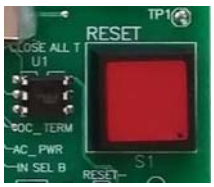
e) Place the new battery into the bracket with terminals at bottom.

f) Reinstall the battery crossbar and tighten the screws.

g) Connect the RED lead to the positive terminal and BLACK lead to the negative terminal of the battery. The **Armed/Ready** lights should slowly flash continuously ON and OFF for each connected actuator.

h) Reconnect AC power.

i) **Push the red RESET button on the mainboard** (see image and drawing on pages 11 & 13 for button location).



D. Microprocessor Circuit Board

All of the power management, display and diagnostic elements of the Gemini controller are integrated on a single circuit board mounted within the controller enclosure. The actuator power fuse, located in the upper right hand corner of the circuit board is the only replaceable component on the circuit board.

Two spare 30 amp green blade type fuses are included inside the controller. Additional fuses are available from the factory as Part No. 4102.

WARNING

Substitution of other fuses may result in damage to the control circuitry and/or actuator failure and may void warranty.

The microprocessor program is stored in an EPROM memory chip that is pre-programmed at the factory. The board is not field repairable and if it malfunctions it must be exchanged with a new or rebuilt factory unit.

How to remove the circuit board for replacement or repair:

1. Disconnect 115 / 230 VAC power at the source external to the control enclosure.
2. Disconnect DC power supply input.
3. Disconnect the battery leads from battery, then from board.
4. Disconnect the signal inputs, and optional relay board if installed, from the circuit board.
5. Disconnect actuator cables from board.
6. Remove the single screw holding the board to the center pin holder. Gently pull the circuit board down and it will pop out of the pin holders.

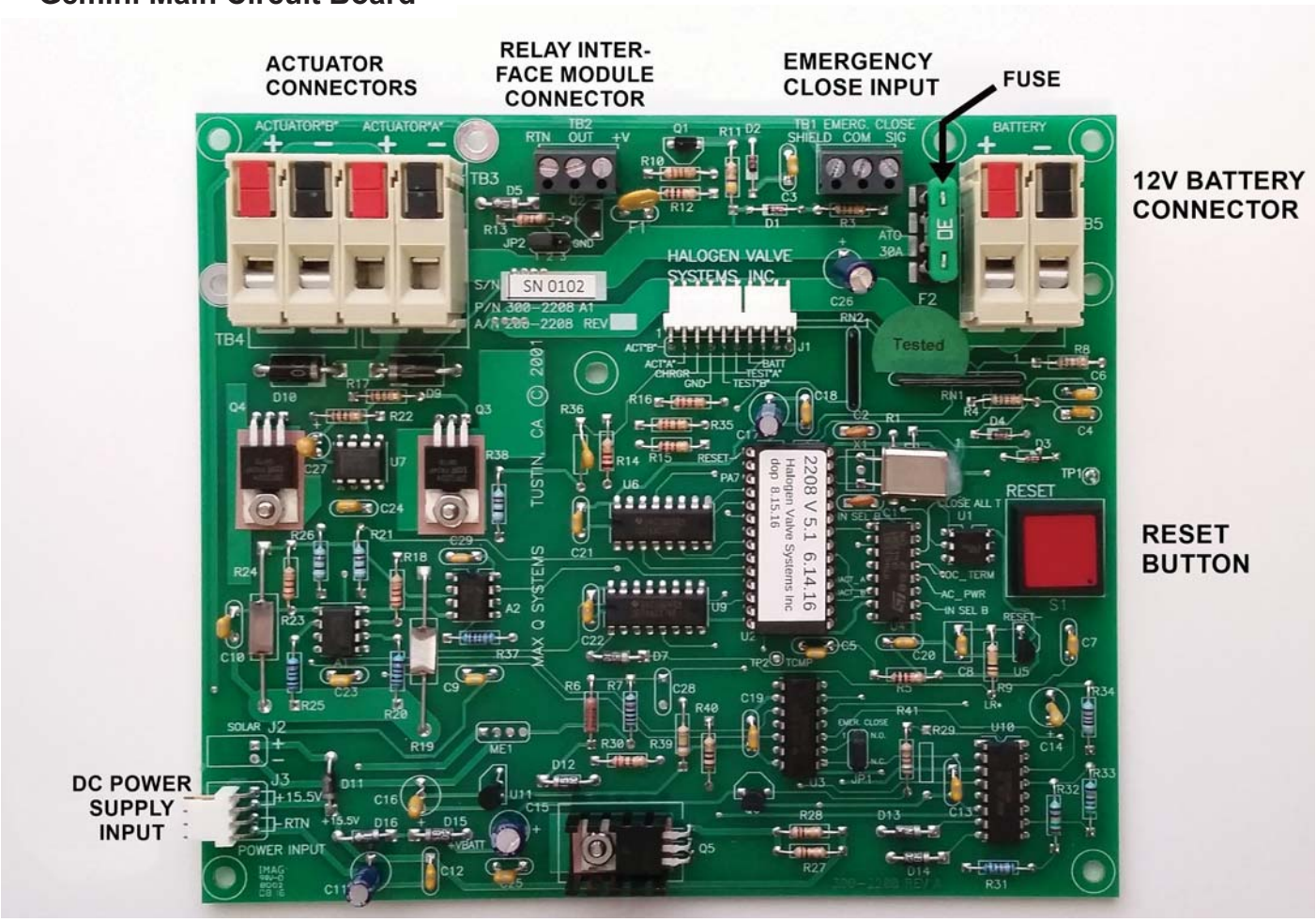
Reverse the above 6 steps to install the new board.

Be sure that the terminal posts and cable connections are secure in the terminal connectors.

OPERATIONAL TEST – IMPORTANT!

Verify wiring is in accordance with steps D thru I on pages 3,4 and 5 and that system passes test in step J on page 5 before placing system in service.

Gemini Main Circuit Board



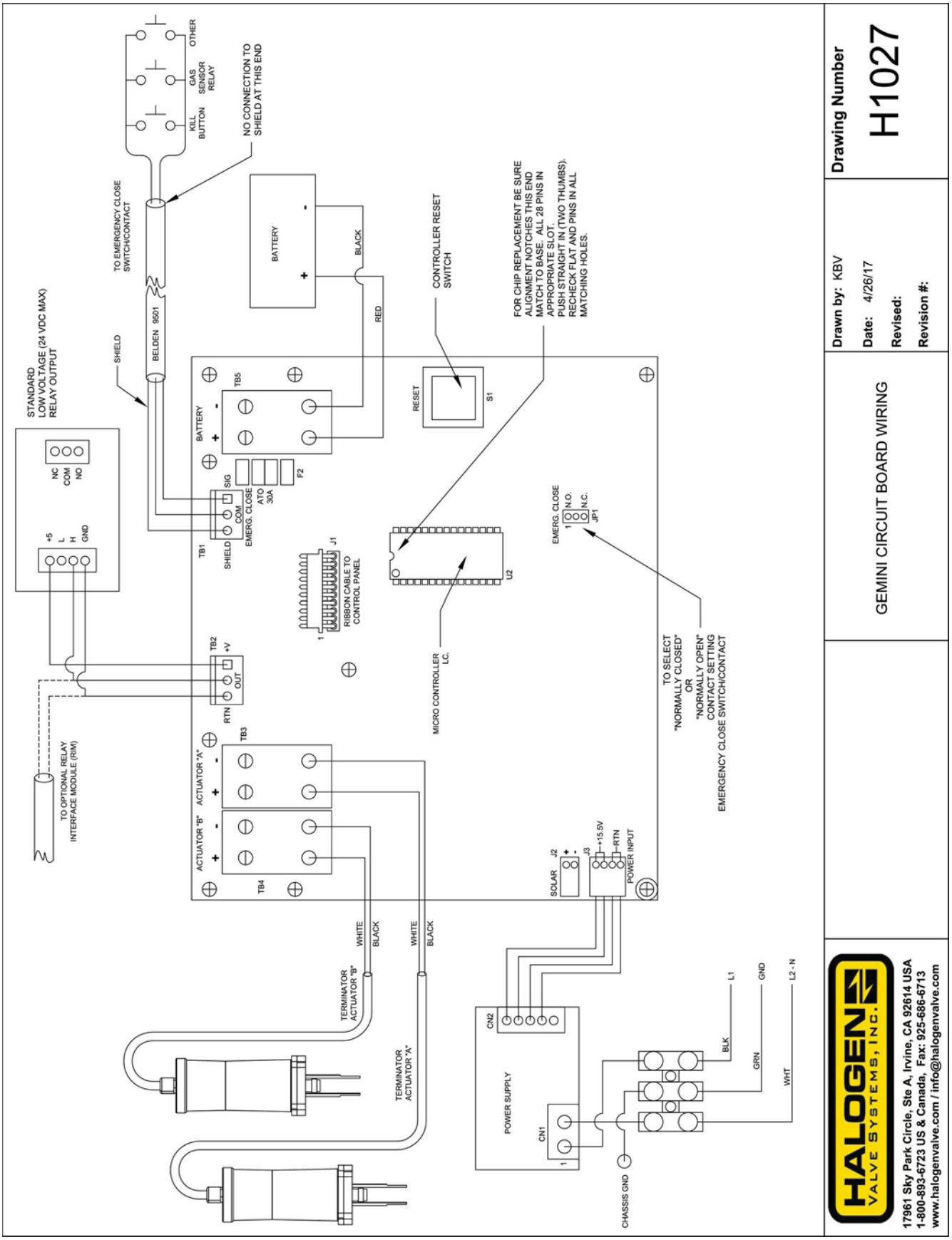
VIII. Troubleshooting

*For the **Gemini Controller***

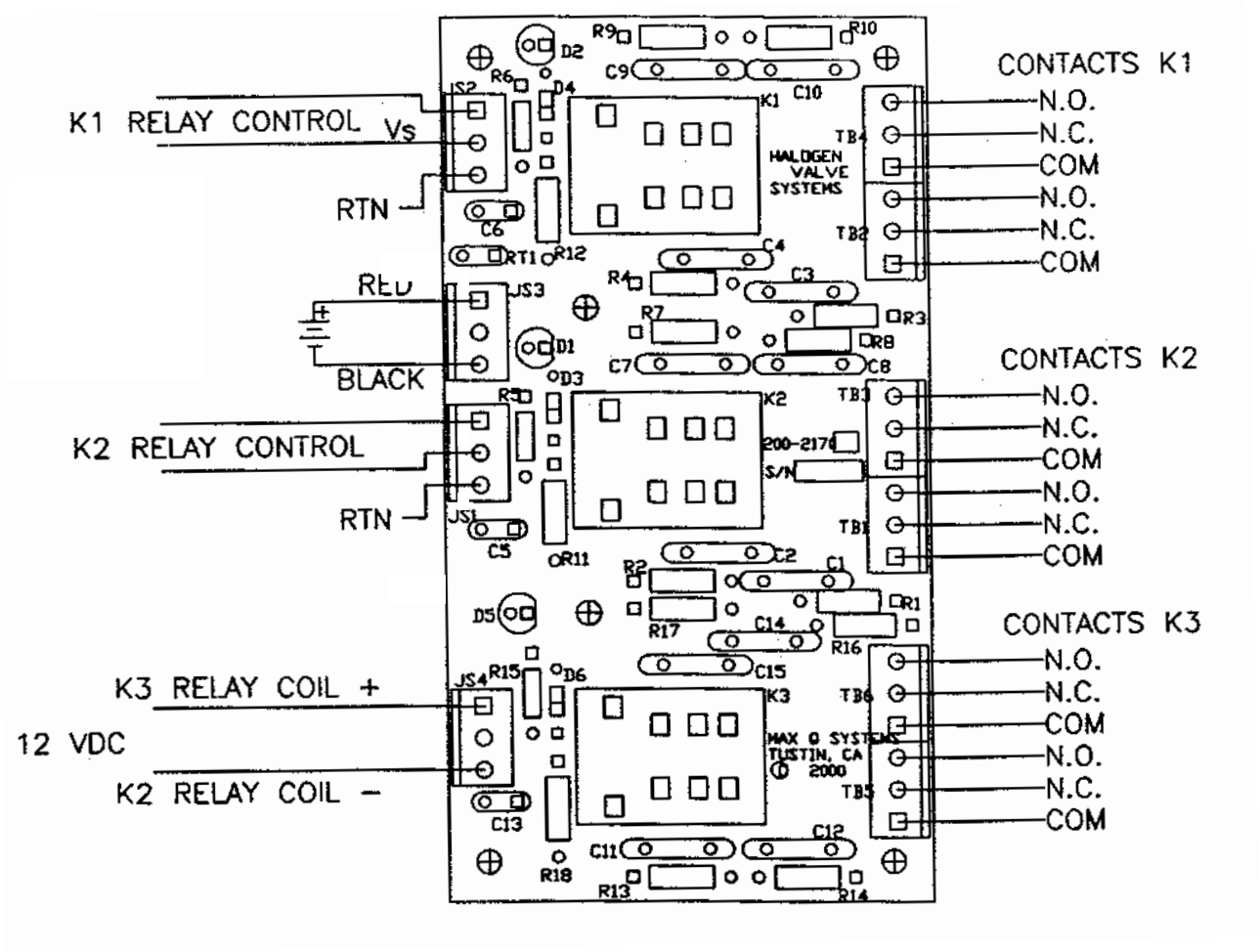
Trouble	Probable Cause	Corrective Action
"ARMED/READY " light OFF	A. Reset required	1. Press and hold "TEST B" key for 6 seconds. Required after every emergency activation. 2. Check "BATTERY STATUS" light. If OFF, go to "BATTERY STATUS" section below. 3. Check "BATTERY CHARGER STATUS " light. If OFF, check AC power to unit.
	B. Defective control panel	1. Press reset button on mainboard and hold while observing controller panel LEDs. All four LEDs should be illuminated. If one or more but not all are illuminated, replace controller panel.
	C. Defective control module	1. Press reset button on mainboard and hold while observing controller panel LEDs. All four LEDs should be illuminated. If none are illuminated, replace control module. Note: All LEDs should be OFF for 0.75 seconds after the reset button is released.
Actuator fails to operate when "TEST A" or "TEST B" key is pushed (Battery OK)	A. Microprocessor Stalled	1. Push microprocessor " RESET" button located on mainboard (see image and drawing on pages 11 & 13)
	B. Power fuse blown	1. Check the 30 amp, blade-type fuse (See page 11). Replace with spare included with instructions. 2. Determine the cause of the blown fuse. Most likely cause of blown fuse is a cross-connect or short in the cable.
	C. Cable damaged or bad connection	1. Check cable terminations for proper polarity. Check for damaged cable. Check for secure connections at cable termination in control box. Return actuator and cable to factory for service.
"BATTERY STATUS" light FLASHING or OFF	A. FLASHING- Low battery	1. Battery should recharge if "BATTERY CHARGER STATUS" light is on or flashing. Light should eventually return to steady on.
	B. OFF– Replace/ Recharge	1. Replace battery (page 10). After removal from the controller, verification of a bad battery can be accomplished by checking the voltage across the terminals with a voltmeter. Less than 12v indicates a defective battery. Otherwise, proceed with the following checks of the charging circuit. 2. Confirm AC power or solar cell power is available. Check the charging circuit as follows: a) "BATTERY CHARGER STATUS" light is on or flashing. b) Check that battery cable connections are secure at the circuit board terminals (refer to Maintenance Section for access to circuit board). c) Connect a DC voltmeter across the Red and Black battery cables. Must be at least 13 volts DC. Otherwise, replace circuit board (See Maintenance Section VII).

IX. Typical Circuit Board Wiring

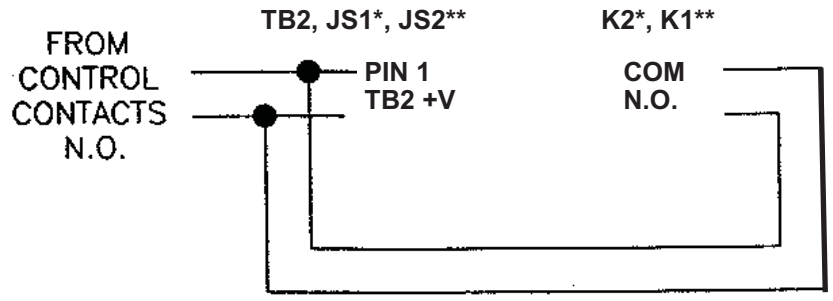
*For the **Gemini Controller***



X. Optional Relay Interface Module Circuit Board



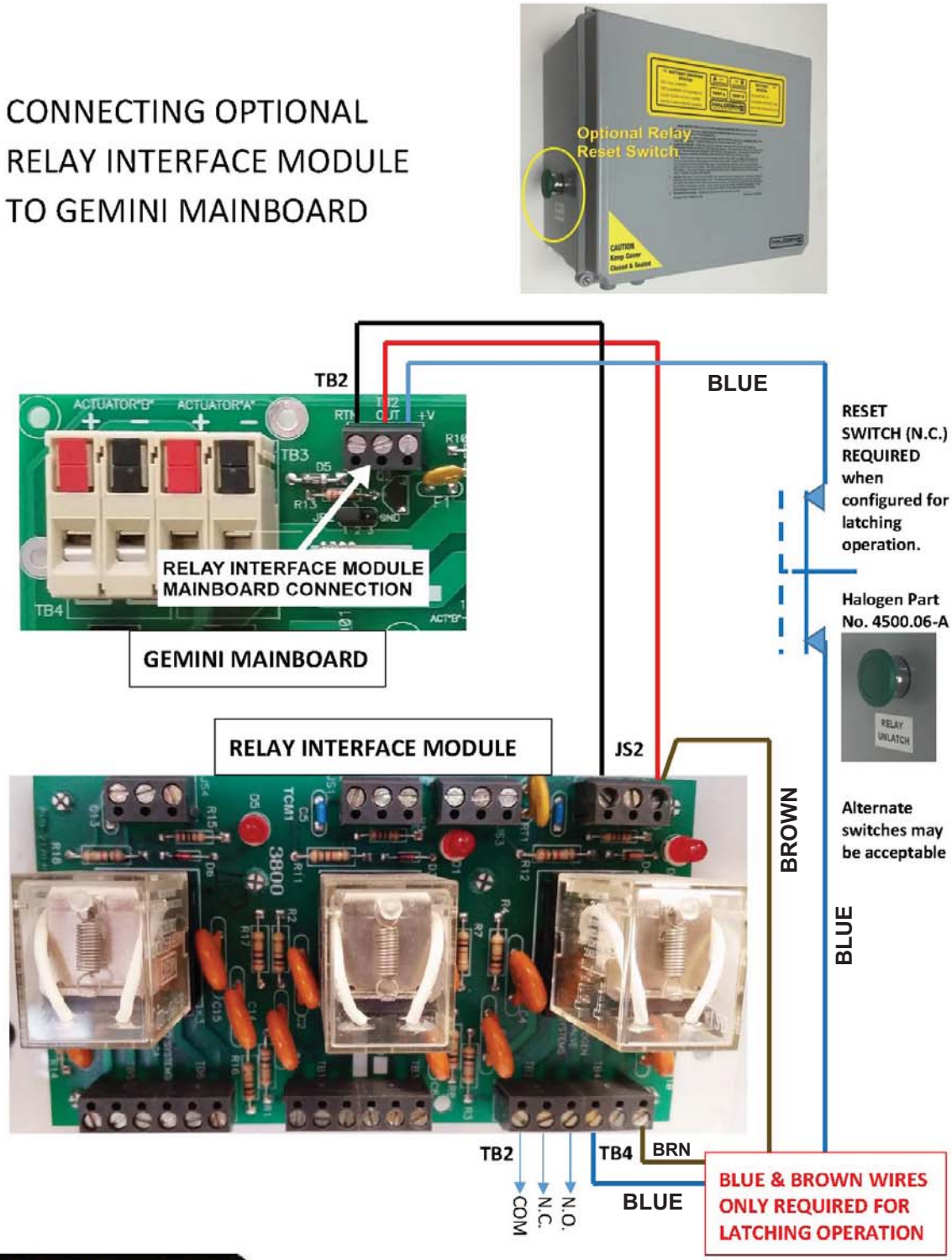
TO CONNECT AS LATCHING



*USE K2 RELAY WITH JS1
**USE K1 RELAY WITH JS2

XI. Optional Relay Interface Module Wiring

*For the **Gemini Controller***

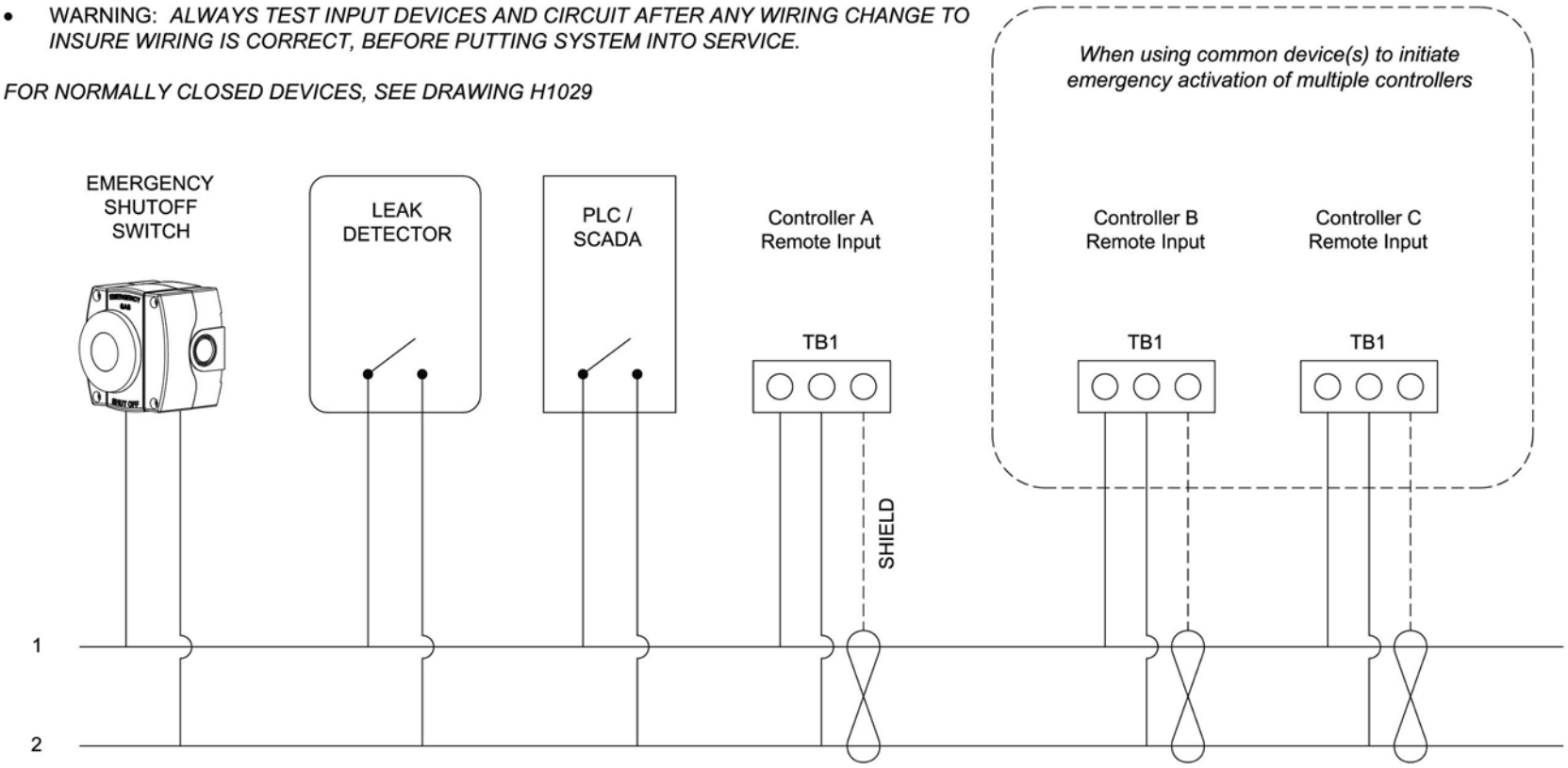


NORMALLY OPEN INPUT CIRCUIT WIRING

(FACTORY DEFAULT CONFIGURATION)

- FOR NORMALLY OPEN INPUT DEVICES
- CLOSING OF CONTACT INITIATES EMERGENCY CLOSE
- ALL DEVICES MUST BE WIRED IN PARALLEL
- WARNING: *ALWAYS TEST INPUT DEVICES AND CIRCUIT AFTER ANY WIRING CHANGE TO INSURE WIRING IS CORRECT, BEFORE PUTTING SYSTEM INTO SERVICE.*

FOR NORMALLY CLOSED DEVICES, SEE DRAWING H1029



RECOMMEND 24 AWG, TWISTED & SHIELDED WIRE (E.g. BELDEN 9501)

HALOGEN VALVE SYSTEMS, INC.
17961 Sky Park Circle, Ste A, Irvine, CA 92614 USA
1-800-893-6723 US & Canada, Fax: 925-686-6713
www.halogenvalve.com / info@halogenvalve.com

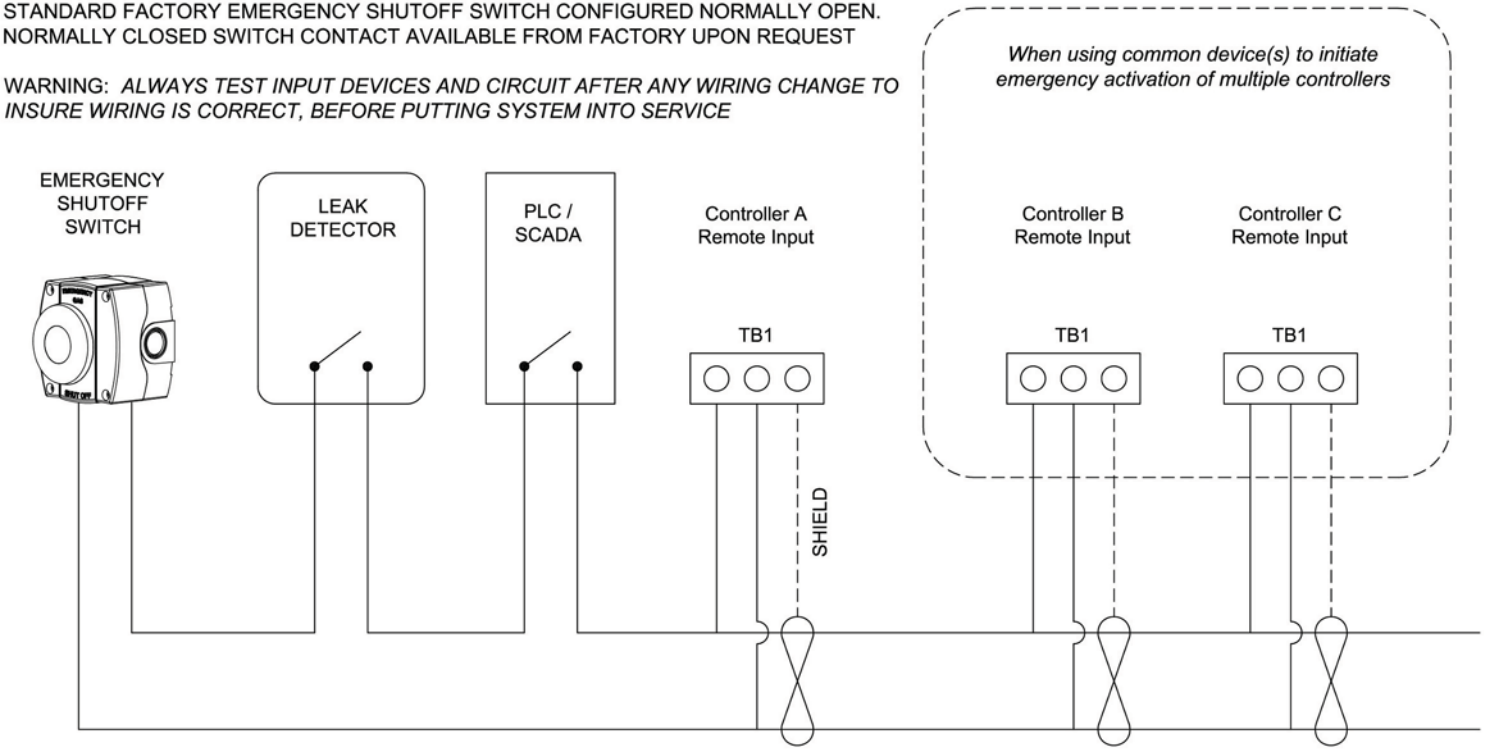
- NORMALLY OPEN -
REMOTE INPUT DEVICE
WIRING SCHEMATIC
FOR HALOGEN CONTROLLERS

Drawn by: KBV
Date: 5/10/17
Revised:
Revision #:

Drawing Number
H1028

NORMALLY CLOSED INPUT CIRCUIT WIRING

- FOR NORMALLY CLOSED INPUT DEVICES
- OPENING OF CONTACT INITIATES EMERGENCY CLOSE
- ALL INPUT DEVICES MUST BE WIRED IN SERIES WHILE INPUT TERMINALS OF MULTIPLE CONTROLLERS MUST BE WIRED IN PARALLEL
- CONTROLLER REMOTE INPUT FACTORY CONFIGURED AS NORMALLY OPEN. REMOTE INPUT ON HEXACON III AND DUPLEX II CONTROLLERS CAN BE CHANGED TO NORMALLY CLOSED IN CONTROLLER SETUP MENU. GEMINI CONTROLLER REMOTE INPUT CAN BE CHANGED TO NORMALLY CLOSED USING JUMPER J1 ON MAIN BOARD
- STANDARD FACTORY EMERGENCY SHUTOFF SWITCH CONFIGURED NORMALLY OPEN. NORMALLY CLOSED SWITCH CONTACT AVAILABLE FROM FACTORY UPON REQUEST
- WARNING: *ALWAYS TEST INPUT DEVICES AND CIRCUIT AFTER ANY WIRING CHANGE TO INSURE WIRING IS CORRECT, BEFORE PUTTING SYSTEM INTO SERVICE*



RECOMMEND 24 AWG, TWISTED & SHIELDED WIRE (E.g. BELDEN 9501)

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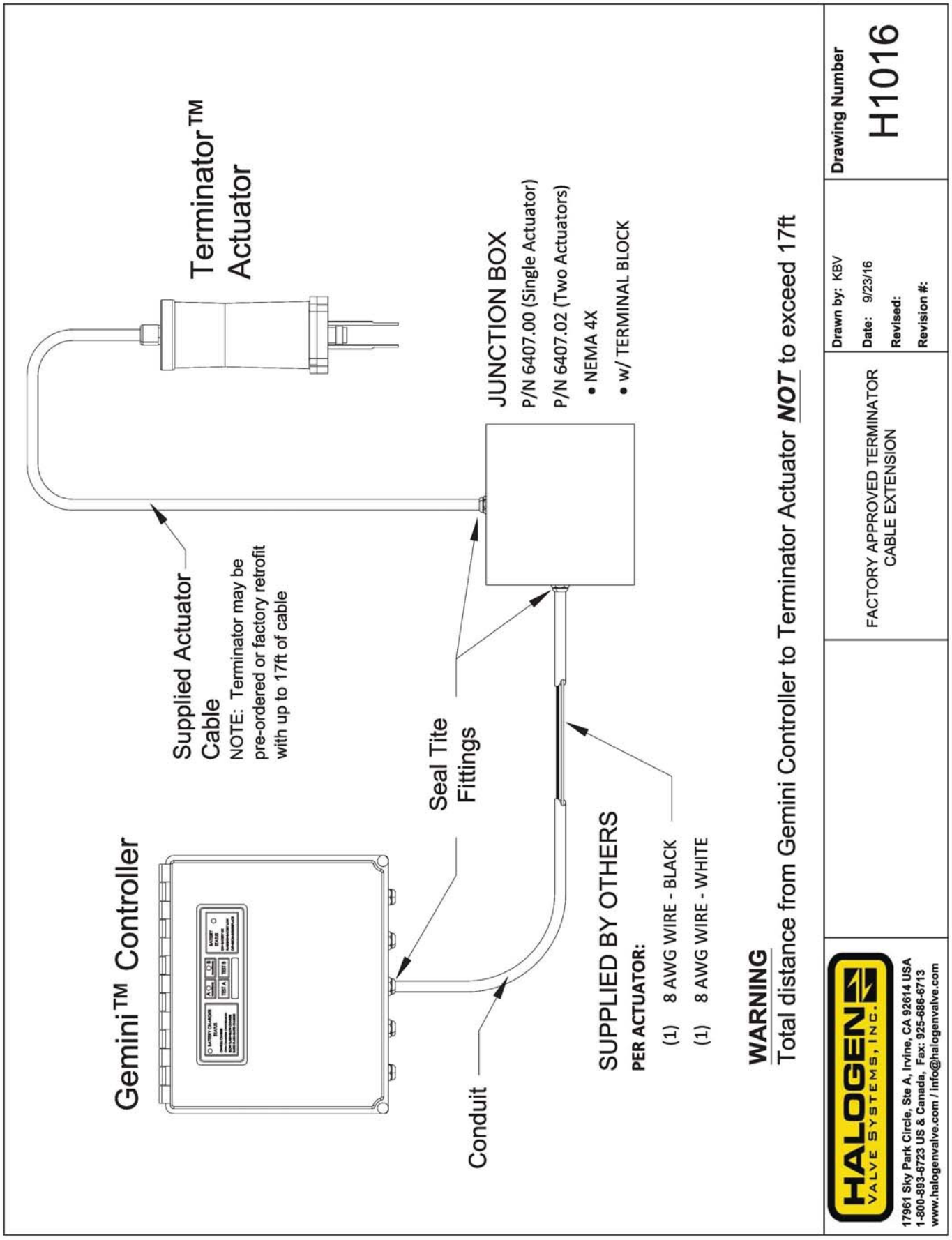
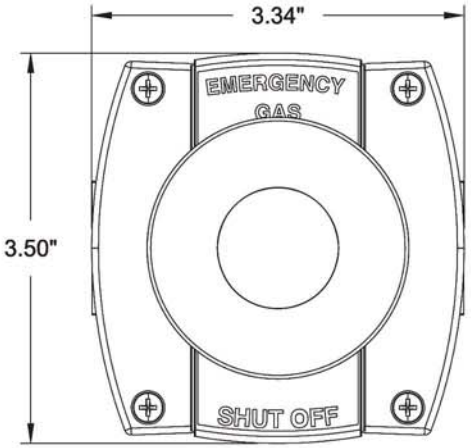
www.halogenvalve.com / info@halogenvalve.com

- NORMALLY CLOSED -
REMOTE INPUT DEVICE
WIRING SCHEMATIC
FOR HALOGEN CONTROLLERS

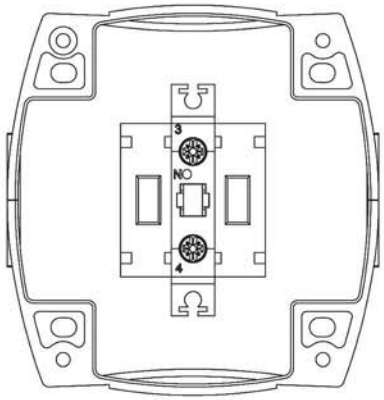
Drawn by: KBV
Date: 6/2/17
Revised:
Revision #:

Drawing Number
H1029

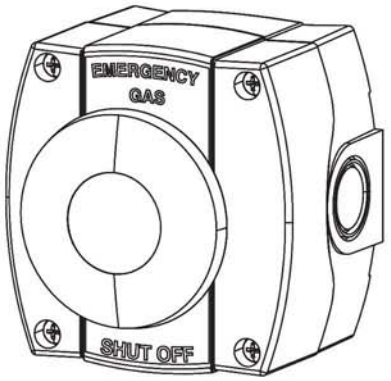

Terminator™ Actuator
Supplied Actuator Cable
NOTE: Terminator may be pre-ordered or factory retrofit with up to 17ft of cable
JUNCTION BOX
P/N 6407.00 (Single Actuator)
P/N 6407.02 (Two Actuators)
• NEMA 4X
• w/ TERMINAL BLOCK
Seal Tite Fittings
Gemini™ Controller
Conduit
SUPPLIED BY OTHERS
PER ACTUATOR:
(1) 8 AWG WIRE - BLACK
(1) 8 AWG WIRE - WHITE
WARNING
Total distance from Gemini Controller to Terminator Actuator NOT to exceed 17ft
HALOGEN VALVE SYSTEMS, INC.
17961 Sky Park Circle, Ste A, Irvine, CA 92614 USA
1-800-893-6723 US & Canada, Fax: 925-686-6713
www.halogenvalve.com / info@halogenvalve.com
FACTORY APPROVED TERMINATOR CABLE EXTENSION
Drawn by: KBV
Date: 9/23/16
Revised:
Revision #:
Drawing Number
H1016



Front View



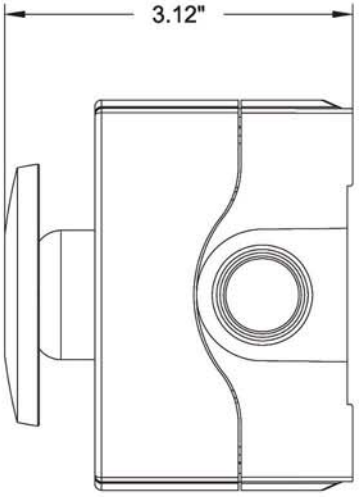
Inside View



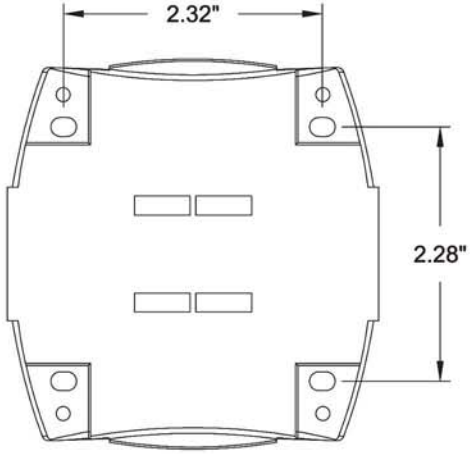
NOTE:

Use 24 AWG twisted and shielded wire to connect emergency switch to controller (e.g. Belden 9501 or equivalent).

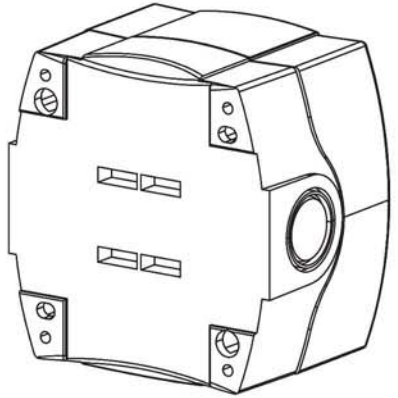
Do not put shielded wire in conduit with other electrical wiring.



Side View



Back View



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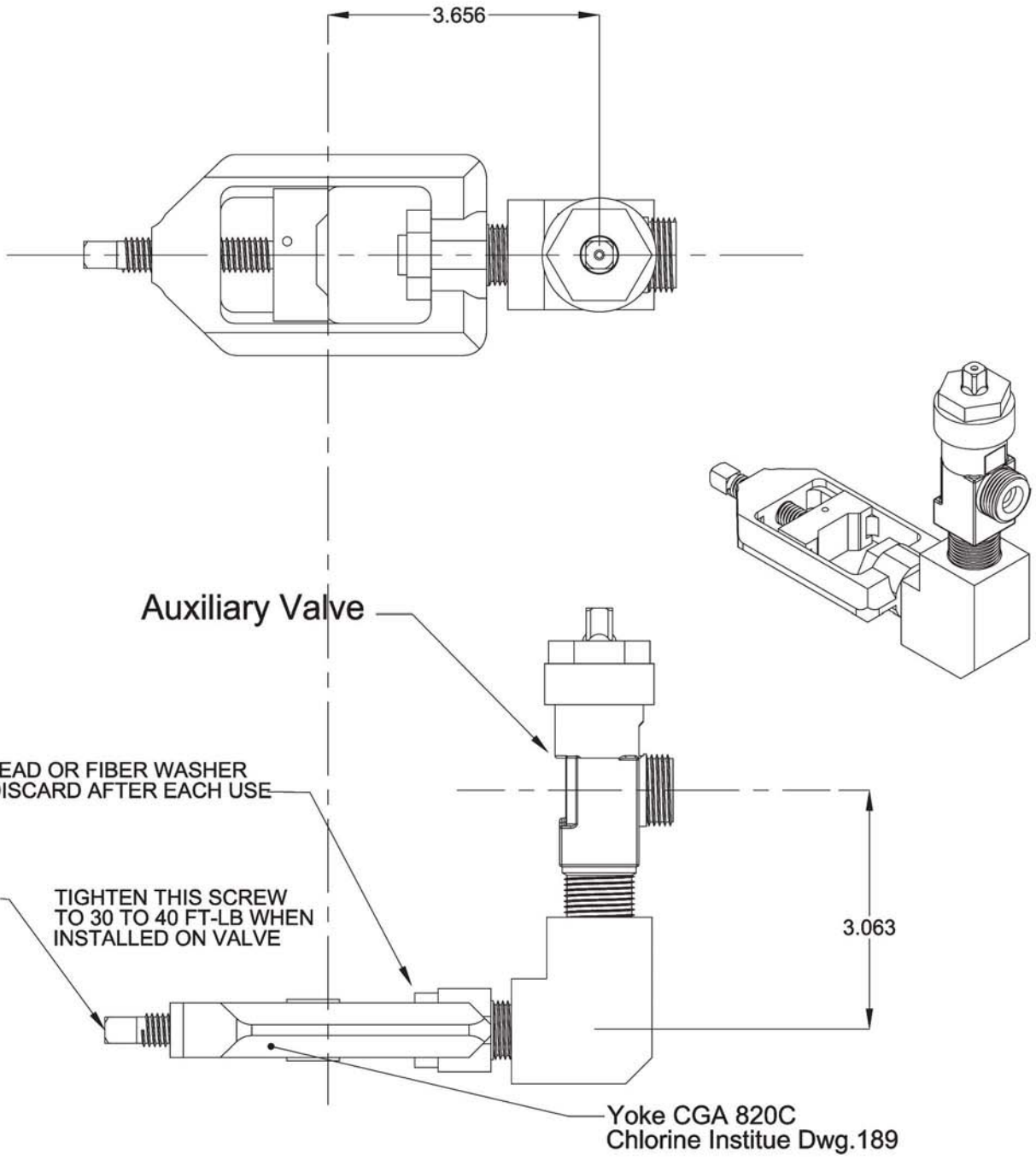
EMERGENCY SHUTOFF SWITCH
MODEL 6430.00

Drawn by: KBV
Date: 11/20/15
Revised:
Revision #:

Drawing Number
H1005

XVI. Optional Auxiliary Valve Adapter

APPLICATION		REVISIONS			
NEXT ASSY.	USED ON	REV.	DESCRIPTION	DATE	APPROVED



UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ARE: FRACTIONS ± 1/64 DECIMALS .XX ± .01 .XXX ± .001 .XXXX ± .0005 ANGLES ± 1 °	**Halogen** *Valve Systems, Inc.* 17961 Sky Park Circle Ste. A Irvine, Ca. 92614 Ph. (949) 261-5030 Fax (949) 261-5033	TITLE **Auxiliary Valve Adapter** (Universal Regulator Adapter)	
	MATERIAL / DATE	SIZE A / CODE / DWG. NO. D2202.00 / REV. 1	
	FINISH / 1/14/15		
DO NOT SCALE DRAWING	ISSUED	SCALE / WEIGHT / SHEET	

HALOGEN
VALVE SYSTEMS, INC.

17961 Sky Park Circle, Ste. A,
Irvine, CA 92614
Phone: 949-261-5030 Fax: 949-261-5033

TERMINATOR ACTUATOR ANNUAL CERTIFICATION PROGRAM

Halogen Valve Systems, Inc. (HVSI) has an annual program to clean, lubricate, inspect and test Terminator actuators that are no longer covered under the original warranty program. This program is designed to bring these actuators back into compliance to meet the standard design specifications. Following a thorough cleaning of the actuator, a complete inspection will be performed. Any replacement parts required would then be submitted to customer for approval prior to repairs. After repairs, the actuator will be subjected to a complete testing procedure on our test bench. If all replacement items are approved as requested by HVSI and bench testing is successfully completed, a “Terminator Actuator Inspection Certificate” will be issued for that actuator. Ask your local authorized Halogen Valve Systems, Inc. representative for additional details of this program.

Halogen Valve Systems, Inc. (HVSI) will not make an implied warranty of any other kind with respect to this product except as set forth herein. Seller makes no warranty of merchantability or of fitness of the material or equipment for any particular purpose even if seller knows that purpose. HVSI shall not be liable for any incidental or consequential damages arising from the use of the equipment. HVSI’s liability and customer’s remedies for a period of one year from inspection date are expressly limited to the repayment of the repair price or repair of the unit at HVSI’s election. Items requiring repair must be returned to HVSI’s factory, or a designated repair station, freight prepaid. HVSI reserves the right to void any warranty on equipment that has been clearly abused or left open to the elements.

Our Toll-Free Number is 877-476-4222

HALOGEN
VALVE SYSTEMS, INC.

THREE YEAR FACTORY WARRANTY

Halogen Valve Systems, Inc. warrants its Eclipse™ & Terminator™ Actuators and their Controllers for a period of three (3) years from the date of shipment against defects in materials or workmanship. Halogen makes no implied warranty of any other kind with respect to the products except as set forth herein. Seller makes no warranty of merchantability or of fitness of the material or equipment for any particular purpose even if seller knows that purpose. Seller shall not be liable for any incidental or consequential damages arising from the sale or use of the equipment. Halogen's liability and customer's remedies are expressly limited to repayment of the purchase price, repair or replacement (at Halogen's election) during the warranty period. Items requiring repair must be returned to Halogen's factory, or a designated repair station, freight prepaid. Halogen reserves the right to void the warranty on equipment that has been clearly abused or left open to the elements.

Any Problems?….Call our Toll-Free Number (877) 476-4222

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Rev 12/2016

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