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Flare Stack

Operations & Maintenance Manual

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WARNING

Read the OPERATION MANUAL before operating this equipment.

- **NOTE:** Algas-SDI reserves the right to use alternate manufacturers' components as vendor delivery applicability dictates. Vendors have supplied literature contained in the Operation Manual. Please check to be sure supplied data matches your configuration. Contact Algas-SDI if any questions exist.
- This equipment uses LPG-a flammable fuel, or NH₃-a toxic gas, (depending on the model), handled under pressure. Inherent hazards exist and a thorough understanding of the equipment is required to allow safe operation and maintenance.
- Allow only a TRAINED and FULLY QUALIFIED PERSON to service this equipment.
- Any time a component must be replaced, use the same type, model, etc. **DO NOT SUBSTITUTE!** The consequence from such actions are unpredictable and may lead to dire consequences. When components are replaced with components not approved for use in our FM/UL listed equipment, the FM/CSA listing becomes void for that unit.

WARRANTY REGISTRATION

To Register your new equipment: Visit Algas-SDI's web site at: algas-sdi.com, then click on the "Tech Support" button. Select online Registration or print out the Acrobat Warranty Registration.

OR

Fill out the Warranty Registration information on the last page of this manual. Then make a photocopy and mail to the address shown at the bottom.

WARRANTY, COPYRIGHTS and APPROVALS

WARRANTY

Algas-SDI International, LLC (ASDI) warrants that the equipment is free of defects in materials and workmanship under normal use and service. ASDI agrees to repair or replace, at our option, without charge f.o.b. factory, any part which has proven defective to the satisfaction of Algas-SDI International, LLC within one (1) year from the date of the original installation or within 18 months from the date of shipment, whichever is earlier. Equipment, which in the opinion of ASDI, has been damaged by improper installation or operation, or has been abused or tampered with in any way, will not be accepted for return under warranty.

Algas-SDI International, LLC will not accept back charges for work performed by others upon or in conjunction with ASDI equipment, unless prior authorization is given by means of an Algas-SDI International, LLC purchase order. Algas-SDI International, LLC will not be liable by reason of shutdown, non-operation or increased expense of operation of other equipment, or any other loss or damage of any nature, whether direct or consequential, arising from any cause whatsoever.

Algas-SDI International, LLC makes NO other warranty of any kind, whatsoever expressed or implied; and all warranties of merchantability and fitness for a particular purpose are hereby disclaimed by Algas-SDI International, LLC and excluded from these terms of sale. No person has any authority to bind Algas-SDI International, LLC to any representation or warranty other than this warranty.

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SYMPOLS and CONVENTIONS

Special symbols are used to denote hazardous or important information. You should familiarize yourself with their meaning and take special notice of the indicated information. Please read the following explanations thoroughly.



GENERAL WARNING OR CAUTION

Indicates hazards or unsafe practices, which can result in damage to the equipment or cause personal injury. Use care and follow the instructions given.



FLAMMABLE GAS HAZARD

Indicates a potential hazard, which can result in severe personal injury or death. Use extreme care and follow the instructions given.



ELECTRICAL DISCONNECT REQUIRED

Indicates a potentially dangerous situation, which can result in severe personal injury or death or damage to equipment. Use great care and follow the instruction given.

ASDI CONTACT NUMBERS

If you have questions, need help with your equipment, or want information on other products, contact Algas-SDI at:

Telephone: 206.789.5410

Facsimile: 206.789.5414

Email: sales@algas-sdi.com

Internet: <http://www.algas-sdi.com>

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Appendix A: Component Information

Appendix B: Technical Information

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Figure 6 - Electrical schematic for 220V Flare Stack - Page 1 of 2

Figure 7 - Electrical schematic for 220V Flare Stack - Page 2 of 2

Warranty Registration - Refer to the nameplate on the unit to fill out the product registration. Then Photocopy and mail to address shown. Or register on line by visiting Algas-SDI web site under "Tech Support".

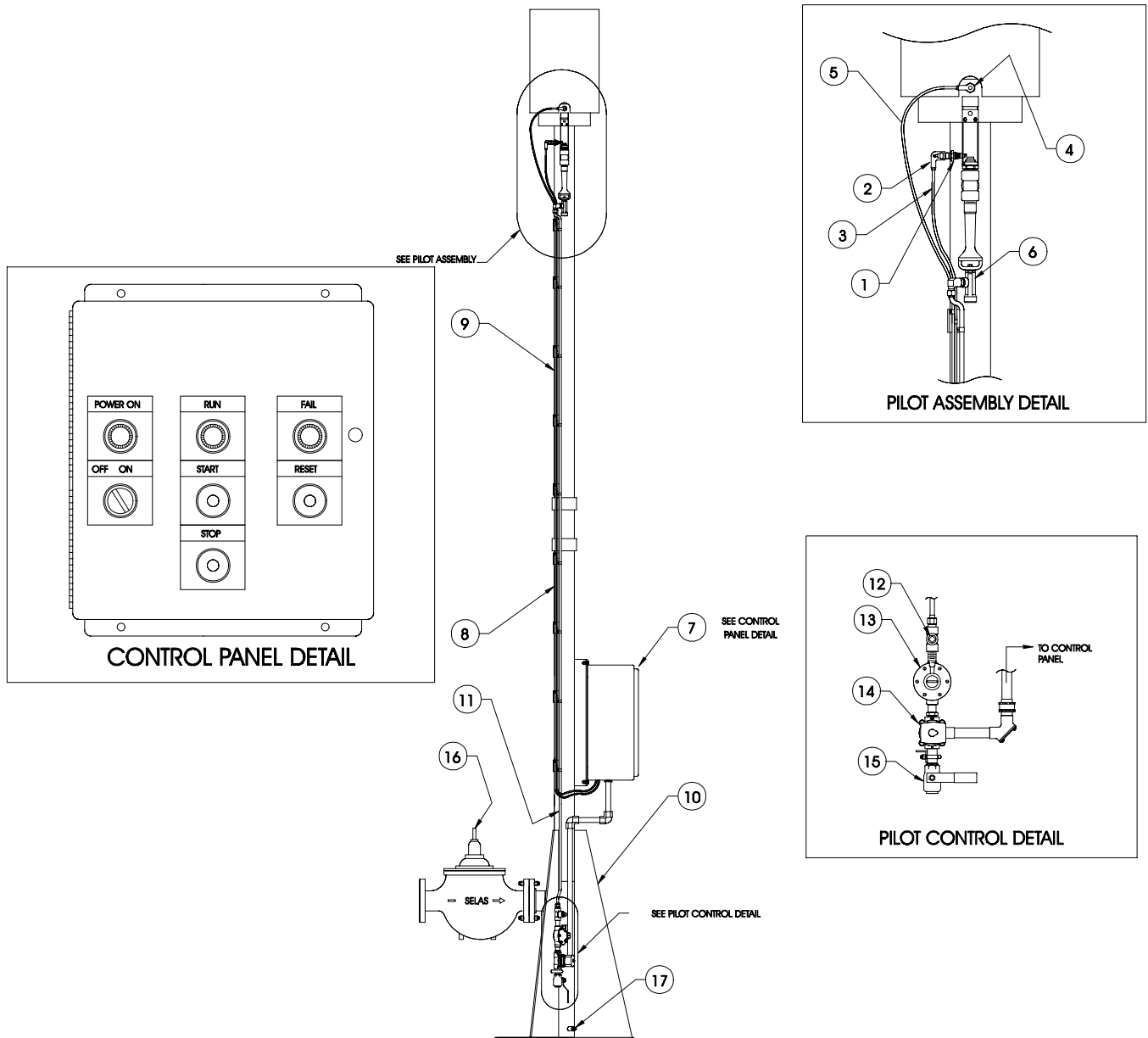
DESCRIPTION

Algas-SDI FLARE STACK burns unwanted combustible hydrocarbon gases. When the flare stack starts, a flame safeguard controller energizes an ignition transformer, opens a pilot valve, and ignites a gas pilot. A flame detector then verifies the pilot flame. After the flame is detected, the status contacts in the control panel close, allowing primary gas valves (by others) to open. Gas flows through the fire check and out the flare stack. The unwanted gas is then lit by the pilot flame.

When the flare stack is stopped, the status contacts in the control panel open, allowing the primary gas valves to close. The pilot valve closes, extinguishing the pilot flame. If the pilot flame is not detected, the status contacts in the control panel open, allowing the primary gas valves to close. The system activates an alarm and must be manually reset.

Introduction

Figure 1 – Components



Components.wmf

PILOT ASSEMBLY DETAIL

1. Spark igniter
2. Spark connector with boot
3. Spark igniter cable
4. Flame rod with boot and cable
5. Flame rod cable
6. Adjustable orifice assembly

MAIN COMPONENTS

7. Control box
8. Flare stack lower assembly
9. Flare stack mounting bracket
10. Mounting base
11. Pilot light tubing
12. Pilot gas test plug
13. Pilot regulator
14. Pilot solenoid valve
15. Pilot shut-off valve
16. Fire check valve
17. Drain plug

CONTROL BOX SWITCHES AND INDICATORS

- Power ON indicator
- OFF-ON switch
- RUN indicator
- START push button
- STOP push button
- FAIL indicator
- RESET push button

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WARNING

Before starting, be sure control box and Flare Stack assembly have a good ground connection. The ignition transformer requires a good ground connection. Grind paint off mounting panel and transformer mounting foot for a good connection. Use locking star washers to mount transformer.

Install the flare stack in accordance with applicable codes and local regulations, as required.

Installation requirements vary according to local, provincial and state requirements. Consult state, provincial, and local authorities as well as insurance carriers for installation requirements.

ASSEMBLY OF COMPONENTS

The following separate items compose the flare stack and require assembly by the installer. Refer to the installation/equipment drawing assembly.

1. Base, lower assembly and control box.
2. Upper assembly with stainless steel head, flame rod, and spark ignitor.
3. Fire-check valve.
4. Copper tubing for gas pilot.

Clamps, screws, and nuts for mounting the copper tubing to the stack. Mounting brackets are included.

5. Wiring for spark ignitor and flame rod.

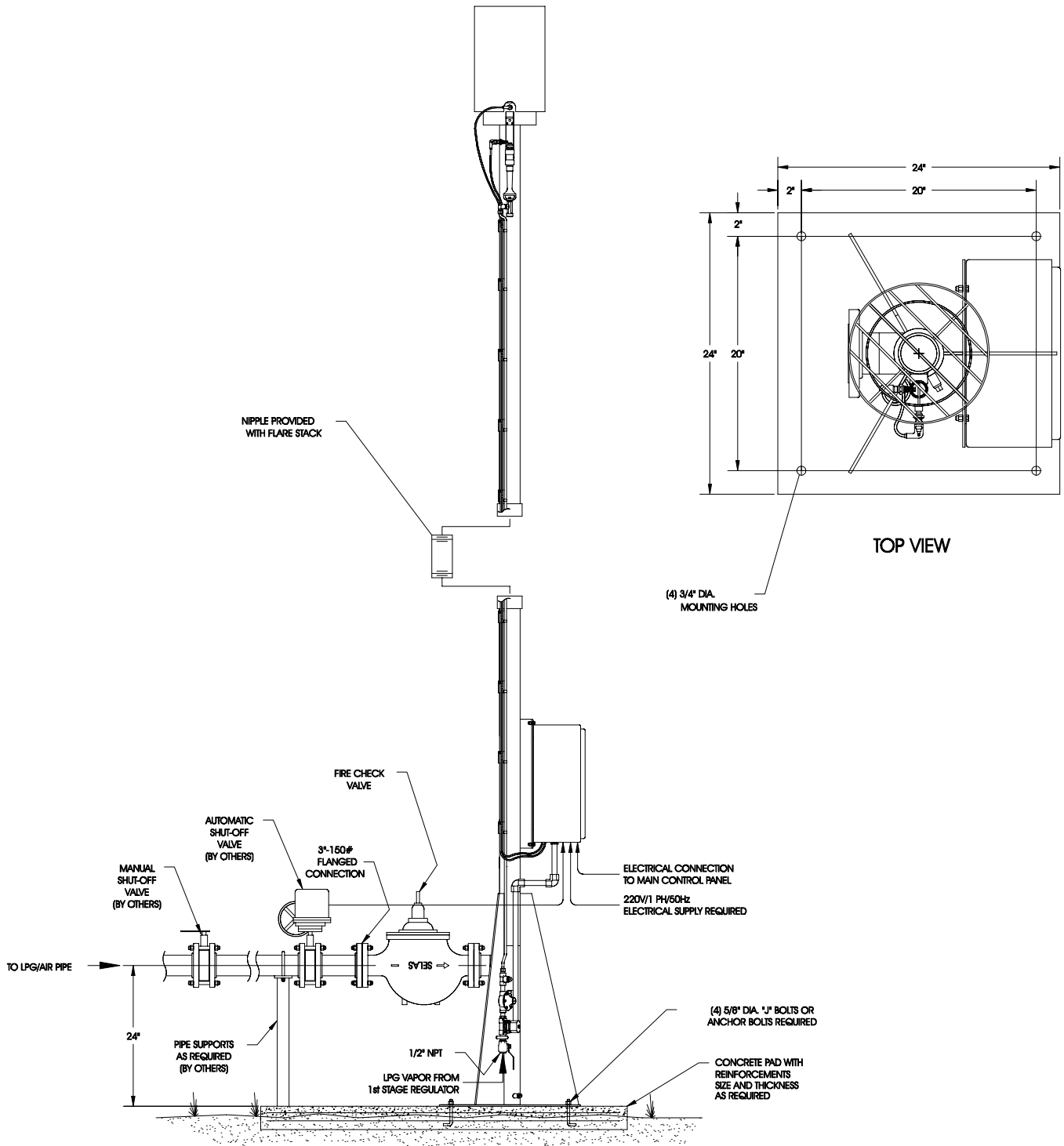
Clamps and fasteners for mounting the cable to the stack. Mounting brackets are included.

Additional items not supplied but required for installation are:

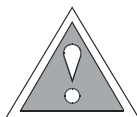
1. Automatic shut-off valve.
2. Manual shut-off valve.
3. Reinforced concrete pad at least four inches thick, with “J” bolts.

Installation

Figure 2 – Installation



Installation.wmf



WARNING

DO NOT use TEFLON tape or compounds with TEFLON content as an oil or gas pipe sealant. TEFLON can cause valves to fail, creating a SAFETY HAZARD. Warranties are nullified and liability rests solely with the installer when evidence of TEFLON is found.

LOCATION

Install the assembled flare stack outside an appropriately sized level concrete pad. A typical installation of a flare stack is shown in **Figure 2 – Installation**.

PIPING

Prior to making final piping connections, clean all foreign material from the pipes. Connect the waste gas piping to the flare stack. Piping thread sealant conforming to AGA No. 4-90 is recommended.

Connect the pipe inlet to the LPG vapor from the first stage regulator, set at 10 psig (0.703 kg/cm²).

NOTE

Thread sealant conforming to AGA No. 4-90 is recommended.

ELECTRICAL SERVICE

Make electrical service connections to the control box. Bring conduit through the side or bottom of the control box's enclosure. Connections to the control box must be watertight. The installer should provide a disconnect. **See Data Sheet** for electrical service requirements.

In the U.S., all wiring should comply with U.S. NFPA 70, state and local codes. In other countries, wiring should comply with applicable governing codes and standards.

An electrical ground must be connected to the control box. The ground lug is located on the inside of the control box and identified by a green colored ground label. Applicable codes and standards determine the size of the ground wire.

A dry contact is provided at the control box for controlling the automatic shut-off valve.

VALVE REQUIREMENTS

Both an automatic shut-off valve and manual shut-off valve must be installed on the inlet side of the Firecheck valve. The manual valve must be a full port gas cock or gate valve. The automatic shut-off valve must have a twenty-three second opening rate and a five-second closing rate.

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OPERATIONAL SETTINGS

All operational settings were made at the factory. However, settings may require minor adjustments.

ELECTRICAL CONNECTIONS

Check that the voltage to the control panel is correct by testing the line with a voltmeter. Refer to the data sheet for correct voltage.

STARTUP PROCEDURE

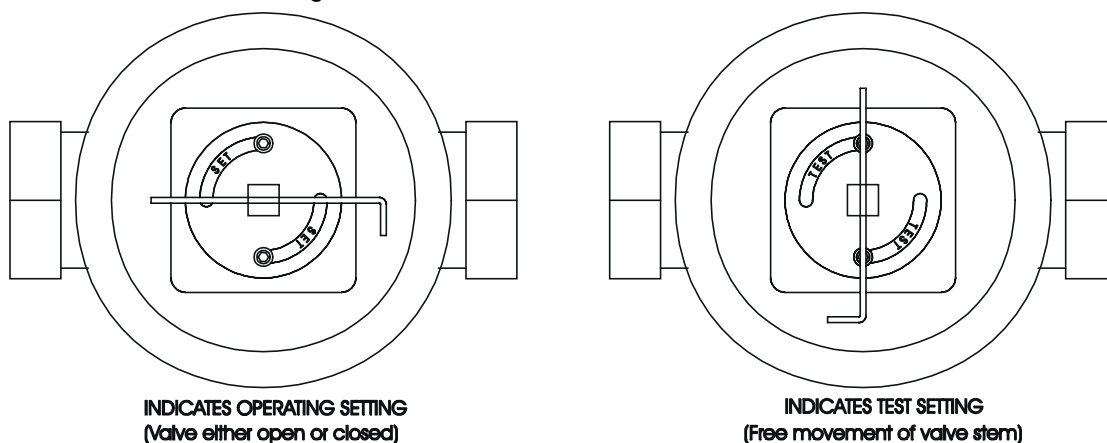
1. Close the manual waste gas shut-off valve.
2. Purge the air from the pilot inlet line.
3. Turn off the power at the control cabinet.
4. Press the **START** button. This lights the gas pilot.
5. Adjust the regulator per the data sheet and adjust the orifice per the pilot adjustment procedure. Refer to the Maxon installation startup bulletin, page 9531-9532 in the appendix.
6. To prepare the Firecheck valve for normal operation, the **TEST-SET** disk must be in the **SET** position. See the setting indicator in the drawing. Insert the wrench through the hole in the reset stud and pull it to the open position as shown. This will cock the valve disk.

CAUTION



Do not exceed 15 psig when testing the Firecheck valve. Should leaks develop between the surfaces of the bottom cover and the body, disassemble, clean the machined surfaces and re-grease with Exxon "Andok B" or Shell "Cyprina RA" or any equivalent NLGI grade3 grease. Refer to the Selas Instruction Bulletin FC-1A enclosed for instructions.

Figure 3 – Fire Check Valve Settings



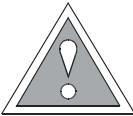
Fire Check Valve.wmf

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WARNING

LPG is explosive and extremely flammable. Appropriate safety procedures must be observed when installing, starting, and operating the system. Any leak anywhere in the system is extremely dangerous and should not be tolerated. This equipment produces an open flame so if there is any evidence of unburned gas, shut down the system. If any leak is detected the entire system must be shut down, power turned off, lines bled to zero. The leak must be properly repaired.



CAUTION

Before starting the flare stack, check for leaks. Check all connections using an appropriate leak detection solution or device. Even small leaks are unacceptable! ELMINATE ALL LEAKS PRIOR TO OPERATION!



WARNING

During initial startup, the operator must be on constant alert for emergency conditions such as fuel leaks, electrical malfunctions, etc. The location of all manual shutoff valves and disconnect switches should be clearly in mind so the system can be quickly shut down if necessary.

STARTING THE FLARE STACK

1. Open the manual shutoff valve.
2. Turn on the power at the control cabinet.
3. Press the **START** button. This starts the pilot light.
4. When the pilot ignites, the run indicator will be lit.
5. The automatic shutoff valve will open and the flare stack will start burning gas.

STOPPING THE FLARE STACK

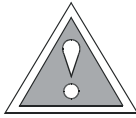
1. Close the manual shutoff valve.
2. Once all of the gas has burned, no flame will be detected and the flare stack will shut down.
3. Turn the power switch to the **OFF** position.

FIRECHECK VALVE

When a backfire occurs in the flare stack piping, any resulting shockwave immediately closes the check valve, and the combustion is arrested. The valve must be reset after a backfire.

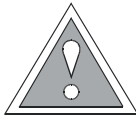
If the bimetal strips inside the valves are damaged, they must be replaced. The valve cannot be re-opened with damaged bimetal strips. The strips can be inspected by removing the valve cartridge from the bottom of the valve and inspecting the strips located on the top of the valve mechanism. Refer to the maintenance section of the Selas Instruction Bulletin FC-1A for replacement of the strips.

WARNING



Improper installation, adjustment, alteration, service, or maintenance can cause injury or property damage. Refer to this manual and the manuals in the Appendix for information. For assistance or additional information, consult a qualified installer or Algas-SDI directly.

CAUTION



In accordance with OSHA standard 1910.147, all equipment, machines, and processes shall be locked out prior to servicing.

ONLY FULLY TRAINED AND QUALIFIED PERSONNEL MUST DO SERVICING.

CAUTION



When performing any service, shut off all electrical power, close all supply valves, bleed the gas lines to zero pressure, purge them, and vent any gas to a safe location.

WARNING



LPG is explosive and extremely flammable. Appropriate safety procedures must be performed when all maintenance procedures are performed.

Maintenance

Table 1 – Flare Stack Maintenance Schedule

DESCRIPTION	WEEKLY	MONTHLY	ANNUALLY
Firecheck valve (see Selas Instruction Bulletin FC-1A)		Test for freedom of movement – valve should snap shut.	Remove cartridge, clean screen, inspect bimetal strips, and check pressure loss.
Pilot flame (see Fireye Bulletin C-4000E)	Check operation, flame signal strength, recycle controls.	Check operation.	
Flame rod		Check operation.	
Spark ignitor		Check operation.	
Control box		Check operation of switch and push buttons.	Remove cover and check wiring.
Wiring		Check voltage.	Visually check for broken or loose wires.
Solenoid valve (see Asco Form No. V-5825)		Check operation.	Check, Rebuilt if required.
Pilot regulator (see Fisher Form 8124)		Check settings, operation.	Clean, Rebuild if required.
Orifice assembly (see Maxon pilots pgs. 9531-9532)		Visually inspect and clean if necessary.	Check operation and adjust if necessary.
Automatic shut-off valve		Check operation.	Rebuild if required.
Piping			Check for leaks.
Drain plug			Bleed lines and drain heavy ends.

Firecheck Valve

MONTHLY CHECKS

NOTE

All checks of valve operation must be made without the LPG/air mixture in the piping. Bleed all lines before conducting the test.

DETERMING THE FREEDOM OF VALVE MOVEMENT

Conduct the test by loosening the two socket head cap screws which hold the manual test disk secure, then turn the disk as far as the slots will allow to **TEST** position, whereupon the valve should snap shut. If the valve is sluggish or fails to shut, the valve stem and screen busing should be cleaned and the test repeated.

After a satisfactory test, the manual disk must be returned to the **SET** position and locked by tightening the two socket head cap screws. The valve is now ready to be reset. Check the clearance between the reset stud and the **TEST-SET** disk. Sufficient clearance is required to prevent binding.

ANNUAL CHECKS

DETERMINE PRESSURE LOSS THROUGH THE VALVE

Pressure loss through the Firecheck valve can be measured by using the two-plugged pipe connections located near the inlet and outlet of the valve. If there is a pressure drop of more than five inches of water column, the screen should be removed and cleaned. Refer ton the Selas manual for cleaning instructions.

BIMETAL STRIPS

Inspect the bimetal strips annually by unscrewing the hex head screws and pulling the cartridge from the valve body. Check for distortion or discoloration (light blue to blue-black) due to over-heating. Discolored or distorted strips must be replaced. The strips can be inspected by unbolting the valve assembly from the valve body, allowing the valve assembly to be lowered and checking the bimetal strips on the top of the valve mechanism. Refer to the Firecheck manual for details.

Checking the Pilot Pressure Regulator and Inlet Solenoid

MONTHLY CHECKS

1. Both the regulator and inlet solenoid can be tested with a pressure gauge inserted in the plug fitting above the pilot regulator.
2. To test both the regulator and solenoid valve, close the manual shutoff valve, turn off the power, remove the NPT plug above the regulator and install a suitable pressure gauge.
3. Open the manual shutoff valve, turn on the power and start the flare stack. **Under normal operating conditions, the pressure should be 50 psig (3.5 kg/cm²). A correct pressure reading indicates that both the regulator and solenoid are working properly.**
4. With the system operating, turn the power switch to **OFF**, shutting down the flare stack. The pressure should drop to "0". If there is any pressure reading, the solenoid is not closing and must be repaired.
5. If either component malfunctions, shut down the system, bleed the lines, and repair or replace them.

NOTE

When re-installing the plug, use an appropriate sealer to ensure that it does not leak.

APPENDIX A

COMPONENT INFORMATION

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INSTALLATION AND MAINTENANCE INSTRUCTIONS

2-WAY INTERNAL PILOT OPERATED SOLENOID VALVES
HUNG DIAPHRAGM - 3/8, 1/2 AND 3/4 N.P.T.
NORMALLY CLOSED OPERATION

BULLETINS

8210
8211

ASCO®

Form No. V-5825

DESCRIPTION

Bulletin 8210's are 2-way, normally closed, internal pilot operated solenoid valves. Valve body and bonnet are of brass construction. Standard valves have a General Purpose, NEMA Type 1 Solenoid Enclosure.

Bulletin 8211's are the same as Bulletin 8210's except the solenoids are equipped with an enclosure which is designed to meet NEMA Type 4 Watertight, NEMA Type 7 (C or D) Hazardous Locations - Class I, Group C or D, and NEMA Type 9 (E, F or G) Hazardous Locations - Class II, Group E, F or G. The explosion-proof/watertight solenoid enclosure is shown on a separate sheet of Installation and Maintenance Instructions, Form No. V-5380.

Bulletin 8210 and 8211 valves with suffix 'HW' in the catalog number are specifically designed for hot water service.

OPERATION

Normally Closed: Valve is closed when solenoid is de-energized and opens when solenoid is energized.

MANUAL OPERATOR (Optional)

Valves with suffix 'MO' in catalog number are provided with a manual operator which allows manual operation when desired or during an interruption of electrical power. To operate valve manually, push in knurled cap and rotate clockwise 180°. Disengage manual operator by rotating knurled cap counterclockwise 180° before operating electrically.

MANUAL OPERATOR LOCATION (Refer to Figure 3)

Manual operator (when shipped from factory) will be located over the valve outlet. Manual operator may be relocated at 90° increments by rotating valve bonnet. Remove bonnet screws (4) and rotate valve bonnet with solenoid to desired position. Replace bonnet screws (4) and torque in a crisscross manner to 110 ± 10 inch pounds.

If valve is installed in system and is operational, proceed in the following manner:

WARNING: Depressurize valve and turn off electrical power supply.

1. Remove retaining cap or clip and slip the entire solenoid enclosure off the solenoid base sub-assembly. CAUTION: When metal retaining clip disengages, it will spring upwards.
2. Remove bonnet screws (4) and rotate valve bonnet to desired position.
3. Replace bonnet screws (4) and torque in a crisscross manner to 110 ± 10 inch pounds.
4. Replace solenoid enclosure and retaining clip or cap.

INSTALLATION

Check nameplate for correct catalog number, pressure, voltage and service.

TEMPERATURE LIMITATIONS

For maximum valve ambient and fluid temperatures refer to chart. The temperature limitations listed are for UL applications. For non UL applications, higher ambient and fluid temperature limitations are available. Consult factory. Check catalog number on nameplate to determine maximum temperatures.

Construction	Coil Class	Catalog Number Prefix	Maximum Ambient Temp. °F.	Maximum Fluid Temp. °F.
A-C Construction (Alternating Current)	A	None or DA	77	180
	F	DF or FT	122	180
	H	HT	140	180
D-C Construction (Direct Current)	A, F or H	None, FT or HT	77	150
Catalog Numbers Suffix 'HW'	A	None or DA	77	210
	F	DF or FT	77	210
A-C Construction (Alternating Current)	H	HT	122	210

POSITIONING/MOUNTING

Valve may be mounted in any position. For mounting bracket (optional feature) dimensions, refer to Figure 1.

PIPING

Connect piping to valve according to markings on valve body. Apply pipe compound sparingly to male pipe threads only; if applied to valve threads, it may enter the valve and cause operational difficulty. Pipe strain should be avoided by proper support and alignment of piping. When tightening the pipe do not use valve as a lever. Wrenches applied to valve body or piping are to be located as close as possible to connection point. **IMPORTANT: Valves with suffix 'HW' in the catalog number have a special diaphragm material which is specifically compounded for hot water service. This material can be attacked by oil and grease. Wipe the pipe threads clean of cutting oils and use teflon tape to seal pipe joints.**

IMPORTANT: For the protection of the solenoid valve, install a strainer or filter suitable for the service involved in the inlet side as close to the valve as possible. Periodic cleaning is required depending on the service conditions. See Bulletins 8600, 8601 and 8602 for strainers.

WIRING

Wiring must comply with Local and National Electrical Codes. Housings for all solenoids are provided with connections for 1/2 inch conduit. The general purpose solenoid enclosure may be rotated to facilitate wiring by removing the retaining cap or clip. CAUTION: When metal retaining clip disengages it will spring upwards. Rotate to desired position. Replace retaining cap or clip before operating.

NOTE: Alternating Current (A-C) and Direct Current (D-C) Solenoids are built differently. To convert from one to the other, it is necessary to change the complete solenoid including the solenoid base sub-assembly and core assembly.

SOLENOID TEMPERATURE

Standard catalog valves are supplied with coils designed for continuous duty service. When the solenoid is energized for a long period, the solenoid enclosure becomes hot and can be touched with the hand for only an instant. This is a safe operating temperature. Any excessive heating will be indicated by the smoke and odor of burning coil insulation.

MAINTENANCE

WARNING: Turn off electrical power and depressurize valve before making repairs. It is not necessary to remove valve from pipe line for repairs.

ASCO Valves



CLEANING

A periodic cleaning of all solenoid valves is desirable. The time between cleanings will vary, depending on media and service conditions. In general, if the voltage to the coil is correct, sluggish valve operation, excessive leakage or noise will indicate that cleaning is required.

PREVENTIVE MAINTENANCE

1. Keep the medium flowing through the valve as free from dirt and foreign material as possible.
2. While in service, operate valve at least once a month to insure proper opening and closing.
3. Periodic inspection (depending on media and service conditions) of internal valve parts for damage or excessive wear is recommended. Thoroughly clean all parts. Replace any parts that are worn or damaged.

IMPROPER OPERATION

1. **Faulty Control Circuit:** Check electrical system by energizing solenoid. A metallic click signifies the solenoid is operating. Absence of the click indicates loss of power supply. Check for loose or blown-out fuses, open circuited or grounded coil, broken lead wires or splice connections.
2. **Burned-Out Coil:** Check for open circuited coil. Replace coil if necessary.
3. **Low Voltage:** Check voltage across coil leads. Voltage must be at least 85% of nameplate rating.
4. **Incorrect Pressure:** Check valve pressure. Pressure to the valve must be within range specified on nameplate.
5. **Excessive Leakage:** Disassemble valve and clean all parts. Replace worn or damaged parts with a complete Spare Parts Kit for best results.

COIL REPLACEMENT (Refer to Figure 2)

Turn off electrical power supply and disconnect coil leads. Proceed in the following manner:

1. Remove retaining cap or clip, nameplate and cover. CAUTION: When metal retaining clip disengages, it will spring upwards.
2. Remove spring washer, insulating washer and coil. Insulating washers are omitted when a molded coil is used.
3. Reassemble in reverse order of disassembly paying careful attention to exploded view provided for identification and placement of parts.

CAUTION: Solenoid must be fully reassembled as the housing and internal parts are part of and complete the magnetic circuit. Place insulating washer at each end of coil if required.

VALVE DISASSEMBLY (Refer to Figures 2 and 3)

Depressurize valve and turn off electrical power supply. Proceed in the following manner:

1. Remove retaining cap or clip and slip the entire solenoid enclosure off the solenoid base sub-assembly. CAUTION: When metal retaining clip disengages, it will spring upwards.
2. Unscrew solenoid base sub-assembly and remove bonnet gasket.
3. Remove valve bonnet screws (4) and valve bonnet.
4. For normal maintenance, it is not necessary to disassemble the manual operator (optional feature) unless external leakage is evident. To disassemble remove stem pin, manual operator stem, stem spring and stem gasket.
5. Remove core spring, core/diaphragm sub-assembly and body gasket. CAUTION: Do not damage or distort hanger spring between core/diaphragm sub-assembly.
6. All parts are now accessible for cleaning or replacement. Replace worn or damaged parts with a complete Spare Parts Kit for best results.

VALVE REASSEMBLY

1. Reassemble in reverse order of disassembly paying careful attention to exploded views provided for identification and placement of parts.
2. Replace body gasket and core/diaphragm sub-assembly. Locate the bleed hole in core/diaphragm sub-assembly approximately 45° from the valve outlet.
3. Replace core spring with wide end in core first; closed end protrudes from top of core.
4. If removed, replace manual operator stem, stem spring, stem gasket and stem pin.
5. Replace valve bonnet and bonnet screws (4). Torque bonnet screws (4) in a crisscross manner to 110 ± 10 inch pounds.
6. Replace bonnet gasket and solenoid base sub-assembly. Put solenoid base sub-assembly to 175 ± 25 inch pounds.
7. Replace solenoid enclosure and retaining cap or clip.
8. After maintenance, operate the valve a few times to be sure of proper opening and closing.

SPARE PARTS KITS

Spare Parts Kits and Coils are available for ASCO valves. Parts marked with an asterisk (*) are supplied in Spare Parts Kits.

ORDERING INFORMATION FOR SPARE PARTS KITS

When Ordering Spare Parts Kits or Coils Specify Valve Catalog Number, Serial Number and Voltage.

PARTIAL VIEW OF MOUNTING BRACKET (OPTIONAL)

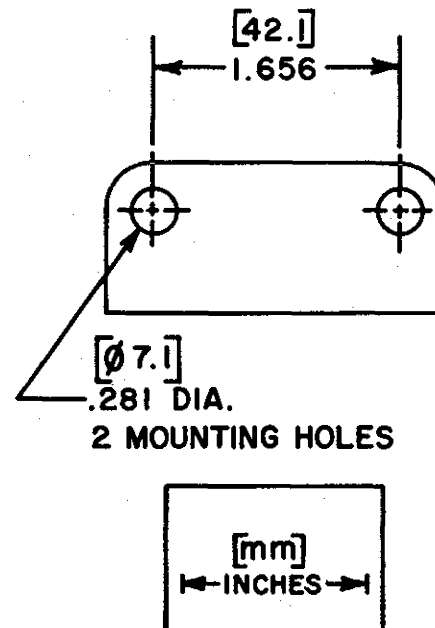
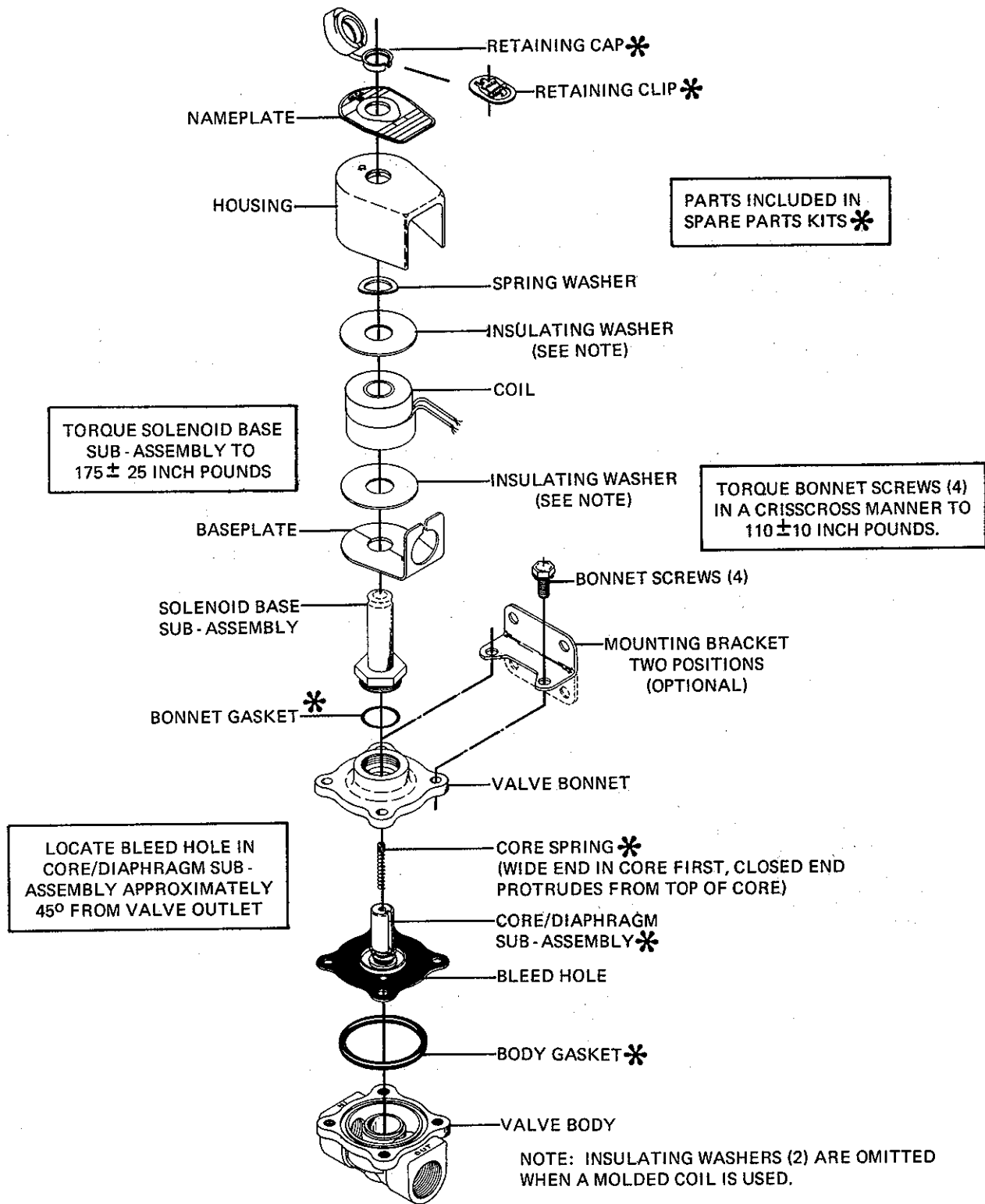


Figure 1.

Dimensions For Mounting Bracket (Optional Feature)



Bulletin 8210 — 3/8, 1/2 & 3/4 N.P.T. — A-C Construction
 General purpose solenoid enclosure shown.

For explosion-proof/ watertight solenoid enclosure used on Bulletin 8211, see Form No. V-5380.

Figure 2.

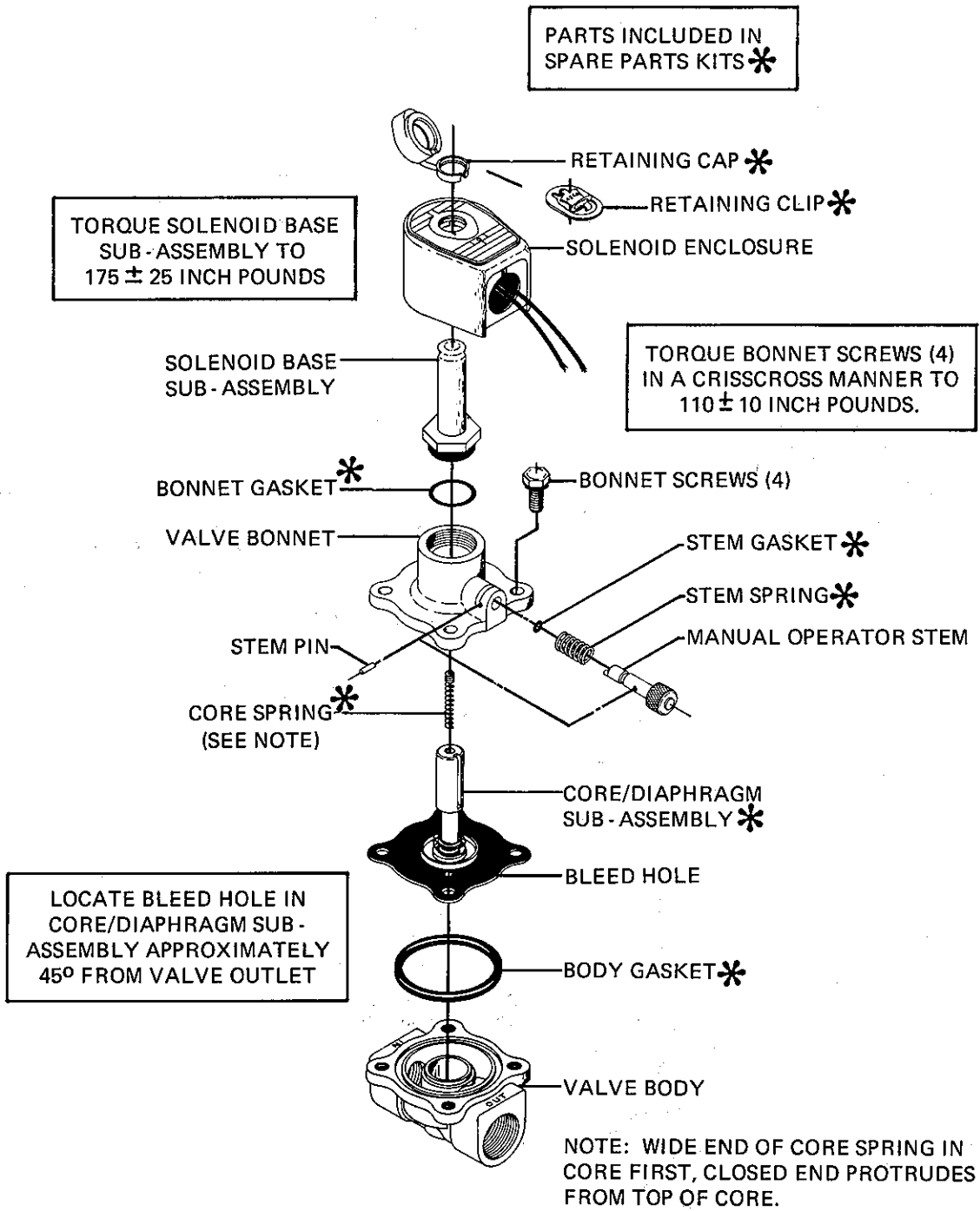


Figure 3. Bulletin 8210 — Manual Operator General purpose solenoid enclosure shown. For explosion-proof/watertight solenoid enclosure used on Bulletin 8211, see Form No. V-5380.

Installation & Maintenance Instructions



OPEN-FRAME, GENERAL PURPOSE, WATERTIGHT/EXPLOSIONPROOF SOLENOIDS

SERIES

8003G

8202G

Form No.V6584R7

— SERVICE NOTICE —

ASCO® solenoid valves with design change letter “G” or “H” in the catalog number (ex. 8210G 1) have an epoxy encapsulated ASCO® Red Hat II® solenoid. This solenoid replaces some of the solenoids with metal enclosures and open-frame constructions. Follow these installation and maintenance instructions if your valve or operator uses this solenoid.

See separate instructions for basic valve.

DESCRIPTION

Catalog numbers 8003G and 8202G are epoxy encapsulated pull-type solenoids. The green solenoid with lead wires and 1/2" conduit connection is designed to meet Enclosure Type 1-General Purpose, Type 2-Dripproof, Types 3 and 3S-Raintight, and Types 4 and 4X-Watertight. The black solenoid on catalog numbers prefixed “EF” or “EV” is designed to meet Enclosure Types 3 and 3S-Raintight, Types 4 and 4X-Watertight, Types 6 and 6P-Submersible, Type 7 (A, B, C & D) Explosionproof Class I, Division 1 Groups A, B, C, & D and Type 9 (E, F, & G)-Dust-Ignitionproof Class II, Division 1 Groups E, F & G. The Class II, Groups F & G Dust Locations designation is not applicable for solenoids or solenoid valves used for steam service or when a class “H” solenoid is used. See *Temperature Limitations* section for solenoid identification and nameplate/retainer for service. When installed just as a solenoid and not attached to an ASCO valve, the core has a 0.250-28 UNF-2B tapped hole, 0.38 or 0.63 minimum full thread.

NOTE: Catalog number prefix “EV” denotes stainless steel construction.

Catalog numbers 8202G1, 8202G3, 8202G5 and 8202G7 are epoxy encapsulated push-type, reverse-acting solenoids having the same enclosure types as previously stated for Catalog numbers 8003G1 and 8003G2.

Series 8003G and 8202G solenoids are available in:

- **Open-Frame Construction:** The green solenoid may be supplied with 1/4" spade, screw or DIN terminals. (Refer to Figure 4)
- **Panel Mounted Construction:** These solenoids are specifically designed to be panel mounted by the customer through a panel having a .062 to .093 maximum wall thickness. Refer to Figure 1 and section on *Installation of Panel Mounted Solenoid*.

Optional Features For Type 1 – General Purpose Construction Only

- **Junction Box:** This junction box construction meets Enclosure Types 2,3,3S,4, and 4X. Only solenoids with 1/4" spade or screw terminals may have a junction box. The junction box provides a 1/2" conduit connection, grounding and spade or screw terminal connections within the junction box (See Figure 5).
- **DIN Plug Connector Kit No.K236034:** Use this kit only for solenoids with DIN terminals. The DIN plug connector kit provides a two pole with grounding contact DIN Type 43650 construction (See Figure 6).

OPERATION

Series 8003G – When the solenoid is energized, the core is drawn into the solenoid base sub-assembly. **IMPORTANT: When the solenoid is de-energized, the initial return force for the core, whether developed by spring, pressure, or weight, must exert a minimum force to overcome residual magnetism created by the solenoid. Minimum return force for AC construction is 11 ounces, and 5 ounces for DC construction.**

Series 8202G – When the solenoid is energized, the disc holder assembly seats against the orifice. When the solenoid is de-energized, the disc holder assembly returns. **IMPORTANT: Initial return force for the disc or disc holder assembly, whether developed by spring, pressure, or weight, must exert a minimum force to overcome residual magnetism created by the solenoid. Minimum return force is 1 pound, 5 ounces.**

INSTALLATION

Check nameplate for correct catalog number, service, and wattage. Check front of solenoid for voltage and frequency.

⚠ WARNING: Electrical hazard from the accessibility of live parts. To prevent the possibility of death, serious injury or property damage, install the open-frame solenoid in an enclosure.

FOR BLACK ENCLOSURE TYPES 7 AND 9 ONLY

⚠ CAUTION: To prevent fire or explosion, do not install solenoid and/or valve where ignition temperature of hazardous atmosphere is less than 165° C. On valves used for steam service or when a class “H” solenoid is used, do not install in hazardous atmosphere where ignition temperature is less than 180° C. See nameplate/retainer for service.

NOTE: These solenoids have an internal non-resettable thermal fuse to limit solenoid temperature in the event that extraordinary conditions occur which could cause excessive temperatures. These conditions include high input voltage, a jammed core, excessive ambient temperature or a shorted solenoid, etc. This unique feature is a standard feature only in solenoids with black explosionproof/dust-ignitionproof enclosures (Types 7 & 9).

⚠ CAUTION: To protect the solenoid valve or operator, install a strainer or filter, suitable for the service involved in the inlet side as close to the valve or operator as possible. Clean periodically depending on service conditions. See ASCO Series 8600, 8601, and 8602 for strainers.

Temperature Limitations

For maximum valve ambient temperatures, refer to chart. The temperature limitations listed, only indicate maximum application temperatures for field wiring rated at 90°C. Check catalog number prefix and watt rating on nameplate to determine maximum ambient temperature. See valve installation and maintenance instructions for maximum fluid temperature. NOTE: For steam service, refer to *Wiring* section, *Junction Box* for temperature rating of supply wires.

Temperature Limitations For Series 8003G or 8202G Solenoids for use on Valves Rated at 10.1, 11.6, 17.1, or 22.6 Watts			
Watt Rating	Catalog Number Coil Prefix	Class of Insulation	Maximum † Ambient Temp.
10.1 & 17.1	None, FB, KF, KP, SC, SD, SF, & SP,	F	125°F (51.7°C)
10.1 & 17.1	HB, HT, KB, KH, SS, ST, SU,	H	140°F (60°C)
11.6 & 22.6	None, FB, KF, KP, SC, SD, SF, & SP,	F	104°F (40°C)
11.6 & 22.6	HP, HT, KB, KH, SS, ST, SU, & SV	H	104°F (40°C)

† Minimum ambient temperature -40° F (-40° C).

Positioning

This solenoid is designed to perform properly when mounted in any position. However, for optimum life and performance, the solenoid should be mounted vertically and upright to reduce the possibility of foreign matter accumulating in the solenoid base sub-assembly area.

Wiring

Wiring must comply with local codes and the National Electrical Code. All solenoids supplied with lead wires are provided with a grounding wire which is green or green with yellow stripes and a 1/2" conduit connection. To

facilitate wiring, the solenoid may be rotated 360°. For the watertight and explosionproof solenoid, electrical fittings must be approved for use in the approved hazardous locations.

▲ CAUTION: Cryogenic Applications – Solenoid lead wire insulation should not be subjected to cryogenic temperatures. Adequate lead wire protection and routing must be provided.

Additional Wiring Instructions For Optional Features:

- **Open–Frame solenoid with 1/4" spade terminals.**

For solenoids supplied with screw terminal connections use #12–18 AWG stranded copper wire rated at 90°C or greater. Torque terminal block screws to 10 ± 2 in–lbs [1,0 ± 1,2 Nm]. A tapped hole is provided in the solenoid for grounding, use a #10–32 machine screw. Torque grounding screw to 15 – 20 in–lbs [1,7 – 2,3 Nm]. On solenoids with screw terminals, the socket head screw holding the terminal block to the solenoid is the grounding screw. Torque the screw to 15 – 20 in–lbs [1,7 – 2,3 Nm] with a 5/32" hex key wrench.

- **Junction Box**

The junction box is used with spade or screw terminal solenoids only and is provided with a grounding screw and a 1/2" conduit connection. Connect #12–18 AWG standard copper wire only to the screw terminals. Within the junction box use field wire that is rated 90°C or greater for connections. For steam service use 105°C rated wire up to 50 psi or use 125°C rated wire above 50 psi. After electrical hookup, replace cover gasket, cover, and screws. Tighten screws evenly in a crisscross manner.

- **DIN Plug Connector Kit No.K236034**

1. The open–frame solenoid is provided with DIN terminals to accommodate the plug connector kit.
2. Remove center screw from plug connector. Using a small screwdriver, pry terminal block from connector cover.
3. Use #12–18 AWG stranded copper wire rated at 90°C or greater for connections. Strip wire leads back approximately 1/4" for installation in socket terminals. The use of wire–end sleeves is also recommended for these socket terminals. Maximum length of wire–end sleeves to be approximately 1/4". Tinning of the ends of the lead wires is not recommended.
4. Thread wire through gland nut, gland gasket, washer and connector cover. NOTE: Connector housing may be rotated in 90° increments from position shown for alternate positioning of cable entry.
5. Check DIN connector terminal block for electrical markings. Then make electrical hookup to terminal block according to markings on it. Snap terminal block into connector cover and install center screw.
6. Position connector gasket on solenoid and install plug connector. Torque center screw to 5 ± 1 in–lbs [0,6 ± 1,1 Nm].

NOTE: Alternating current (AC) and direct current (DC) solenoids are built differently. To convert from one to the other, it may be necessary to change the complete solenoid including the core and solenoid base sub–assembly, not just the solenoid. Consult ASCO.

Installation of Solenoid

Solenoids may be assembled as a complete unit. Tightening is accomplished by means of a hex flange at the base of the solenoid.

Installation of Panel Mounted Solenoid (See Figure 1)

1. Disassemble solenoid following instruction under *Solenoid Replacement* then proceed.
2. Install solenoid base sub–assembly through customer panel.
3. Position spring washer on opposite side of panel over solenoid base sub–assembly.
4. Replace solenoid, nameplate/retainer and red cap.
5. Make electrical hookup, see *Wiring* section.

Solenoid Temperature

Standard solenoids are designed for continuous duty service. When the solenoid is energized for a long period, the solenoid becomes hot and can be touched by hand only for an instant. This is a safe operating temperature.

MAINTENANCE

▲ WARNING: To prevent the possibility of death, serious injury or property damage, turn off electrical power, depressurize solenoid operator and/or valve, and vent fluid to a safe area before servicing.

Cleaning

All solenoid operators and valves should be cleaned periodically. The time between cleaning will vary depending on medium and service conditions. In general, if the voltage to the solenoid is correct, sluggish valve operation, excessive noise or leakage will indicate that cleaning is required. Clean strainer or filter when cleaning the valve.

Preventive Maintenance

- Keep the medium flowing through the solenoid operator or valve as free from dirt and foreign material as possible.
- While in service, the solenoid operator or valve should be operated at least once a month to insure proper opening and closing.
- Depending on the medium and service conditions, periodic inspection of internal valve parts for damage or excessive wear is recommended. Thoroughly clean all parts. Replace any worn or damaged parts.

Causes of Improper Operation

- **Faulty Control Circuit:** Check the electrical system by energizing the solenoid. A metallic *click* signifies that the solenoid is operating. Absence of the *click* indicates loss of power supply. Check for loose or blown fuses, open–circuited or grounded solenoid, broken lead wires or splice connections.
- **Burned–Out Solenoid:** Check for open–circuited solenoid. Replace if necessary. Check supply voltage; it must be the same as specified on nameplate/retainer and marked on the solenoid. Check ambient temperature and check that the core is not jammed.
- **Low Voltage:** Check voltage across the solenoid leads. Voltage must be at least 85% of rated voltage.

Solenoid Replacement

1. Disconnect conduit, coil leads, and grounding wire.

NOTE: Any optional parts attached to the old solenoid must be reinstalled on the new solenoid. For 3–way construction, piping or tubing must be removed from pipe adapter.

2. Disassemble solenoids with optional features as follows:

- **Spade or Screw Terminals**

Remove terminal connections, grounding screw, and terminal block (screw terminal type only).

NOTE: For screw terminals, the socket head screw holding the terminal block serves as a grounding screw.

- **Junction Box**

Remove conduit and socket head screw (use 5/32" hex key wrench) from center of junction box. Disconnect junction box from solenoid.

- **DIN Plug Connector**

Remove center screw from DIN plug connector. Disconnect DIN plug connector from adapter. Remove socket head screw (use 5/32" hex key wrench), DIN terminal adapter, and gasket from solenoid.

3. Snap off red cap from top of solenoid base sub–assembly. For 3–way construction with pipe adapter (Figure 3), remove pipe adapter, nameplate and solenoid. Omit steps 4 and 5.
4. Push down on solenoid. Then using a suitable screwdriver, insert blade between solenoid and nameplate/retainer. Pry up slightly and push to remove.

NOTE: Series 8202G solenoids have a spacer between the nameplate/retainer and solenoid.

5. Remove solenoid from solenoid base sub–assembly.
6. Reassemble in reverse order of disassembly. Use exploded views for identification and placement of parts.
7. Torque pipe adapter to 90 inch–pounds maximum [10,2 Nm maximum]. Then make up piping or tubing to pipe adapter on solenoid.

Disassembly and Reassembly of Solenoids

1. Remove solenoid, see *Solenoid Replacement*.
2. Remove spring washer from solenoid base sub–assembly. For 3–way construction, remove plugnut gasket.
3. Unscrew solenoid base sub–assembly from valve body.
4. Remove internal solenoid parts for cleaning or replacement. Use exploded views for identification and placement of parts.
5. If the solenoid is part of a valve, refer to basic valve installation and maintenance instructions for further disassembly.
6. Torque solenoid base sub–assembly and adapter to 175±25 in–lbs [19,8±2,8 Nm].

ORDERING INFORMATION FOR ASCO SOLENOIDS

When Ordering Solenoids for ASCO Solenoid Operators or Valves, order the number stamped on the solenoid. Also specify voltage and frequency.

Torque Chart

Part Name	Torque Value Inch-Pounds	Torque Value Newton-Meters
solenoid base sub-assembly & adapter	175 ± 25	19,8 ± 2,8
pipe adapter	90 maximum	10,2 maximum

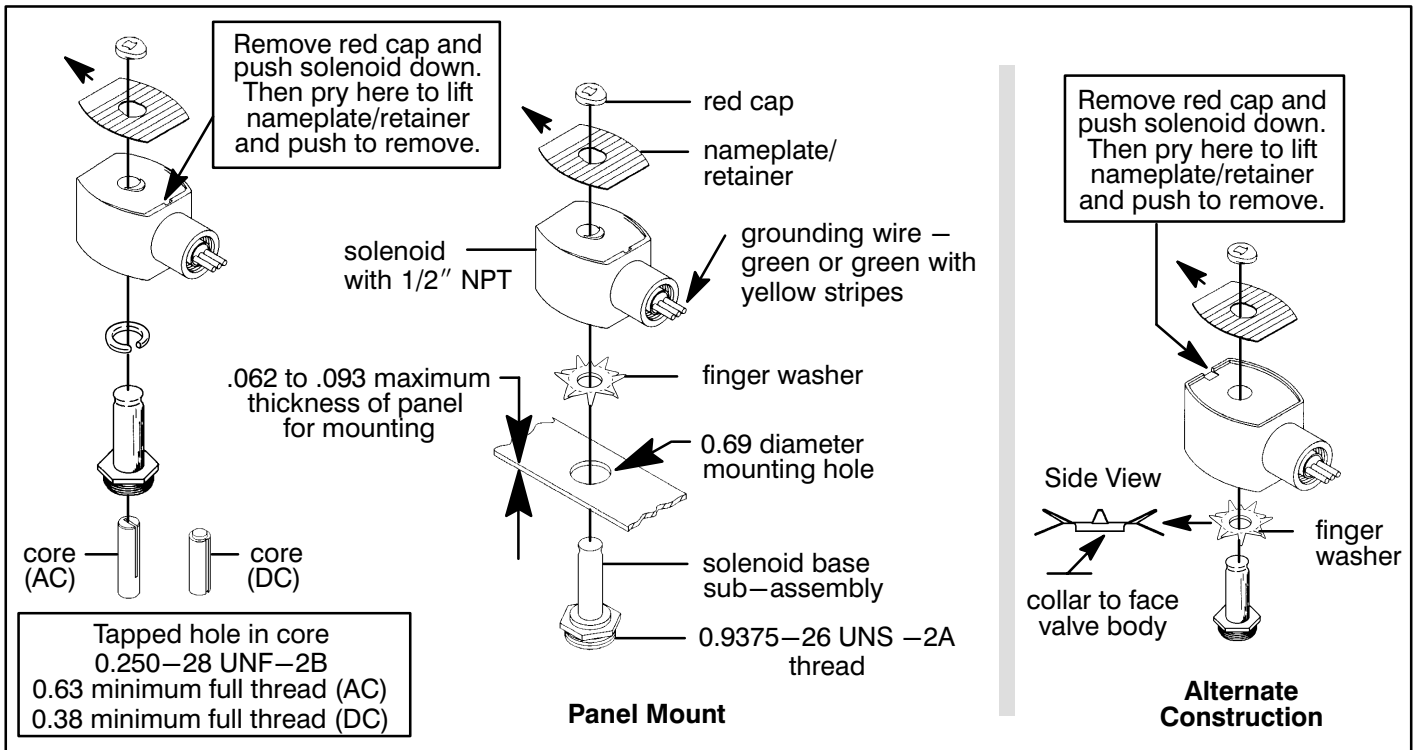


Figure 1. Series 8003G solenoids

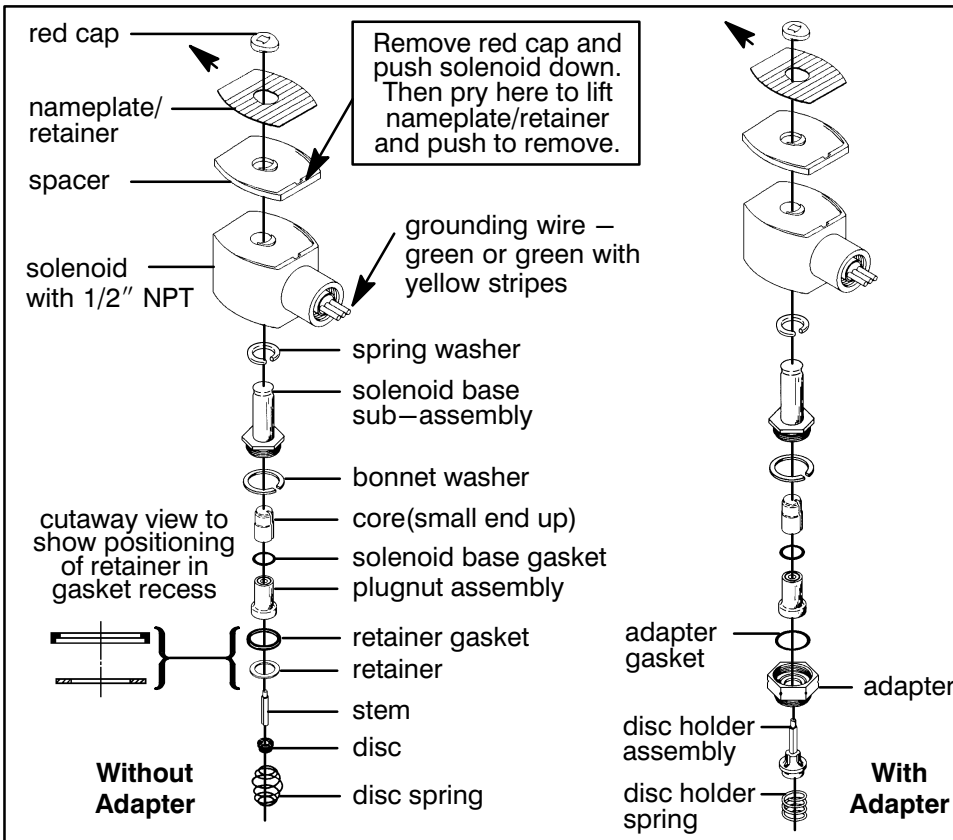


Figure 2. Series 8202G solenoids

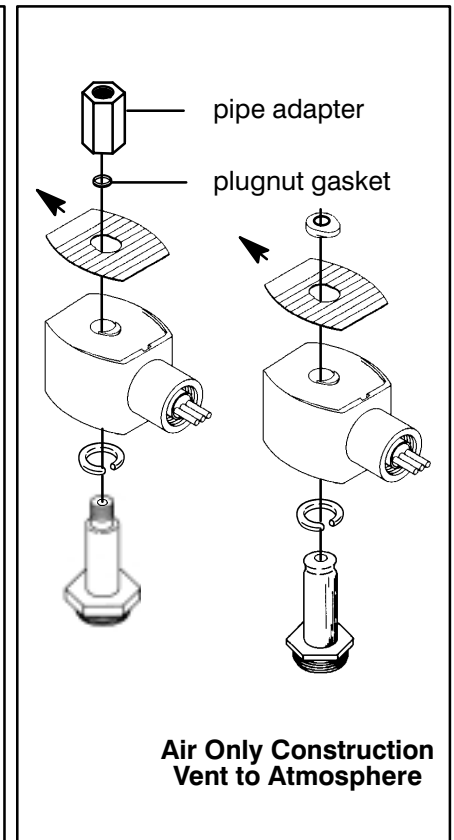
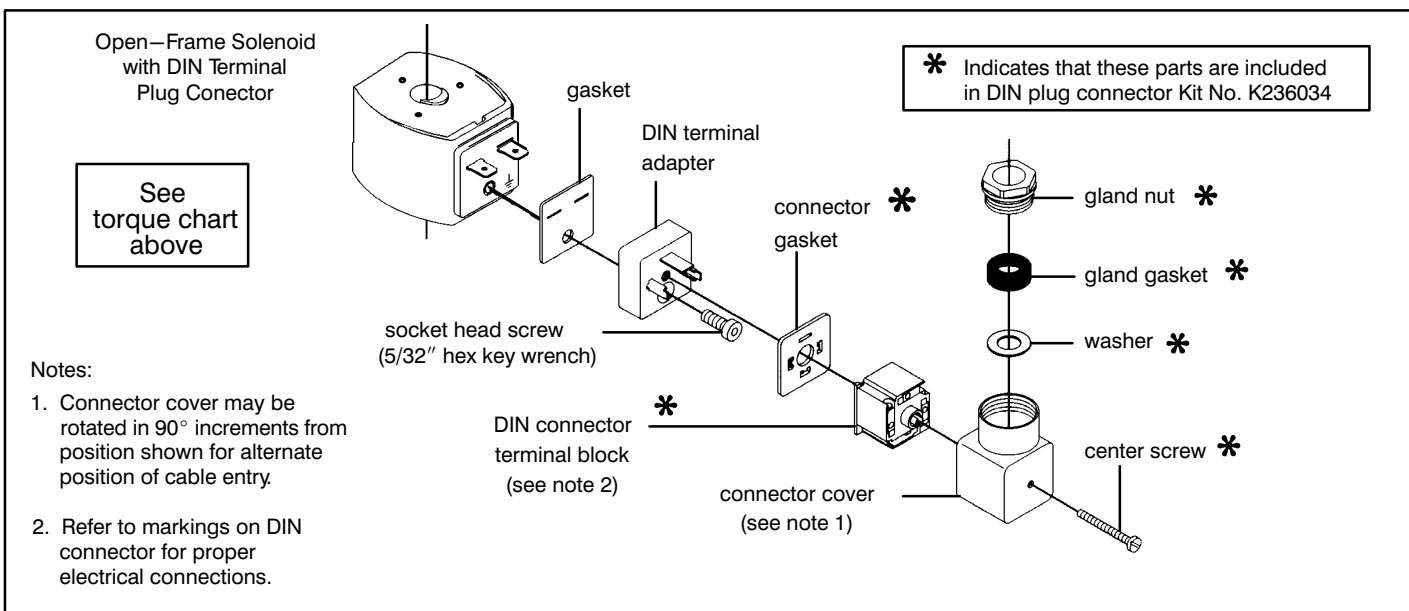
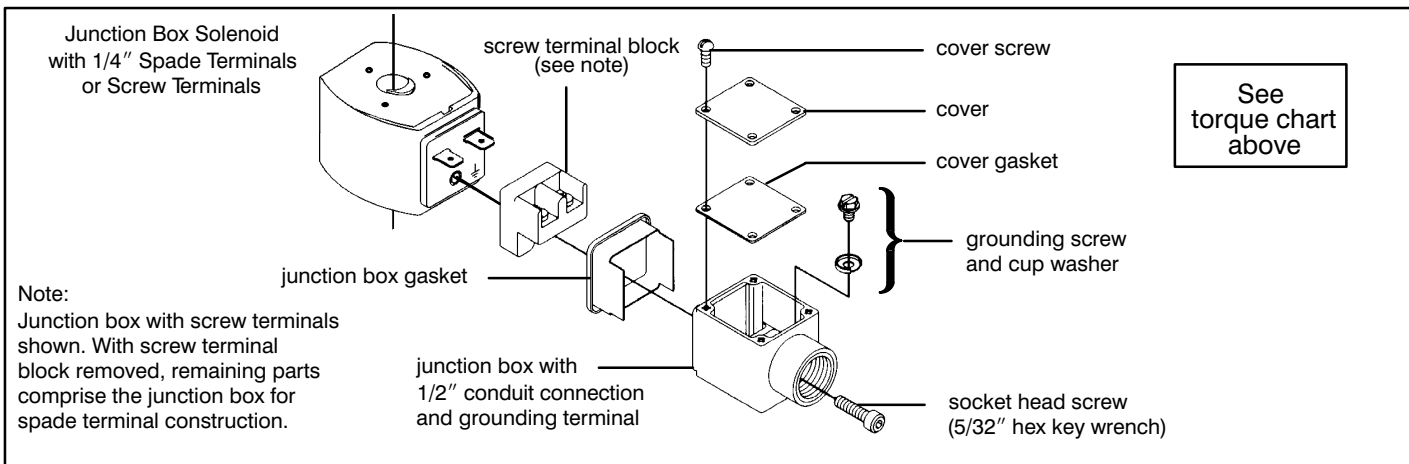
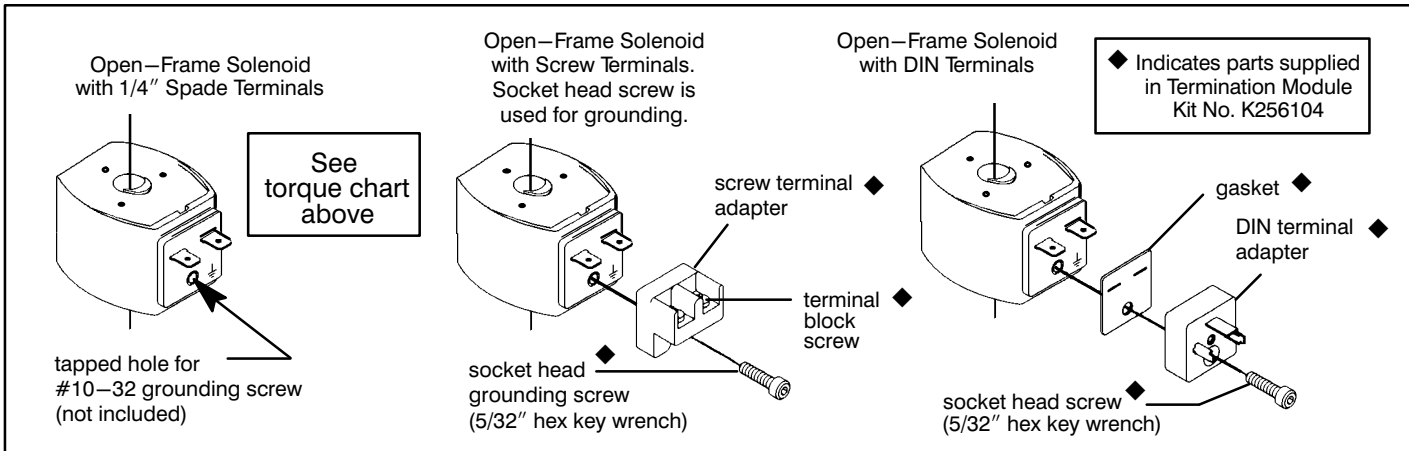


Figure 3. 3-Way Construction

Torque Chart

Part Name	Torque Value in Inch-Pounds	Torque Value in Newton-Meters
terminal block screws	10 ± 2	1,1 ± 0,2
socket head screw	15 – 20	1,7 – 2,3
center screw	5 ± 1	0,6 ± 0,1





FIREYE MODULAR M-SERIES II

FLAME SAFEGUARD CONTROLS



Year 2000 Compliant in accordance with BSI document DISC PD2000-I:



WARNING: Selection of this control for a particular application should be made by a competent professional, licensed by a state or other government agency. Inappropriate application of this product could result in an unsafe condition hazardous to life and property.

DESCRIPTION

Fireye® Modular M-Series II Flame Safeguard Controls are compact, modular burner management systems. They are designed to provide automatic ignition and continuous flame monitoring for commercial sizes of heating and process burners that use gas and/or light oil fuels.

Flame monitoring is accomplished by miniature UV scanners or Flame Rod/Photocell detectors and plug-in amplifier and programmer modules which connect into a standard chassis and wiring base. Interchangeable programmer and amplifier modules allow for complete versatility in selection of control function, timing, and flame scanning means. Functions such as relight, two stage capability, non-recycle air flow, purge timing, and pilot cutoff are determined by the programmer module. Type of flame scanner (UV, Flame Rod, or Photocell) and Flame Failure Response Time (F.F.R.T.) are determined by the amplifier module.

Some programmer modules are equipped with a series of dipswitches to select Purge Timing, Pilot Trial For Ignition (P.T.F.I.) timing, and Recycle or Non-Recycle operation. LED indicator lights on all programmer modules indicate the operating status of the control.

In the event of ignition failure, or following a safety shutdown, the unit locks out, activating an alarm circuit. Manual reset is required. Remote reset (via remote pushbutton or power interruption) is available on the MC120R, MC120P and MC230R chassis. A detailed description of the various programmer modules is found later in this document. Test jacks are provided to permit flame signal measurement during operation. A “run-check” switch is provided on the MP560, MP561 and MP562 programmer modules to assist in testing size, position, and stabilization of the pilot.

Modular M-Series II controls incorporate a safety checking circuit that is operative on each start. If flame (real or simulated) is detected prior to a start or during the purge, the fuel valves will not be energized, and the unit will lock out.

The Modular M-Series II controls use the same wiring base as the Fireye UVM and TFM Controls and are designed to be interchangeable with most models without rewiring. See INSTALLATION OF CONTROL, SCANNERS, AND FLAME DETECTORS (page 5) for temperature and wiring requirements.



NOTE: Using MC120P chassis to upgrade UVM and TFM controls requires re-wiring the air flow switch.



SPECIFICATIONS

Supply:

120V (min. 102, max. 132) 50/60 Hz. (MC120/MC120R/MC120P)

230V (min. 196, max 253) 50/60Hz (MC230/MC230R)

Table 1: AMBIENT TEMPERATURE LIMITS

	MAXIMUM		MINIMUM	
Control	125°F	(52°C)	- 40°F	(- 40°C)
Scanner UV1A, UV2, UV8A, 45UV3	200°F	(93°C)	- 40°F	(- 40°C)
Photocell 45CM1	165°F	(74°C)	- 40°F	(- 40°C)
Flame Rod (Tip 2460 F)	1500°F	(816°C)	- 40°F	(- 40°C)

Power Consumption: 12 VA (Operating)

Shipping Weight (Approx.): 3 lbs. (1.4kg)

Table 2: LOAD RATINGS

Fireye Terminal	Typical Load	Maximum Rating & 120V 60 Hz
3 or 4 Individual or combined	Pilot valve(s) Solenoid valve Ignition Transformer	125 VA pilot duty (solenoid valve) plus 250 VA (Transformer)
5	Main Fuel Valve(s)	125 VA pilot duty (solenoid) or 25 VA pilot duty (solenoid) and 400 VA (opening) motorized
8	Motor or contactor	Motor normally energized and de-energized by the operating control whose rating must be suitable. Terminal 8 rated to de-energize 9.8 FLA, 58.8 LRA, on safety lockout.
A	Alarm	50 VA, pilot duty
Minimum load requirement = 100mA		

APPROVALS

Underwriters Laboratories Inc.
Listed Guide MCCZ - File MP 1537

Factory Mutual System (FM) Approved

Underwriters Laboratories Inc.
Recognized Components Guide MCCZ2
File MP1537

Canadian Standards Association
Guide 300-1-0.2 Class 2642 Oil File LR7989
Guide 140-A-2 Class 2632 Gas File LR7989

American Gas Association (for the following models only):

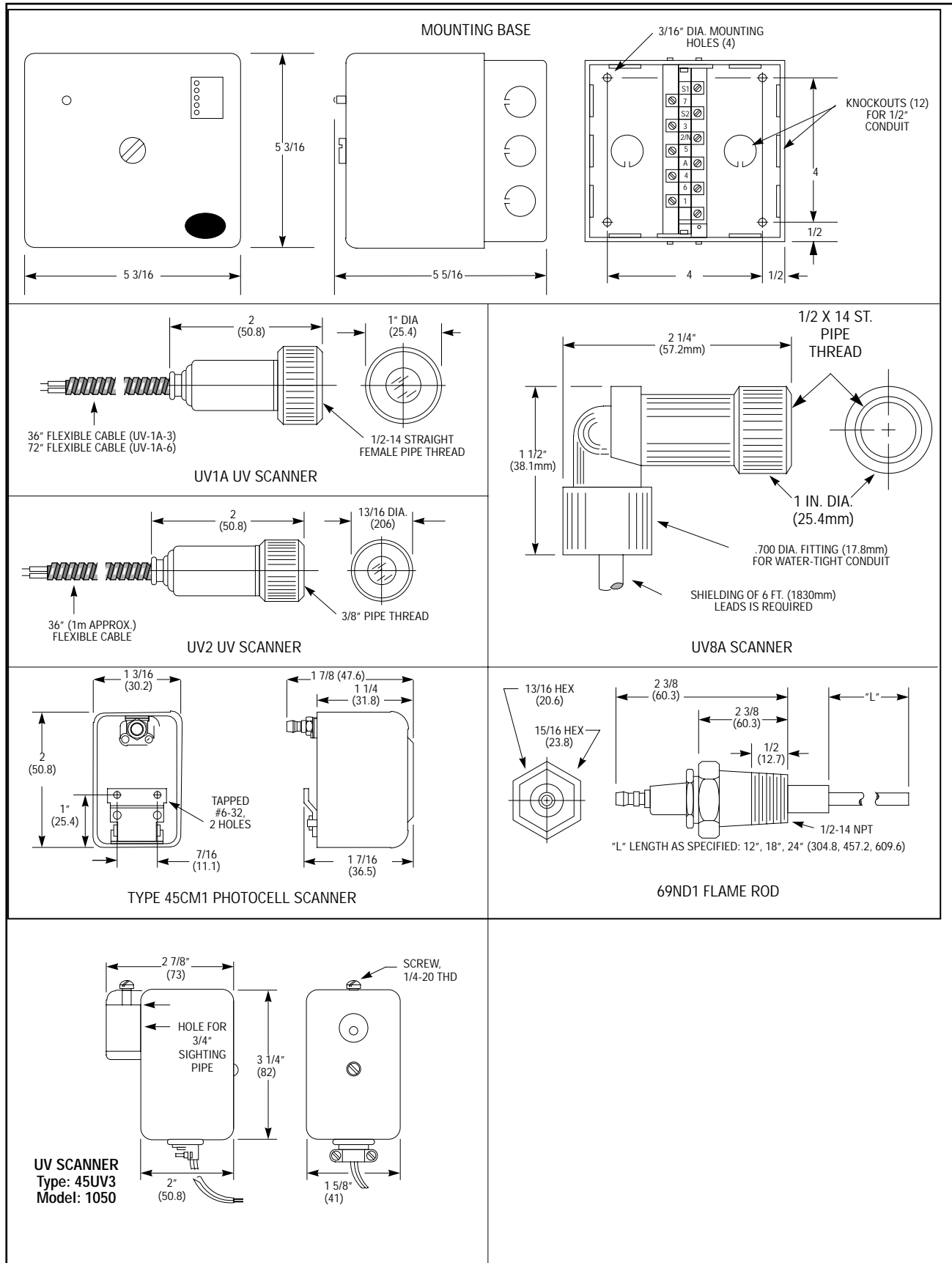
MC120	MAUV1	MP100, MP230 (Fixed), MP230H (Fixed), MP560 (Fixed)
	MAUV1T	Programmer modules where purge time, PTFI and recycle or
	MART1	non-recycle operation is specified. See <i>Ordering</i>
	MART1T	<i>Information— Programmer Modules.</i>

ANS Z21.20 Automatic Ignition Systems.

Approvals do not apply to MC230 and MC230R Chassis and associated programmers.

Year 2000 Compliant in accordance with BSI document DISC PD2000-I:1998.

OUTLINE DIMENSIONS





ORDERING INFORMATION

CHASSIS (COMMON FOR ALL CONTROLS, INCLUDES DUST COVER):

MC120	120 VAC Supply, 50 Hz/60 Hz
MC120R	120 VAC Supply, 50 Hz/60 Hz. Remote reset capability.
MC120P	120 VAC Supply, 50 Hz/60 Hz. Remote reset and post purge capability.
MC230	230 VAC Supply, 50 Hz/60 Hz
MC230R	230 VAC Supply, 50 Hz/60Hz. Remote reset capability.

PROGRAMMER MODULES:

MP100, MP100E	Relight operation.
MP101	Relight operation. Programmer will not lockout on flame signal during "off cycle."
MP102, MP102E	Non-recycle on flame fail, 5 second PTFI.
MP230	Selectable purge timing, trial for ignition timing, and recycle/non-recycle operation.
MP230H	Selectable purge timing, trial for ignition timing, pilot stabilizing period, and recycle/non-recycle operation. For use with two stage burners.
MP560	Selectable purge timing, pilot trial for ignition timing, pilot stabilizing period, and recycle/non-recycle operation. 10 second main flame trial for ignition, run-check switch.
MP561	MP560 programmer without pilot stabilization period.
MP562	MP560 programmer with lockout on loss of air flow. Non-recycle operation only.

NOTE: Programmers with the suffix "E" (e.g. MP100E) are for use with the MC230 and MC230R chassis only.

AMPLIFIER MODULES:USE WITH SCANNERS:

MAUV1	UV amplifier, 2-4 second F.F.R.T.	UV1A, UV2, UV8A, 45UV3-1050
MAUV1T	UV amplifier,.8 second F.F.R.T.	UV1A, UV2, UV8A, 45UV3-1050
MART1	Flame rectification amplifier, 2-4 second F.F.R.T.	45CM1, 69ND1
MART1T	Flame rectification amplifier, .8 second F.F.R.T.	45CM1, 69ND1

UV SCANNERS:

UV1A3	1/2" NPT connector, 3' flex. cable
UV1A6	1/2" NPT connector, 6' flex. cable
UV2	3/8" NPT connector, 3' flex. cable
UV8A	1/2" NPT 90 degree angle head, 6' flex. cable
45UV3-1050	3/4" sleeve/setscrew mount

FLAME DETECTORS:

45CM1-1000	Photocell with filter
45CM1-1000Y	Photocell without filter
69ND1-1000K4	12 inch flame rod, 1/2" NPT connector
69ND1-1000K6	18 inch flame rod, 1/2" NPT connector
69ND1-1000K8	24 inch flame rod, 1/2" NPT connector

WIRING BASE (COMMON FOR ALL CONTROLS):

- 61-3060 Closed wiring base, surface mounting
- 61-5042 Open wiring base, cabinet mounting

For a complete system, choose one of each of the following:

- Chassis
- Programmer Module
- Amplifier Module
- UV Scanner or Flame Detector
- Wiring Base



WARNING: Installer must be trained and qualified. Follow the burner manufacturer's instructions, if supplied. Otherwise, proceed as follows:

INSTALLATION OF CONTROL, SCANNERS, AND FLAME DETECTORS

Wiring Base

Mount the wiring base on the burner or on a panel. The location should be free from excessive vibration and within the specified ambient temperature rating. The base may be mounted in any angular position.

All wiring should comply with applicable electrical codes, regulations, and local ordinances. Use moisture resistant wire suitable for at least 90 degrees C. Circuit recommendations are found on pages 26 through 30. Consult the factory for assistance with non-standard applications.

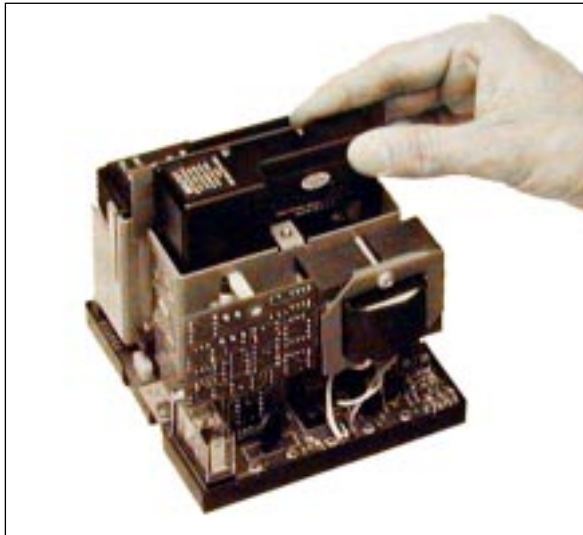


WARNING: Controls require safety limits utilizing isolated mechanical contacts. Solid state limit switches are not acceptable and should not be used due to their high leakage currents.

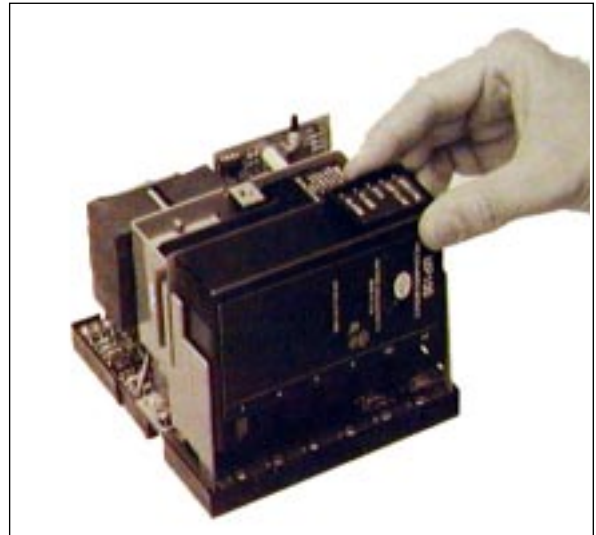
Installing the Programmer and Amplifier Modules



WARNING: Remove power from the control before proceeding.



AMPLIFIER



PROGRAMMER

Select the appropriate programmer and amplifier modules for your application. Remove the dust cover from the chassis. Insert the amplifier module into the slot in the center of the chassis and gently push the module into position. Insert the programmer module into the slot at the right side of the chassis and gently push the module into position.

***NOTE:** Refer to Programmer dipswitch settings on page 12 for the proper setting of the dipswitches for those programmers with this feature.*



WARNING: Turn off the power when installing or removing the control.

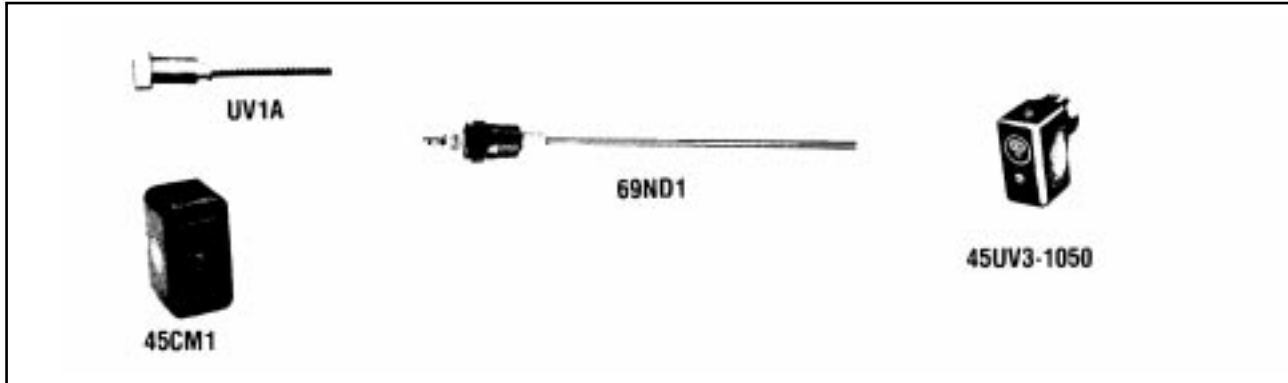
Replaceable Fuse

The programmer modules are designed with a field replaceable fuse. The fuse is located on the printed circuit board below the cover. The fuse will blow as a result of an overload condition on Terminals 3, 4 or 5. To replace the fuse, remove power from the system. Remove the programmer module and using a small screwdriver or similar tool, remove the fuse from its holder. Install a Fireeye replacement fuse (P/N 23-176) or equivalent 8 amp fuse (e.g. Littlefuse 12AG, 8 amp, 125V). FOR MP100E OR MP102E, ORDER FIREYE REPLACEMENT FUSE (P/N 23-183 OR EQUIVALENT 3.5 AMP FUSE (E.G. LITTLEFUSE 2203.5, 3.5 AMP, 250V).



WARNING: Remove power from the control before proceeding.

INSTALLATION - UV SCANNERS



Where possible, obtain the burner manufacturer's instructions for mounting the scanner. This information is available for most standard burners. The scanner mounting should comply with the following general instructions:

1. Locate the scanner within 30 inches of the flame to be monitored, closer if possible.
2. Select a scanner location that will remain within the ambient temperature limits of the UV-eye scanner (200°F/93°C). If cooling is required, use (a) an insulating coupling (Fireeye P/N 35-69) to reduce conducted heat; (b) a window coupling (Fireeye P/N 60-1257) to seal off furnace or burner pressure; (c) cooling air to reduce the scanner sight pipe temperature.
3. Mount rigidly a short length (4" to 8") of $\frac{1}{2}$ " or $\frac{3}{4}$ " black iron pipe in a position that permits an unobstructed view of the pilot and/or main flame.

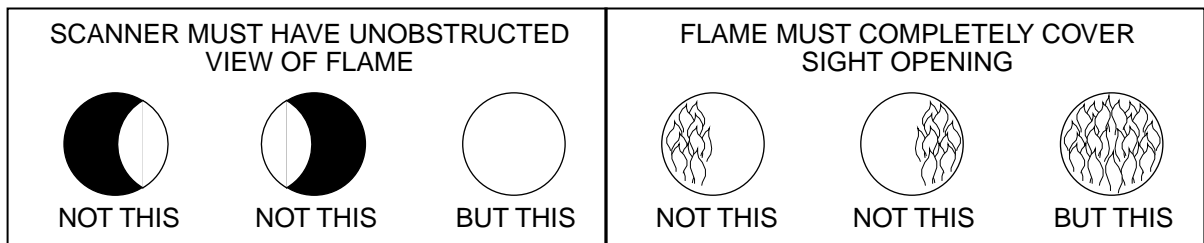


CAUTION: The scanner must not sight the ignition spark directly, or any part of the burner that can reflect the spark back to the scanner.

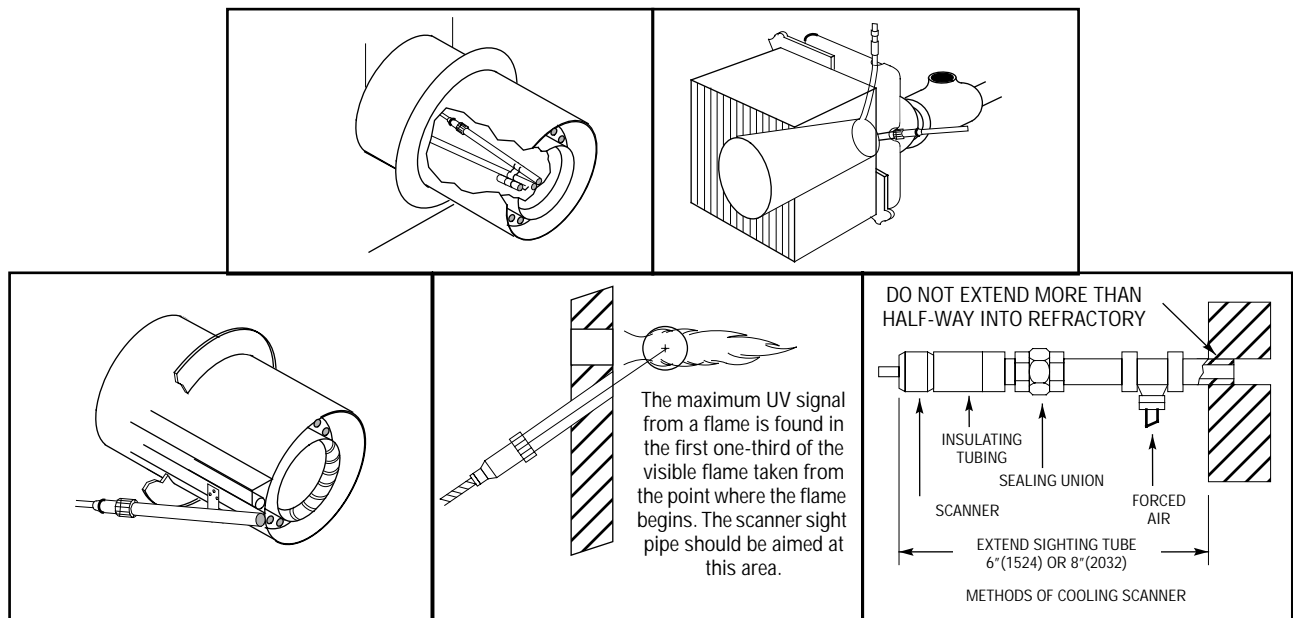
4. The maximum UV signal from a flame is found in the first one-third of the visible flame taken from the point where the flame begins. The scanner sight pipe should be aimed at this area.
5. A correct scanner application will not see a pilot flame that is too small to ignite the main flame reliably. Note particularly the test for minimum pilot that is described on page 22.
6. On installations having negative pressure combustion chambers, a small hole ($\frac{1}{8}$ " or $\frac{3}{16}$ ") drilled in the sight pipe will assist in keeping the pipe clean and free from smoke.
7. Two scanners may be installed on one burner if it is necessary to view two areas to obtain reliable detection of the flame. They should be wired in parallel.
8. The UV-eye scanner is designed to seal off the sight pipe up to pressures of 1 PSI when the scanner lock nut is firmly tightened. Pressures in excess of 1 PSI should be blocked from the scanner. A quartz lens coupling (P/N 60-1290) or quartz window coupling (P/N 60-1257) may be used. Each is rated from -3 to +100 PSI max.
9. To increase scanner sensitivity, a quartz lens coupling (P/N 60-1290) may be used. The quartz lens permits location of the UV-eye twice the distance noted in Item 1. Use $\frac{1}{2}$ " x $1\frac{1}{2}$ " nipple between UV1A scanner and union. Use $\frac{3}{8}$ " close nipple and $\frac{1}{2}$ " by $\frac{3}{8}$ " bushing on UV-2 applications.

General Requirements

1. As close as possible — 30" or closer.
2. As cool as possible — Not over 200°F (93°C).
3. Avoid sighting the spark — Resight scanner, shield between spark and scanner, or orifice to reduce reflected signal from spark.
4. Must see pilot and/or main flame — Scanner view must be unobstructed,
5. Minimum pilot test — See page 22.



Typical Scanner Installations



Wiring of UV Scanners

The UV1A scanner is supplied with 36" or 72" of flexible cable. The UV-2 scanner is supplied with 36" of flexible cable. If it is necessary to extend the scanner leads, the following instructions apply:

1. Scanners without armored cable must be wired using metal cable or rigid conduit.
2. High voltage wiring must not be installed in the same conduit with flame detector wiring.
3. **Selection of Scanner Wire:**
 - a. Use #14, 16, or 18 gauge wire with 90°C, 600 volt insulation for up to 200 feet of distance. (approx. 20% signal loss at 100 feet, 40% signal loss at 200 feet).
 - b. Asbestos insulated wire should not be used.
 - c. Multi-conductor cable is not recommended without prior factory approval.
 - d. High voltage ignition wiring *should not* be installed in the same conduit with flame detector wires.



4. Installation of Extended Scanner Wiring:

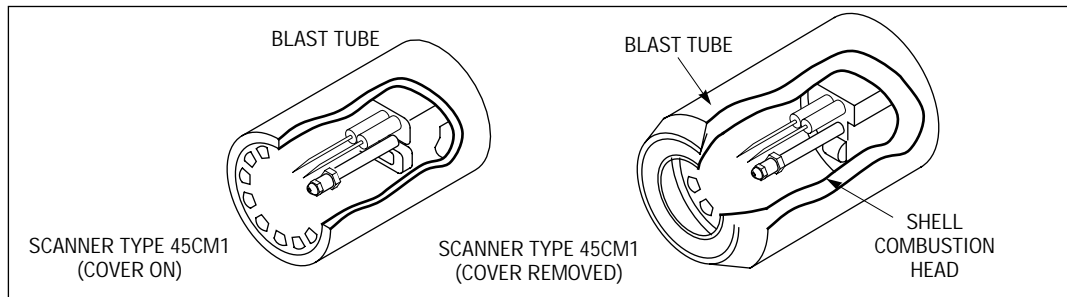
- For extended scanner wiring up to 500 feet, and for shorter lengths to reduce signal loss, use a shielded wire (Belden 8254-RG62 coaxial cable, or equal) **for each scanner wire** of UV1, UV2. The ends of the shielding must be taped and not grounded.

5. Multiple Scanner Installations:

- The wiring from multiple UV scanners may be installed in a common metallic conduit.
- Multi-conductor cable is not recommended without prior factory approval.

INSTALLATION - 45CM1 PHOTOCELL MOUNT

The 45CM1 photocell mount with #922 photocell and Rajah stud terminal, is designed for use in the blast tube on conventional atomizing oil burners. Two typical applications are shown below.



Test for Incandescent Refractory Hold-In with Photocell Detector

Type 45CM1 Photocell Scanners are actuated by light energy. To assure that the flame failure response time is not extended by radiation from incandescent refractory, the following test is recommended.

1. Operate the burner, following the burner manufacturer's instructions, until the refractory is at maximum operating temperature.
2. Turn off the main fuel supply manually.
3. Observe the display flame signal which must drop below 2 VDC within the flame failure response time (.8 seconds for MAUV1T, MART1T; 4 seconds for MAUV1, MART1).
4. If the flame failure response time exceed 4 seconds, reduce the amount of light at the Photocell with a screen, an orifice, or a filter lens, until the normal flame failure response is obtained.

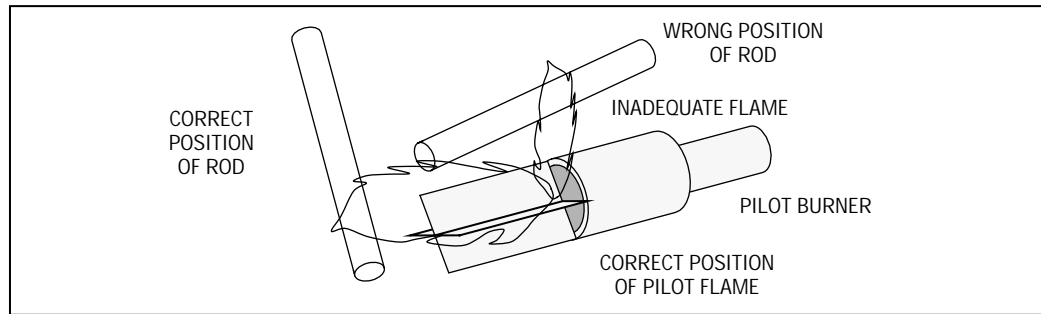
INSTALLATION - 69ND1 FLAME ROD

The 69ND1 flame rod proves a gas pilot flame and/or main gas flame. It is a *spark plug* type unit consisting of $\frac{1}{2}$ " NPT mount, a KANTHAL flame rod, a glazed porcelain insulating rod holder and a spark plug connector for making electrical connections. The 69ND1 is available in 12," 18" or 24" lengths.

The flame rod may be located to monitor only the gas pilot flame or both the gas pilot and main gas flames. It is mounted on a $\frac{1}{2}$ " NPT coupling.

The following instructions should be observed:

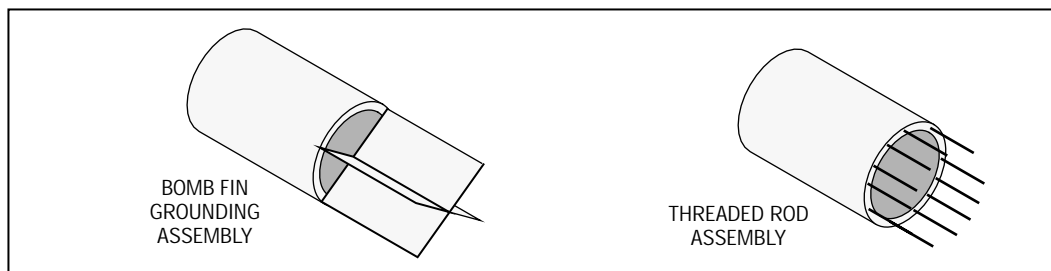
1. Keep flame rod as short as possible.
2. Keep flame rod at least $\frac{1}{2}$ " from any refractory.
3. Flame rod should enter the pilot flame from the side so as to safely prove an adequate pilot flame under all draft conditions.
4. If the flame is nonluminous (air and gas mixed before burning), the electrode tip should extend at least $\frac{1}{2}$ " into the flame, but not more than halfway through



5. If the flame is partly luminous, the electrode tip should extend only to the edge of the flame. It is not necessary to maintain absolutely uninterrupted contact with the flame.
6. It is preferable to angle the rod downward to minimize the effect of sagging and to prevent it from coming in contact with any object.
7. An adequate grounding surface for the flame must be provided. The grounding surface in actual contact with the flame must be at least four times greater than the area of the portion of the flame rod in contact with the flame. It is essential to adjust the flame rod and ground area ratio to provide a minimum signal reading of 6.0 VDC.

Note: Interference from the ignition spark can alter the true signal reading by adding to, or subtracting from it. This trend sometimes may be reversed by interchanging the primary wires (line voltage) to the ignition transformer. This interference can also be reduced by the addition of grounded shielding between the flame rod and ignition spark.

8. Proven types of flame grounding adapters, as shown below, may be used to provide adequate grounding surface. High temperature stainless steel should be used to minimize the effect of metal oxidation. This assembly may be welded directly over the pilot or main burner nozzle



WIRING OF PHOTOCELLS AND FLAME RODS

For proper operation of flame rectification systems (photocells and flame rods), it is necessary to maintain at least 20 megohms insulating resistance in the flame rectification circuit.

1. The scanner should be wired using metal cable or rigid conduit.
2. High voltage wiring must not be installed in the same conduit with scanner wiring.

Selection of Scanner Wire

1. Use #14, 16, or 18 gauge wire with 90 C, 600 volt insulation for up to 20 feet distance.
2. The type of insulation used with flame rectification is important, since it must protect against current leakage resistance to ground. Use Belden 8254-RG62 Coaxial Cable (or equal) for runs greater than 20 feet. **Maximum wiring run not to exceed 100 feet.**



MAINTENANCE

Type UV1, UV2, UV8A, and 45UV3 Ultraviolet and 45CM1 Photoelectric Scanners

The viewing area of the scanner must be kept clean. Even a small amount of contamination will reduce the flame signal reaching the detector by a measurable amount. Wipe the viewing area routinely using a soft cloth dampened with concentrated detergent.

Type 45CM1 Scanners include a replaceable #4-230 Phototube #922.

Type 69ND1 Flame Rod

The flame rod and its insulator should be kept clean by washing routinely with soap and water. Rods should be routinely replaced as they oxidize.

Flame Signal Strength

Routine observation of the flame signal strength will forewarn any deterioration in the capability of the flame detector or its application.

Periodic Safety Check

It is recommended that a procedure be established to test the complete flame safeguard system at least once a month. This test should verify the proper operation of all limit switches and safety interlocks as well as flame failure protection and fuel safety shutoff valve tightness.

Rotation

It is recommended that control and scanner units purchased as spares be installed periodically.

MC120P POST PURGE CHASSIS

The MC120P Chassis provides the following capabilities:

- A fifteen (15) second post purge at the end of an operating cycle or after a safety shutdown condition (prior to initiating a lockout).
- Remote reset in the event of a lockout condition.

Fifteen (15) second post purge — The blower motor (terminal 8) remains energized for at least 15 seconds at the end of every operating cycle (power removed from terminal 7). The blower motor also remains energized for 15 seconds following a condition which causes a safety shutdown (de-energizing terminals 3, 4, and 5). After the 15 second post purge is completed, the MC120P will initiate the safety lockout - energizing the alarm relay (lockout pushbutton) and terminal A.

Note: Refer to Figures 6, 7, 8 and 9 on pages 29 and 30 for wiring the MC120P chassis. The air flow switch is wired between terminals 7 and 6. On the MC120, MC120R, MC230, and MC230R, the air flow switch is wired between terminals 8 and 6.

Remote Reset - The MC120P chassis provides remote reset capability of a safety lockout. Refer to "Remote Reset Chassis (MC120R, MC230R, MC120P) for an explanation of the wiring and operation of the remote reset function.

REMOTE RESET CHASSIS (MC120R, MC120P, MC230R)

The MC120R/MC120P/MC230R Chassis provides remote reset capabilities in the event of a lockout condition. A blue slide switch located on the chassis (on the same PC board as the built-in reset switch) determines the method of reset. The MC120R and MC230R can be reset in any of the following ways:

1. Depress and release the reset button built into the MC120R/MC120P/MC230R chassis. This reset button will always reset the control, regardless of the position of the blue slide switch.
2. To reset the control via a remote pushbutton, move the blue slide switch towards the wiring base. Wire a momentary dry contact pushbutton into the two (2) terminals located on the MC120R/MC120P/MC230R chassis (on the same PC board as the built-in reset switch) and depress the

button for one (1) second. The maximum distance the remote reset switch can be wired from the control is 1,000 feet (max. wire size #14).

3. To reset the control via a power interruption, move the blue slide switch away from the wiring base (towards the dust cover). Interrupt the 120 VAC (MC120R/MC120P) or 230 VAC (MC230R) line power to the MC120R/MC120P chassis for one (1) second. The lockout will be reset when power is restored.
4. To reset via power interruption, remove 120 VAC (MC120R, MC120P) or 230VAC (MC230R) line power on the indicated terminals for 1 second for the following controls:

Terminal 1 MP560, MP561, MP562 when used with any amplifier.

MP100, MP101, MP230, MP230H when used with MAUV1 or MAUV1T amplifier modules.

Terminal 7 MP100, MP101, MP230, MP230H when used with MART1 or MART1T amplifier modules.



CAUTION: Remote reset is recommended only on a control solely for proved ignition programming (pilot ignited burner) or a control for use only with appliances in which unburned fuel cannot accumulate and that is intended for installation in inaccessible locations such as open-flame, ceiling-suspended gas heaters.

PROGRAMMER DIPSWITCH SETTINGS

NOTE: THE DIPSWITCHES ARE A ONE TIME, ONE SHOT SETTING. ONCE THE DIPSWITCHES ARE SET AND THE PLASTIC WINDOW IS MOVED OVER THE SWITCHES, THE WINDOW CANNOT BE MOVED AND THE DIPSWITCHES AND THEIR SETTINGS CANNOT BE CHANGED WITHOUT CAUSING THE CONTROL TO BECOME INOPERABLE.

The MP230, MP230H, and the MP560, MP561, MP562 Programmer Modules have a series of 8 dipswitches which allow the user to program the purge timing, trial for ignition timing, and recycle/non-recycle operation of the control. These dipswitches are programmed only **ONCE**, before the initial operation of the control.



THE PLASTIC WINDOW MUST BE MOVED OVER THE SWITCHES IN ORDER FOR THE PROGRAMMER TO OPERATE BEYOND PURGE.

Purge Timing

Dipswitches # 1 through #5 are used to select the purge timing for the control. The available timing selections are 5 seconds, 7 seconds, 30 seconds, 60 seconds, 240 seconds, and any combination of those timings. The timings for these switches are **additive**. Selecting two or more purge timing switches will result in a purge timing period equal to the sum of the switches (e.g. selecting switches # 3, and #4 will cause a purge timing of 90 second: 30 seconds plus 60 seconds). To select the timing associated with a particular switch, move the switch to the **RIGHT** (On Position).

NOTE: If all 5 switches are set to the OFF position, the control will lock out after the air flow switch has been proven closed.

Trial for Ignition

Dipswitches #6 and #7 are used to select the trial for ignition timing for the control. The available timing selections are 5 seconds and 10 seconds only. See Figure #1. Select **ONLY ONE** of these two switches. These switches **ARE NOT** additive. To select the timing associated with a particular switch, move the switch to the **RIGHT** (On Position).

NOTE: If both switches are set to the OFF position, the control will default to a trial for ignition period less than 5 seconds (e.g.: 3-4 seconds).

If both switches are set to the **ON** position, the control will default to **LOCKOUT**.



Recycle/Non-recycle Operation

Dipswitch #8 is used to select either recycle or non-recycle operation of the control. (See APPLICATION AND FUNCTION). To select RECYCLE operation, move the switch to the LEFT. To select NON-RECYCLE operation, move the switch to the RIGHT.

SWITCH	OFF	ON	
1	-	5	PURGE TIMING *
2	-	7	
3	-	30	
4	-	60	
5	-	240	
6	-	5	PTFI
7	-	10	
8	RECYCLE	NON RECYCLE	
* The MP561 programmer module has purge timing selections of 5, 7, 15, 30 and 60 seconds.			

Setting the Switches

Once the appropriate switches are set, slide the clear plastic window to the left so that it covers the switches and LOCKS into place. This action causes the control to become operable with the settings programmed from the dipswitches. The plastic window CANNOT be moved, and the dipswitches and their settings CANNOT be changed without causing the control to become inoperable. If the control does require alternative timings, the programmer module will have to be removed and replaced with another module with the appropriate dipswitch settings.

LED INDICATOR LIGHTS

The MP100, MP230, MP230H, and the MP560 Programmer Modules have 5 LED lights to indicate the operating status of the control. The function of these lights are:

Operating Control: This LED is energized whenever the burner control switch (Terminal #7) along with the various limit switches, operating controls and fuel interlocks are closed.

Air Flow: This LED is energized whenever power is detected between Terminals #8 and #6, indicating the air flow switch has closed.

PTFI: This LED is energized only during the Pilot Trial For Ignition Period.

Flame On: This LED is energized whenever a flame signal is detected by the UV scanner or Flame detector.

Alarm: this LED is energized whenever a safety lockout occurs. (See APPLICATION AND FUNCTION section).

APPLICATION AND FUNCTION - MP100, MP100E

The MP100 and MP100E Programmer Modules are designed as a replacement for the Fireye M1 Series "relight" controls. It provides ignition and Flame Safeguard for heating or process light oil or gas fired burners. The Amplifier Module should be selected based on the type of flame scanner (UV scanner, photocell, or flame rod), and the required Flame Failure response Time (F.F.R.T.). See ORDERING INFORMATION on page 4 for the appropriate part numbers.

Pilot Ignited Burners

The typical wiring arrangement illustrated on pages 26 (MC120, MC230) or 29 (MC120P) for pilot ignited burners provides the following function:



1. With power applied, and the limit-operating control circuit closed (**Operating Control LED** lit), the burner motor circuit is energized. The air flow switch circuit closes (**Air Flow LED** lit).
2. Following a short-time delay (4 to 6sec.), KL-1 closes, energizing Terminal 3 which powers the pilot gas valve, and Terminal 4 which powers the spark ignition. A 10 sec. trial for ignition is initiated (**PTFI LED** lit).
3. When pilot flame is detected (**Flame LED** lit), KF-1 closes, energizing Terminal 5 which powers the main fuel valve, and KF-2 opens, de-energizing Terminal 4 which shuts off the spark ignition.
4. When the operating control opens its circuit, or if a power failure occurs, the control is de-energized. Power interruptions in the millisecond range do not affect the operation of the control. Power interruptions of longer duration will cause the control to recycle.

NOTE: Controls with UV amplifiers (MAUVI and MAUVIT) are always powered via Terminal #1.

5. In the event the pilot flame is not detected by the end of the trial for ignition period, the pilot gas valve and spark ignition are de-energized. A safety lockout occurs which de-energizes the burner motor and energizes the lockout alarm circuit (**Alarm LED** lit) approximately 30 seconds after the safety lockout occurs.
6. In the even of a flame failure during a firing period, the main fuel valve is de-energized and the spark ignition re-energized. A 10 sec. relight trial for ignition is initiated (**PTFI LED** lit). If flame is detected (**Flame LED** lit) during the trial for ignition period, the main fuel valve is re-energized and the spark ignition de-energized. If flame is not detected during the trial for ignition period, the pilot gas valve and spark ignition are de-energized. A safety lockout occurs which de-energizes the burner motor and energizes the lockout alarm circuit (**Alarm LED** lit) approximately 30 seconds after the safety lockout occurs.
7. **Manual reset is required following any safety lockout.**

NOTE: Wait 10 seconds after lockout before resetting the control.

Direct Spark Ignited Burners

The typical wiring arrangement illustrated on pages 26 (MC120, MC230 or 29 (MC120P) for direct spark ignited burners provides the following function:

1. With power applied, and the limit-operating control circuit closed (**Operating Control LED** lit), the burner motor circuit is energized. The air flow switch circuit closes (**Air Flow LED** lit).
2. Following a short-time delay (4-6 sec.) KL-1 closes, energizing Terminal 3 which powers the primary main fuel valve and Terminal 4 which powers the spark ignition. A ten sec. trial for ignition is initiated (**PTFI LED** lit).
3. When main flame is detected (**Flame LED** lit), KF-1 closes, energizing Terminal 5 which powers the secondary main fuel valve (if used), KF-2 opens de-energizing Terminal 4 which shuts off the spark ignition.
4. When the operating control opens or if a power failure occurs, the control is de-energized. Power interruptions in the millisecond range do not affect the operation of the control. Power interruptions of longer duration will cause the control to recycle.

NOTE: Controls with UV amplifiers (MAUVI and MAUVIT) are always powered via Terminal #1.

5. In the event that main flame is not detected by the end of the trial for ignition period, the primary main fuel valve and the spark ignition are de-energized. A safety lockout occurs which de-energizes the burner motor and energizes the lockout alarm circuit (**Alarm LED** lit) approximately 30 seconds after the safety lockout occurs.
6. In the event of a flame failure during a firing period, the secondary main fuel valve (if used) is de-energized and the spark ignition is re-energized. A 10 sec. re-light trial for ignition is initiated (**PTFI LED** lit). If flame is detected (**Flame LED** lit), the secondary main fuel valve (if used) is re-energized and the spark ignition de-energized. If flame is not detected during the trial for ignition period, the primary main fuel valve and the spark ignition are de-energized. A safety lockout occurs, which de-energizes the burner motor and energizes the lockout alarm circuit (**Alarm LED** lit) approximately 30 seconds after the safety lockout occurs.

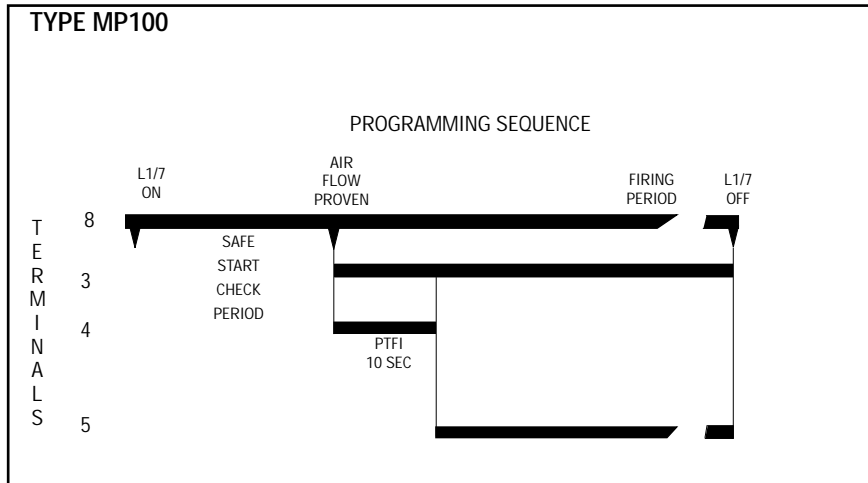
7. Manual reset is required following and safety lockout.

NOTE: Wait 10 seconds after lockout before resetting the control.

Standing Pilot Burners

When using an MP100 or MP100E with an MARTI or MARTIT amplifier to control a burner having a standing pilot, clip out the red wire loop close to the edge of the circuit board. This eliminates pilot proving when the main burner is off and requires pilot flame proving during the subsequent start-up.

TIMING CHART



Re-ignited PTFI on flame fail after Terminal 5 energized.

Recycle on loss of air flow after flame proven.

MP101

Same as MP100 but will tolerate flame signal during "Off" cycle.

APPLICATION AND FUNCTION - MP101

The MP101 operates in the same manner as the MP100 with the following exception. The MP101 programmer module will not lock out if flame signal is detected during the off cycle (no power on terminal 7). If flame signal is present when power is applied to terminal 7, the control will not lock out until the air flow switch is proven closed (power on terminal 6).

Consult the factory before installing the programmer.

APPLICATION AND FUNCTION MP230

The MP230 Programmer Module directly replaces the Fireye M2 Series "recycle" controls and M3 Series "non-recycle" controls. It provides prepurge, ignition and flame safeguard for heating and process light oil or gas fired burners. The "recycle" or "non-recycle" operation is determined by the position of dipswitch #8 on the Programmer Module. Purge timing, as well as trial for ignition timing is also set by the dipswitch settings. See PROGRAMMER DIP-SWITCH SETTINGS on page 11.

Amplifier and Scanner Selection

The Amplifier Module should be selected base on the type of flame scanner (UV scanner, photocell, or flame rod), and the required Flame Failure Response Time (F.F.R.T.). See ORDERING INFORMATION on page 4 for the appropriate part numbers.



Pilot Ignited Burners - "Recycle" Operation

With dipswitch #8 in the "recycle" position, the typical wiring arrangement illustrated on pages 26 (MC120, MC230) or 28 (MC120P) for pilot ignited burners provides the following function:

1. With power applied, and the limit-operating control circuit closed (**Operating Control LED** lit), the burner motor circuit is energized. The air flow circuit closes (**Air Flow LED** lit).
2. Following the prepurge period (as determined by dipswitches #1 through #5), KL-1 closes, energizing Terminal 3 which powers the pilot gas valve and Terminal 4 which powers the spark ignition. A five or ten sec. (as determined by dipswitches #6 or #7) trial for ignition is initiated (**PTFI LED** lit).
3. When pilot flame is detected (**Flame LED** lit), KF-1 closes, energizing Terminal 5 which powers the main fuel valve, KF-2 opens de-energizing Terminal 4 which shuts off the spark ignition.
4. When the operating control opens its circuit, or if a power failure occurs, the entire system is de-energized. Power interruptions in the millisecond range do not affect the operation of the control. Power interruptions of longer duration will cause the control to recycle.

NOTE: Controls with UV amplifiers (MAUVI and MAUVIT) are always powered via Terminal #1.

5. In the event the pilot flame is not detected by the end of trial for ignition period, the pilot gas valve and spark ignition are de-energized. A safety lockout occurs which de-energizes the burner motor and energizes the lockout alarm circuit (**Alarm LED** lit) approximately 30 seconds after the safety lockout occurs.
6. In the event of a flame failure during a firing period, the pilot and main fuel valves are de-energized. Following the prepurge period (as determined by dipswitches #1 through #5), with proven air flow (**Air Flow LED** lit), the pilot gas valve and spark ignition are re-energized and a five or ten sec. (as determined by dipswitches #6 or #7) trial for ignition is initiated (**PTFI LED** lit). If pilot flame is detected (**Flame LED** lit), the main fuel valve is energized, the spark ignition is de-energized. If the pilot flame is not detected during the trial for ignition period, the pilot gas valve and spark ignition are de-energized. A safety lockout occurs which de-energizes the burner motor and energizes the lockout alarm circuit (**Alarm LED** lit) approximately 30 seconds after the safety lockout occurs.
7. Manual reset is required following any safety lockout.

NOTE: Wait 10 seconds after lockout before resetting the control.

Pilot Ignited Burners - "Non-recycle" Operation

The function of "non-recycle" pilot ignited burners is the same as described for the "recycle" controls, except that the "non-recycle" operation will lock out following any flame failure. "Recycle" or "non-recycle" operation is determined by the position of dipswitch #8. See Programmer dipswitch settings on page 12.

Direct Spark Ignited Burners - "Recycle" Operation

With dipswitch #8 in the "recycle" position, the typical wiring arrangement illustrated on pages 26 (MC120, MC230) or 28 (MC120P) for direct spark ignited burners provides the following function:

1. With power applied, and the limit-operating control circuit closed (**Operating Control LED** lit), the burner motor circuit is energized. The air flow switch circuit closes (**Air Flow LED** lit).
2. Following the selected prepurge period (as determined by dipswitches #1 through #5), KL-1 closes, energizing Terminal 3 which powers the primary main fuel valve, and Terminal 4 which powers the spark ignition. A five or ten second (as determined by dipswitches #6 and #7) trial for ignition is initiated (**PTFI LED** lit).

3. When pilot flame is detected (**Flame LED lit**), KF-1 closes, energizing Terminal 5 which powers the secondary main fuel valve, and KF-2 opens, de-energizing Terminal 4 which shuts off the spark ignition.
4. When the operating control opens its circuit, or if a power failure occurs, the control is de-energized. Power interruptions in the millisecond range do not affect the operation of the control. Power interruptions at longer duration will cause the control to recycle.

NOTE: Controls with UV amplifiers (MAUV1 and MAUVIT) are always powered via Terminal #1.

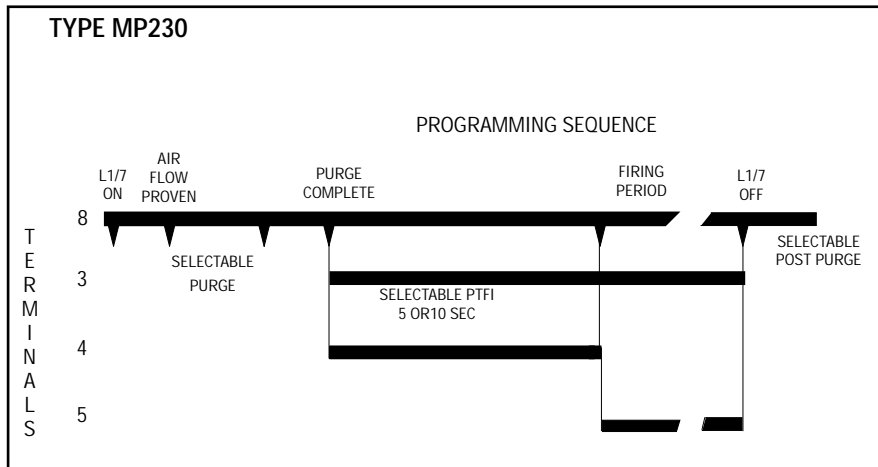
5. In the event the pilot flame is not detected by the end of the trial for ignition period, the pilot gas valve and spark ignition are de-energized. A safety lockout occurs which de-energizes the burner motor and energizes the lockout alarm circuit (**Alarm LED lit**) approximately 30 seconds after the safety lockout occurs.
6. In the event of a flame failure during a firing period, all fuel valves are de-energized. Following the prepurge period (as determined by dipswitches #1 through #5), with proven air flow (**Air Flow LED lit**), the primary main fuel valve and spark ignition are re-energized and a five or ten second (as determined by dipswitches #6 and #7) trial for ignition period is initiated (**PTFI LED lit**). If flame is detected (**Flame LED lit**), the secondary main fuel valve (if used) is energized. The spark ignition is de-energized. If flame is not detected during the trial for ignition period, the primary main fuel valve and spark ignition are de-energized. A safety lockout occurs, de-energizing the burner motor and energizing the lockout alarm circuit (**Alarm LED lit**) approximately 30 seconds after the safety lockout occurs.
7. Manual reset is required following any safety lockout.

NOTE: Wait 10 seconds after lockout before resetting the control.

Direct Spark Ignited Burners - "Non-recycle" Operation

The function of "non-recycle" direct spark ignited burners is the same as described for the "recycle" controls, except that the "non-recycle" operation will lock out following any flame failure. "Recycle" or "non-recycle" operation is determined by the position of dipswitch #8. See Programmer Dipswitch Settings on page 12.

TIMING CHART



Selectable Recycle/Non-Recycle operation on loss of flame after Terminal 5 energized.

Recycle on loss of air flow after flame proven.

APPLICATION AND FUNCTION - MP230H

The MP230H Programmer Module is designed as a direct replacement for the Fireye M3H Series “non-recycle” controls, as well as providing a “recycle” operation for the control. It provides prepurge, ignition and flame safeguard for heating and process light oil or gas fired burners. The “recycle” or “non-recycle” operation is determined by the position of dipswitch #8 on the Programmer Module. Purge timing as well as trial for ignition timing is also set by the dipswitch settings. See Programmer Dipswitch Settings on page 12.

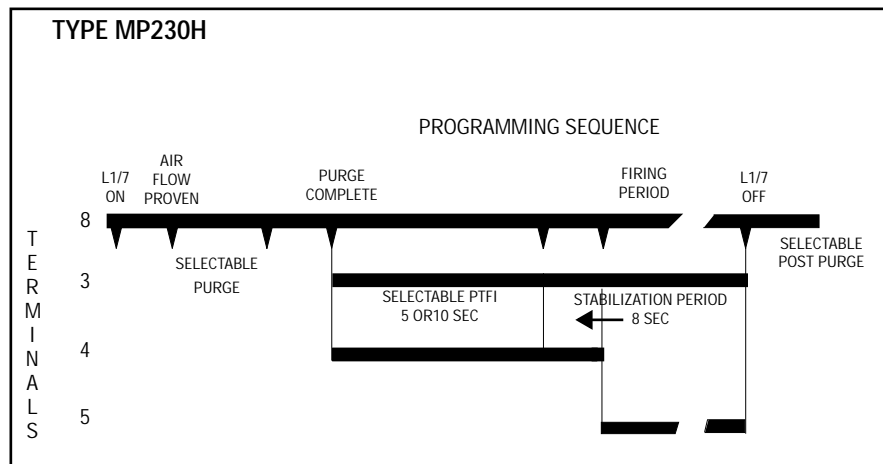
All installation, wiring, functions, testing instructions for the MP230 control are applicable to the MP230H. The MP230H provides an additional function whereby the powering of Terminal 5 is delayed for eight (8) seconds after flame is detected, and Terminal 4 remains powered during the eight (8) second delay.

This additional function is offered primarily for two-stage light oil burners, to assure a specific delay between light off of the first and second stage, and to provide additional ignition timing to improve flame stabilization.

Amplifier and Scanner Selection

The Amplifier Module should be selected based on the type of flame scanner (UV scanner, photocell, or flame rod), and the required Flame Failure response Time (F.F.R.T.). See ORDERING INFORMATION on page 4 for the appropriate part numbers.

TIMING CHART



Pilot Stabilization timing begins as soon as flame is proven.

Selectable Recycle/Non-Recycle operation on loss of flame after Terminal 5 is energized.

APPLICATION AND FUNCTION - MP560, MP561, MP562

The MP560, MP561, MP562 Programmer Modules are designed as a direct replacement for the Fireye M5 Series “non-recycle” controls and M6 Series “recycle” and “non-recycle” controls. It provides prepurge, ignition and flame safeguard for heating and process light oil or gas fired burners. The “recycle” or “non-recycle” operation is determined by the position of dipswitch #8 on the Programmer Module. Purge timing as well as trial for ignition timing is also set by the dipswitch settings. See PROGRAMMER DIPSWITCH SETTING on page 12.

A “run-check” switch is provided to assist in testing size, position, and stabilization of pilot in conjunction with the flame detector. See page 28.



Amplifier and Scanner Selection

The Amplifier Module should be selected based on the type of flame scanner (UV scanner, photocell, or flame rod), and the required Flame Failure Response Time (F.F.R.T.). See ORDERING INFORMATION on page 4 for the appropriate part numbers.

Pilot Ignited Burners - "Recycle" Operation

With dipswitch #8 in the "recycle" position, the typical wiring arrangement illustrated on pages 29 (MC120, MC230) or 30 (MC120P) for pilot ignited burners provides the following function:

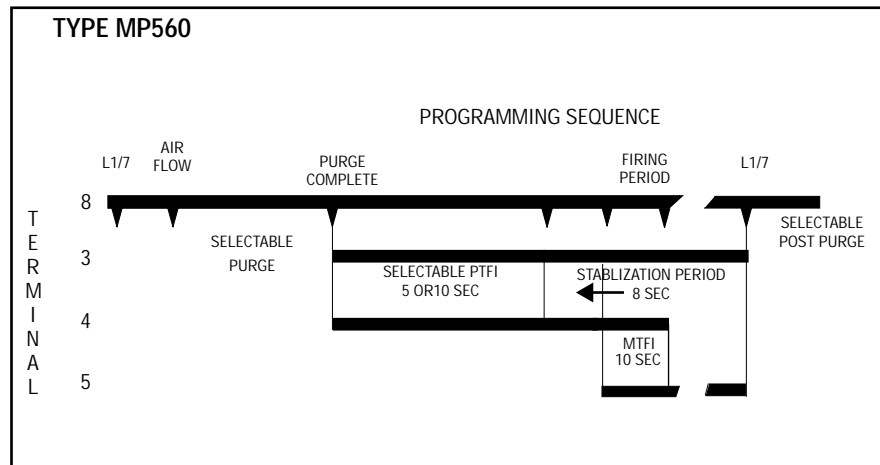
1. With power applied, and the limit-operating control circuit closed (**Operating Control LED** lit), the burner motor circuit is energized. The air flow circuit closes (**Air Flow LED** lit).
2. Following the selected prepurge period (as determined by dipswitches #1 through #5), KL-1 and K1-1 close, energizing Terminals 3 and 4 which powers the pilot valve and the spark ignition. A 5 or 10 sec. (as determined by dipswitches #6 and #7) trial-for-ignition initiates (**PTFI LED** lit).
3. When pilot flame is detected (**Flame LED** lit), an 8 sec. pilot stabilization period begins followed by KF-1 closing. Ten seconds after KF-1 closes, Terminal 4 is de-energized.
4. When the operating control opens its circuit or if a power failure occurs, the control is de-energized. Power interruptions in the millisecond range do not affect the operation of the control. Power interruptions at longer duration will cause the control to recycle.

NOTE: Controls with UV amplifiers (MAUV1 and MAUVIT) are always powered via Terminal #1.

5. In the event the pilot flame is not detected by the end of trial for ignition period, the pilot valve and spark ignition are de-energized. A safety lockout occurs which de-energizes the burner motor and energizes the lockout alarm circuit (**Alarm LED** lit) approximately 30 seconds after the safety lockout occurs.
6. In the event of a flame failure during a firing period, the pilot and main fuel valves are de-energized. Following the prepurge period (as determined by dipswitches #1 through #5), with proven air flow (**Air Flow LED** lit), the pilot valve and spark ignition are re-energized and a 5 or 10 sec. (as determined by dipswitches #6 and #7) trial-for-ignition is initiated (**PTFI LED** lit). If pilot flame is detected (**Flame LED** lit), the main fuel valve is energized, the spark ignition and pilot are de-energized. If the pilot flame is not detected during the trial for ignition period, the pilot gas valve and spark ignition are de-energized. A safety lockout occurs which de-energizes the burner motor and energizes the lockout alarm circuit (**Alarm LED** lit) approximately 30 seconds after the safety lockout occurs.
7. Manual reset is required following any safety lockout.

NOTE: Wait 10 seconds after lockout before resetting the control.

TIMING CHART



Pilot Stabilization timing begins as soon as flame is proven.

Selectable Recycle/Non-Recycle operation on loss of flame after Terminal 5 is energized.

Pilot Ignited Burners - "Non-recycle" Operation

The function of "non-recycle" pilot ignited burners is the same as described for the "recycle" controls, except that the "non-recycle" operation will lock out following any flame failure. "Recycle" or "non-recycle" operation is determined by the position of dipswitch #8. See Programmer Dipswitch Settings on page 11.

Direct Spark Ignited Burners - "Recycle" Operation

With dipswitch #8 in the "recycle" position, the typical wiring arrangement illustrated on page 28 (MC120, MC230) or 25 (MC120P) for direct spark ignited burners will provide the following function:

1. With power applied, and the limit-operating control circuit closed (**Operating Control LED** lit), the burner motor circuit is energized. The air flow circuit closes (**Air Flow LED** lit).
2. Following the selected prepurge period (as determined by dipswitches #1 through #5), KL-1 and K1-1 close, energizing Terminal 3 which powers the primary main fuel valve, and Terminal 4 which powers the spark ignition. A five or ten second (as determined by dipswitches #6 and #7) trial for ignition is initiated (**PTFI LED** lit).
3. When primary flame is detected (**Flame LED** lit), an 8 second stabilization period begins and KF-1 closes, energizing Terminal 5 which powers the main fuel valve. Ten seconds later K1-1 opens, de-energizing Terminal 4 which shuts off the spark ignition.
4. When the operating control opens its circuit, or if a power failure occurs, the control is de-energized. Power interruptions in the millisecond range do not affect the operation of the control. Power interruptions at longer duration will cause the control to recycle.

NOTE: Controls with UV amplifiers (MAUV1 and MAUVIT) are always powered via Terminal #1.

5. In the event the primary flame is not detected by the end of the trial for ignition period, the primary valve and spark ignition are de-energized. A safety lockout occurs which de-energizes the burner motor and energizes the lockout alarm circuit (**Alarm LED** lit) approximately 30 seconds after the safety lockout occurs.
6. In the event of a flame failure during a firing period, the pilot and main fuel valves are de-energized. Following the prepurge period (as determined by dipswitches #1 through #5), with proven air flow (**Air Flow LED** lit), the primary main fuel valve and spark ignition are re-energized and a 5 or 10 sec. (as determined by dipswitches #6 and #7) trial-for-ignition is initiated (**PTFI LED** lit). If flame is detected (**Flame LED** lit), the secondary main fuel valve (if used) is energized. The spark ignition

is de-energized. If flame is not detected during the trial for ignition period, the primary main fuel valve and spark ignition are de-energized. A safety lockout occurs which de-energizes the burner motor and energizes the lockout alarm circuit (**Alarm LED lit**) approximately 30 seconds after the safety lockout occurs.

- Manual reset is required following a safety lockout.

NOTE: Wait 10 seconds after lockout before resetting the control.

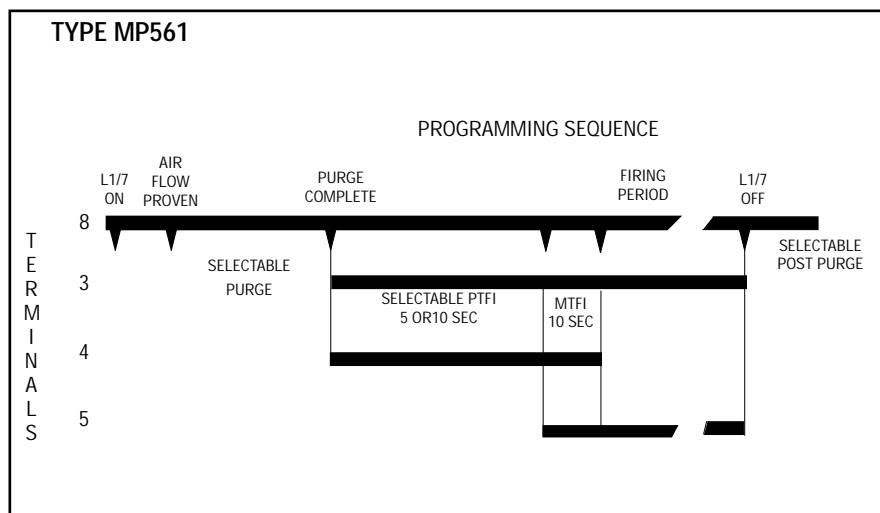
Direct Spark Ignited Burners - "Non-recycle" Operation

The function of "non-recycle" direct spark ignited burners is the same as described for the "recycle" controls, except that the "non-recycle" operation will lock out following any flame failure. "Recycle" or "non-recycle" operation is determined by the position of dipswitch #8. See Programmer Dipswitch Settings on page 11.

APPLICATION AND FUNCTION — MP561

The MP561 operates in the same manner as the MP560 with the following exception. The MP561 programmer does not have the 8 second pilot stabilization period. KF-1 closes as soon as flame is detected. Terminal 4 is de-energized 10 seconds later.

TIMING CHART



Selectable Recycle/Non-Recycle operation on loss of flame after Terminal 5 is energized.

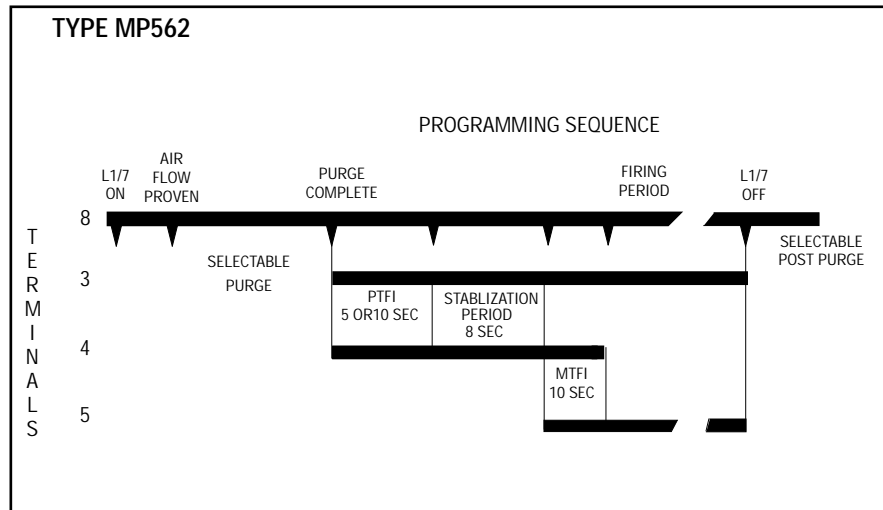
APPLICATION AND FUNCTION - MP562

The MP562 operates in the same manner as the MP560 programmed for "Non-Recycle Operation" with the following exceptions.

- On loss of air flow (terminals 8-6) during the purge period, the control will re-initiate the purge period once air flow is proven.
- On loss of air flow (terminals 8-6) after the purge period has been completed, the control will initiate a safety shutdown and lockout
- Dipswitch #6 is not functional on the MP562, MP562E programmers.

Note: The control will lockout on loss of flame during the trial for ignition period or main flame.

TIMING CHART



Pilot stabilization timing begins as soon as flame is proven.

Lockout on loss of air flow after flame is proven.

Lockout on flame fail.

INSTALLATION TESTING

Use of Test Meter (All Controls)

Testing the Fireye Modular M-Series II Controls requires the use of a test AC-DC multimeter, with a 1,000 ohm/volt DC rating or greater, or a digital meter with 500K input impedance or greater.

With the test meter on the DC scale, and the test meter leads inserted into the test jacks on the amplifier module, a **steady DC voltage reading of 4.0 to 6.0 volts (for UV amplifiers) and 6 to 18 volts (for flame rectification amplifiers)** should be obtained when the controls are detecting flame, and zero volts when no flame is present.

With the test meter on the AC scale, line and load voltages may be measured at the identified test points on the chassis.

On the Modular M-Series II controls utilizing a flame rectification amplifier, a micro-ammeter may be connected in series with the wire to Terminal S2. Normal flame will produce a meter reading between 4 and 10 micro-amps.

Flame Signal Testing (All Controls)

1. Manually shut off the main fuel valve for a pilot ignited burner, or the secondary fuel valve for a direct spark ignited burner.
2. Set the test meter on the DC scale and insert the test leads into the test jacks on the amplifier module. (If the meter reads backwards, reverse the meter leads). Red - Plus, Black - Negative.
3. Initiate a normal startup.
4. When flame is established, the test reading should be normal: a steady DC voltage reading of 4.0 to 6.0 volts (for UV amplifiers) and 6 to 18 volts (for flame rectification amplifiers).
5. Inadequate flame signal may be improved by:
 - a. Assuring that the flame detector and wiring installations have followed the instructions on pages 3 and 5.
 - b. Assuring that the flame detector is clean and within the ambient temperature limits.
 - c. Assuring that the flame is sufficiently large to detect.
 - d. Assuring that the flame quality (fuel to air ratio, combustion air velocity) is satisfactory.
 - e. Trying a shorter sight pipe, or increasing the sight pipe diameter.



WARNING: Before making a pilot flame test, manually shut off the fuel supply to the main burner.

Normal Pilot Flame Test (MP560, MP561, MP562 Programmers Only)

1. Place the “Run-Check” switch in the “Check” position.
2. Turn power on and initiate a normal startup.
3. Observe the pilot flame signal on the test meter. If the average flame is below normal, a steady DC voltage reading of 4.0 to 6.0 volts (for UV amplifiers) and 14 to 18 volts (for flame rectification amplifiers), re-adjust the pilot flame or realign the flame detector.



WARNING: DO NOT TOUCH a flame rectification rod with power applied.

4. During the pilot flame test and adjustment period, if flame is not detected within 30 seconds, the control will lock out. To reestablish the pilot flame trial for ignition (P.T.F.I.), manual reset of the lockout switch is required, and a complete repurge is accomplished.
5. When UV detection is used, a test is required to verify that UV radiation from the ignition spark is not being detected. To accomplish this, manually shut off both pilot and main fuels. Initiate a normal startup, observe the test meter which should read no more than 1/2 volt DC. If more than 1/2 volt DC is observed, realign the UV scanner, and/or shield the spark from the scanner’s view.
6. Move the “Run-Check” switch to the “Run” position, check pilot flame failure response time by manually shutting off the pilot fuel and then initiate a normal startup. With no pilot flame present, the control will de-energize the pilot assembly at the end of the trial for ignition interval (5 or 10 seconds, selected by dipperswitches #6 and #7 - see Programmer Dipperswitch Settings on page 11), and the control will lock out.



WARNING: The minimum pilot test must be accomplished by a trained and qualified burner technician.

Minimum Pilot Test

This test insures that the flame detector will not sense a pilot flame too small to light the main flame reliably. It must be made on every new installation as well as following the repositioning of the flame detector. **This procedure should not be used on a direct spark ignited burner.**

1. Manually shut off the fuel to the main burner.
2. Place the “Run-Check” switch in the “Check” position. (MP560 Programmers only).
3. Connect a test meter to the test jacks on the Amplifier Module.
4. Initiate a normal startup.
5. Reduce the fuel to the pilot until the DC voltmeter reads 3.5 volts for UV scanners. See WARNING below. This is the minimum pilot. For flame rectification the flame signal for minimum pilot varies depending on the application. See WARNING below.
6. Return the “Check-Run” switch to the “Run” position. (MP560 Programmer only).
7. Slowly turn on the main fuel and insure that the main flame lights off promptly and normally.



WARNING: If light off is delayed, shut off the power to the installation. Realign the flame detector so that pilot flame detection requires a larger pilot flame. Repeat this test until the main flame lights reliably with minimum pilot.

8. After the minimum pilot test is completed satisfactorily, increase the pilot flame to normal size, and observe that the main flame is properly established during a normal cycle (“Run-Check” switch in the “Run” position).

Flame Failure Test

1. Temporarily connect spark ignition and pilot valve to Terminal #3.
2. Initiate a normal startup.
3. Manually shut off all fuel and observe the loss of flame signal on the test meter.
4. If flame signal does not reduce to zero within the flame failure response time of the control (F.F.R.T. determined by selection of amplifier), verify that the UV flame detector is not actuated by the spark. If spark is detected, a metallic shield or relocation of the UV detector sight pipe is required.



5. **IMPORTANT:** When the test is completed, reconnect the spark ignition to Terminal #4.

Recommendation

Periodic Safety Check: Test the complete flame safeguard system at least once a month. This test should verify flame failure safety shutdown and positive fuel cutoff when the fuel valve is de-energized.

MAINTENANCE

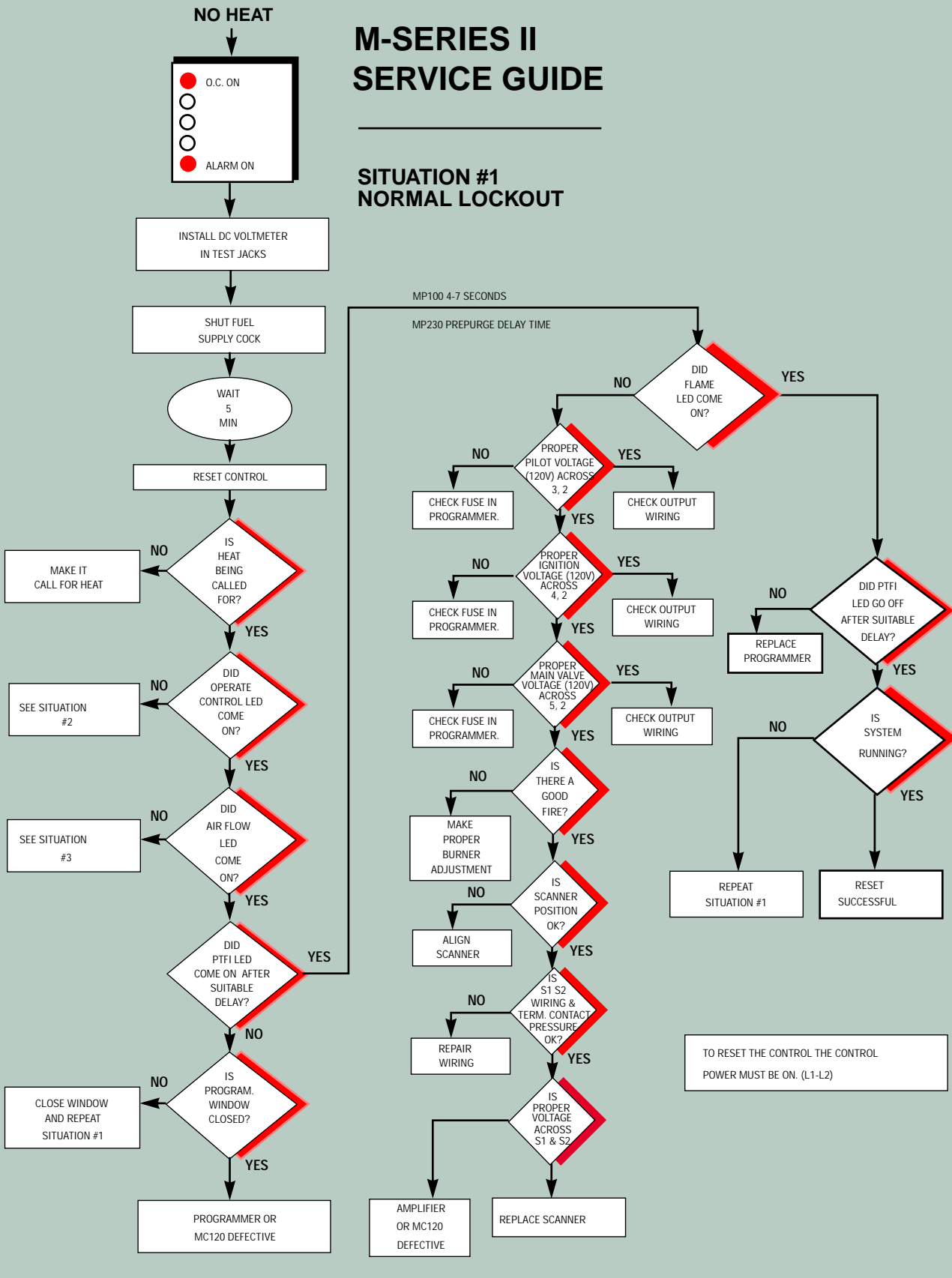
UV-eye scanner: The UV tube must be kept clean. Use a clean cloth with detergent as often as operating conditions require. Remove any residual detergent.

ROTATION

It is recommended that units purchased as spares be rotated periodically, so that each unit will be placed in operation every 90 days.

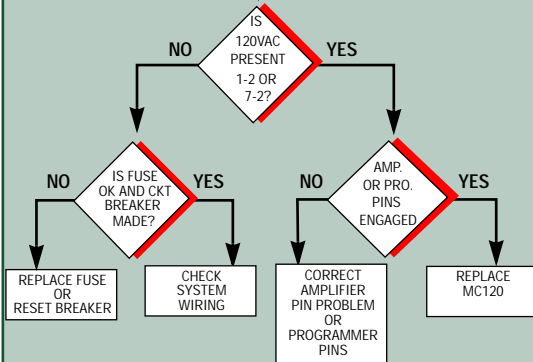
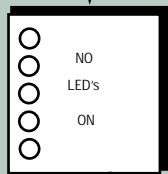
M-SERIES II SERVICE GUIDE

SITUATION #1 NORMAL LOCKOUT



SITUATION #2

NO HEAT



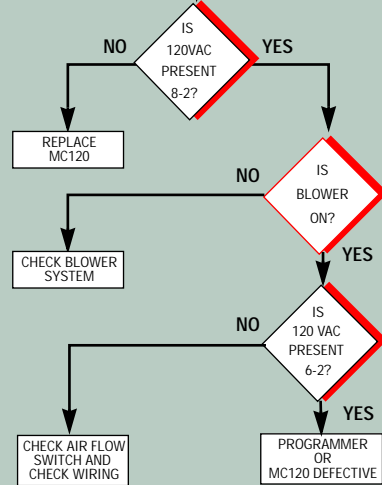
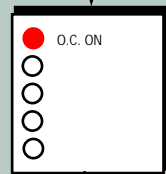
M-Series Fuse 2AG 8 amps.
Fireye Part Number: 23-176
or

TROUBLESHOOTING TIPS

1. Verify that there is a solid earth ground wire brought to the panel that the Fireye base is mounted to.
2. In a rectification system, verify that terminal S1 is solidly earth grounded, and confirm that the flame rod is aligned so it doesn't droop near the ignition spark.
3. Confirm that there is no measurable voltage present between the ground screw and terminal 2 (neutral).
4. Confirm that the 120 volt AC supply has its neutral leg earth grounded at the supply, (floating isolation transformers can cause problems).
5. Confirm that the ignition transformer's secondary winding is solidly earth grounded. The grounding method is usually through the transformer case. Dirt, paint, loose mounting hardware, etc., can all be factors.
6. There may be a problem with transients in the main power supply. If you think this may be the problem, you may want to run a ground wire directly from the pilot assembly back to the electrical panel where the Fireye control is mounted.

SITUATION #3

NO HEAT



SITUATION #4

NO HEAT

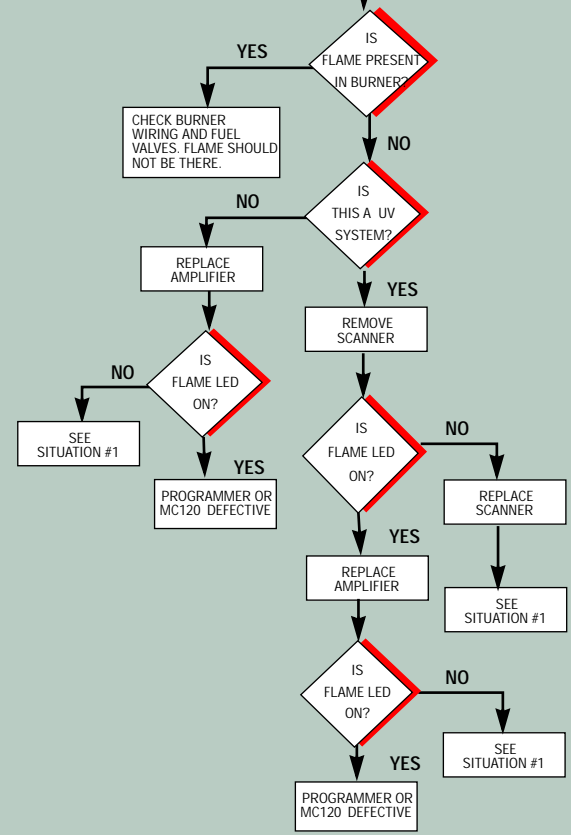
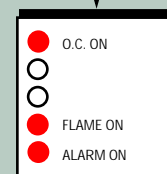
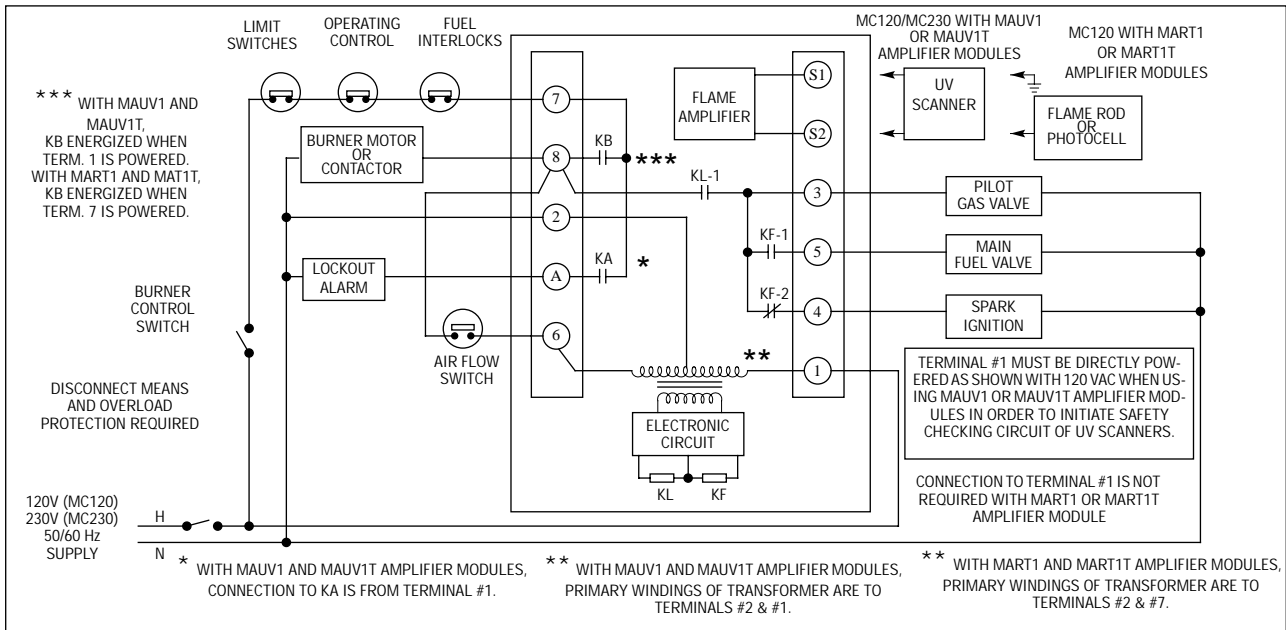




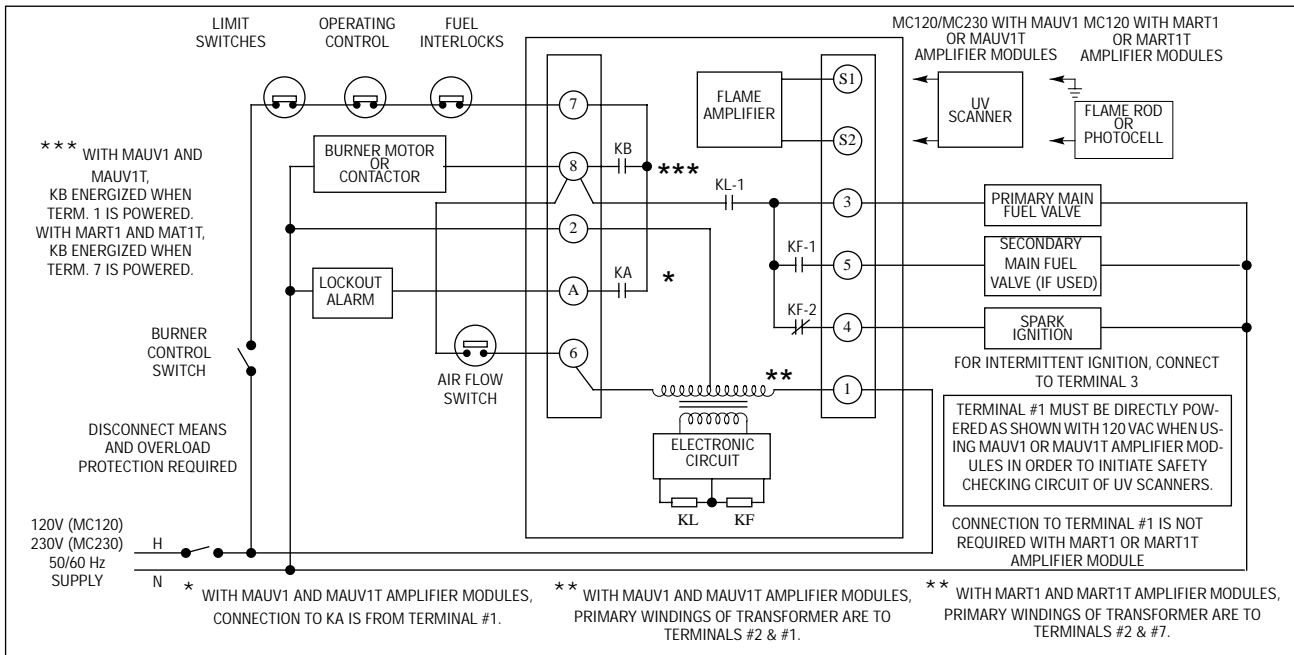
FIGURE 1. TYPICAL MP100, MP100E, MP101, MP230, and MP230H WIRING ARRANGEMENT FOR PILOT IGNITED BURNER. **MC120, MC120R, MC230, MC230R CHASSIS ONLY.**



Use moisture resistant wire suitable for at least 90

CAUTION: When powered, 560 VAC across S1, S2 with MAUV1 and MAUV1T; 260 VAC across S1, S2 with MART1 and MART1T.

FIGURE 2. TYPICAL MP100, MP100E, MP101, MP230, AND MP230H WIRING ARRANGEMENT FOR DIRECT SPARK IGNITED BURNER **MC120, MC120R, MC230, MC230R CHASSIS ONLY.**



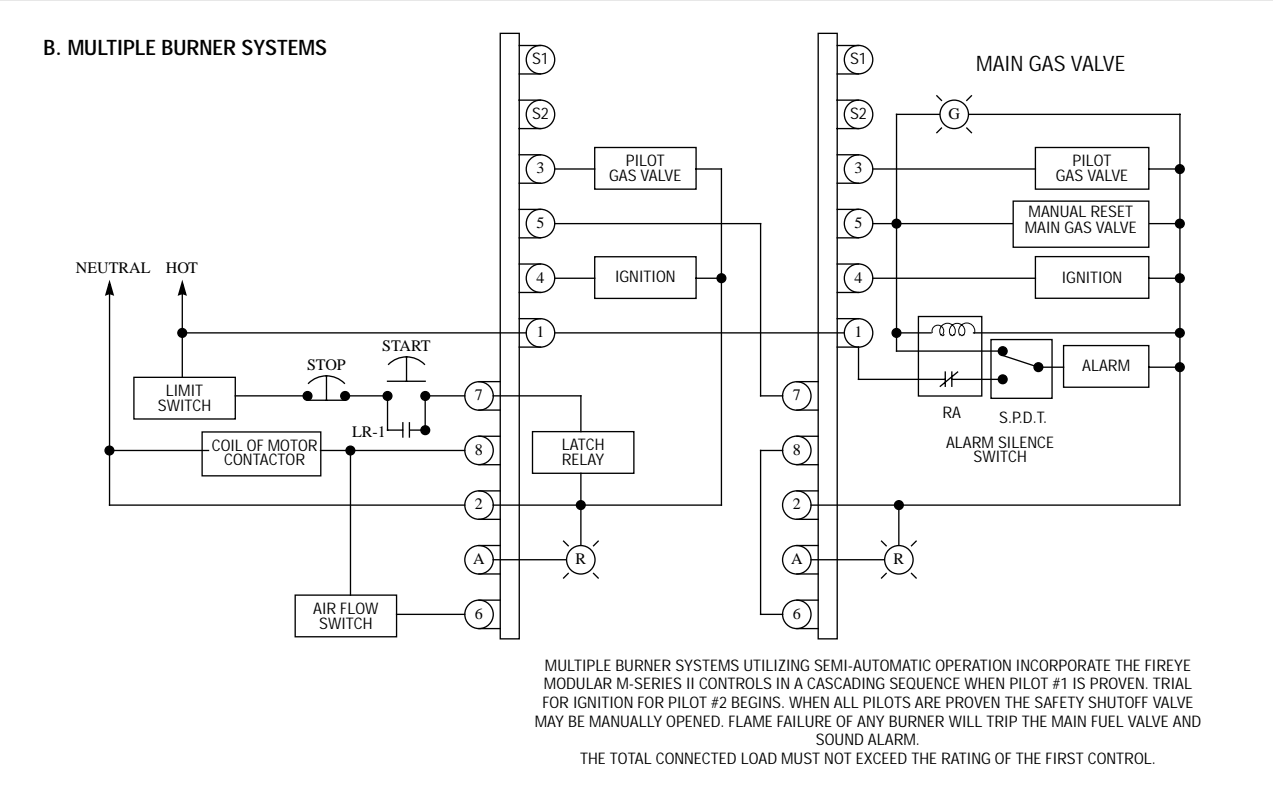
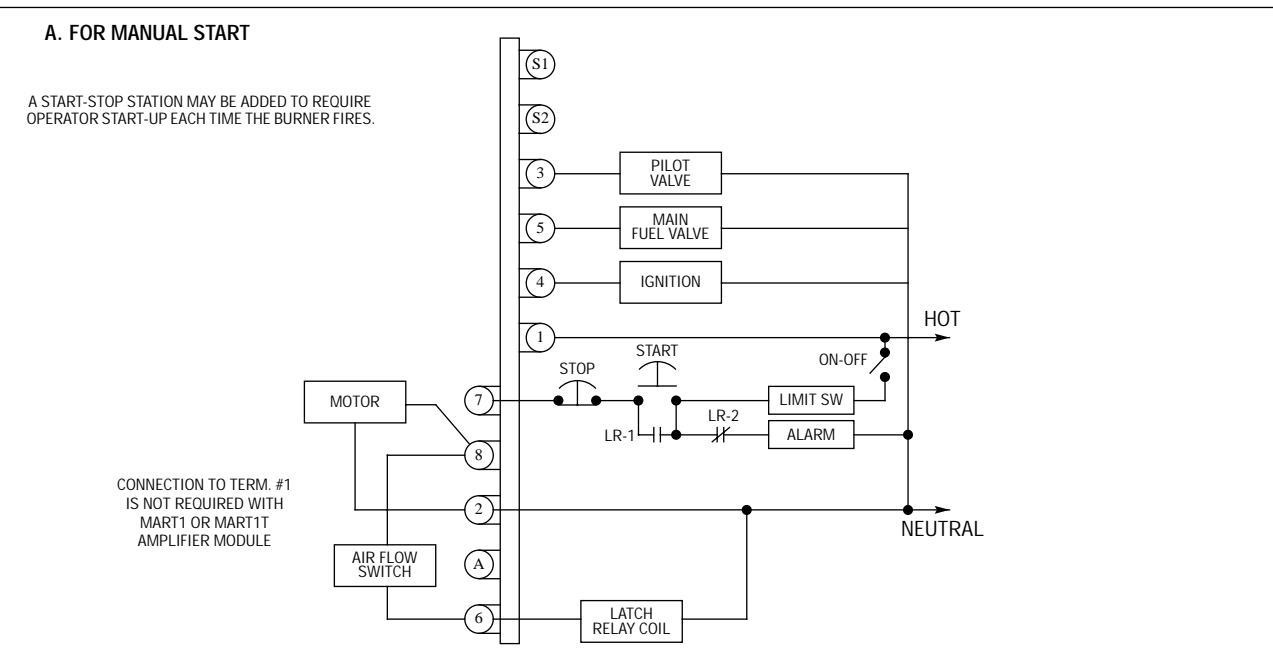
Use moisture resistant wire suitable for at least 90



CAUTION: When powered, 560 VAC across S1, S2 with MAUV1 and MAUV1T; 260 VAC across S1, S2 with MART1 and MART1T.

CAUTION: Control wiring procedures which deviate from those shown in the diagrams may bypass safety functions designed in the control. Check with the Fireye Representative before deviating from the recommended wiring diagrams.

FIGURE 3. ALTERNATE WIRING ARRANGMENT FOR MP100 CONTROLS

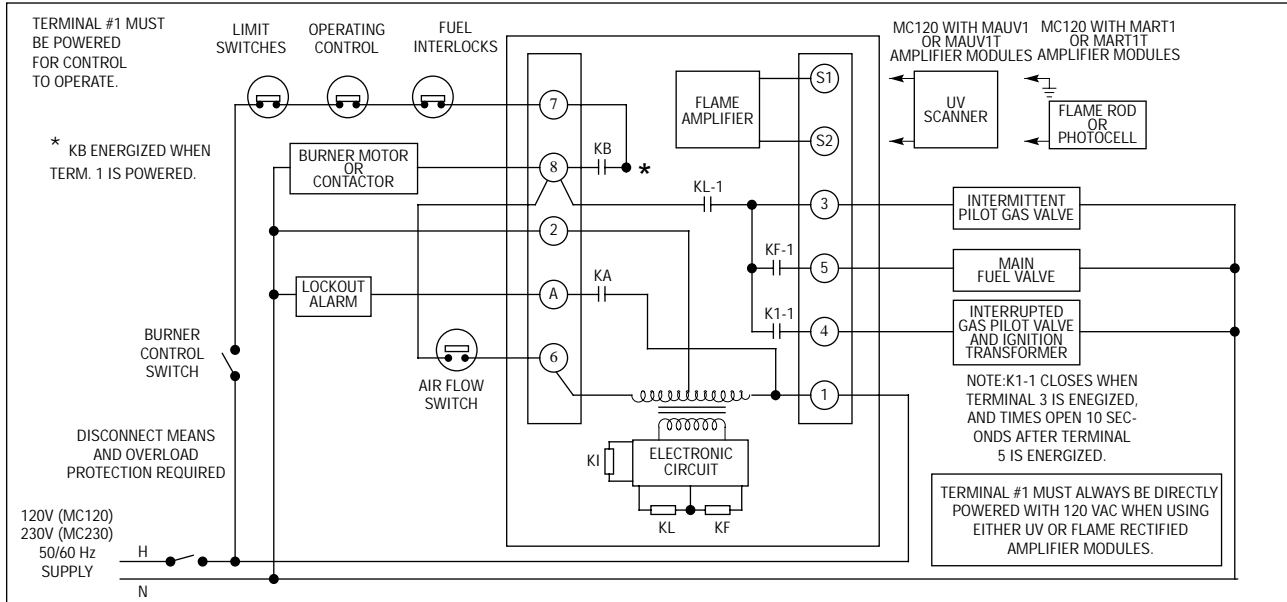


Use moisture resistant wire suitable for at least 90°C.



CAUTION: Control wiring procedures which deviate from those shown in the diagrams may bypass safety functions designed in the control. Check with the Fireye Representative before deviating from the recommended wiring diagrams.

FIGURE 4. TYPICAL MP560, MP561, MP562 WIRING ARRANGEMENT FOR PILOTED IGNITED BURNER. MC120, MC120R, MC230, MC230R, CHASSIS ONLY.

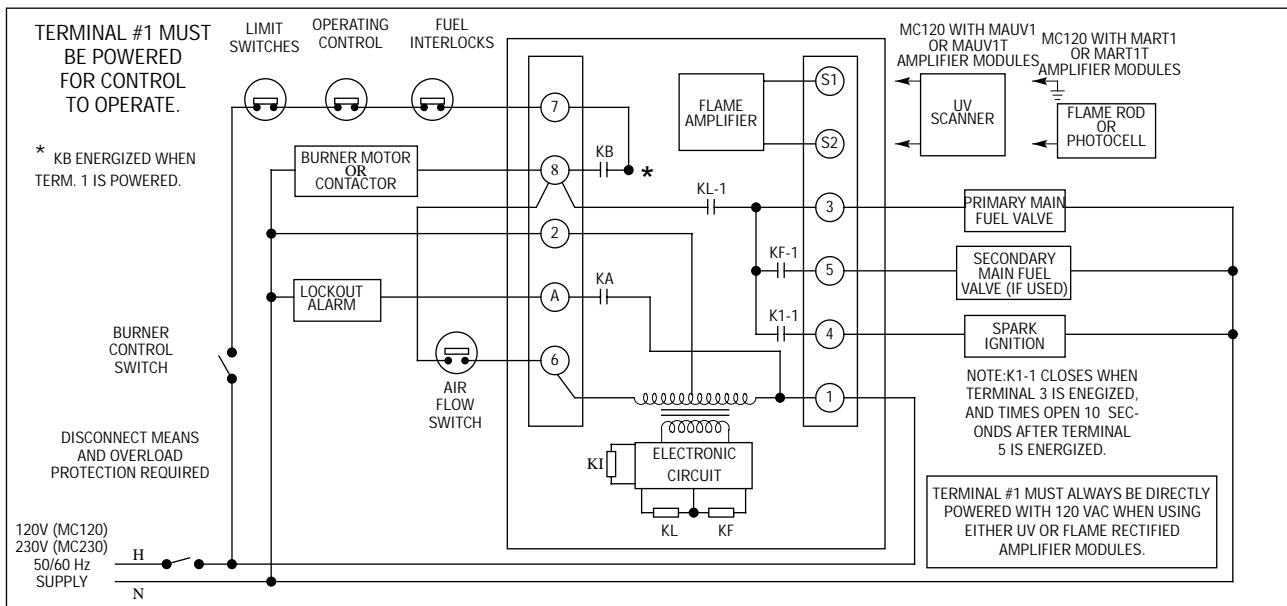


Use moisture resistant wire suitable for at least 90°C.



CAUTION: When powered, 560 VAC across S1, S2 with MAUV1 and MAUV1T; 260 VAC across S1, S2 with MART1 and MART1T.

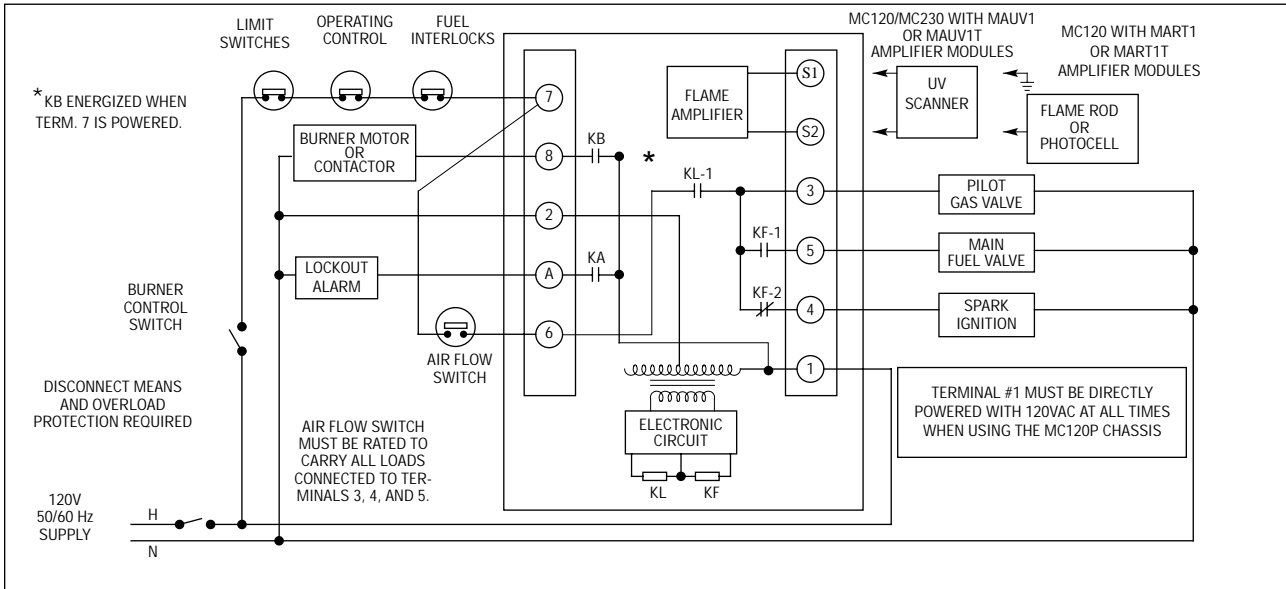
FIGURE 5. TYPICAL MP560, MP561, MP562 WIRING ARRANGEMENT FOR DIRECT SPARK IGNITED BURNER. MC120, MC120R, MC230, MC230R CHASSIS ONLY.



Use moisture resistant wire suitable for at least 90°C.



FIGURE 6. TYPICAL MP100, MP100E, MP101, MP230, and MP230H WIRING ARRANGEMENT FOR PILOT IGNITED BURNER. MC120P CHASSIS ONLY.

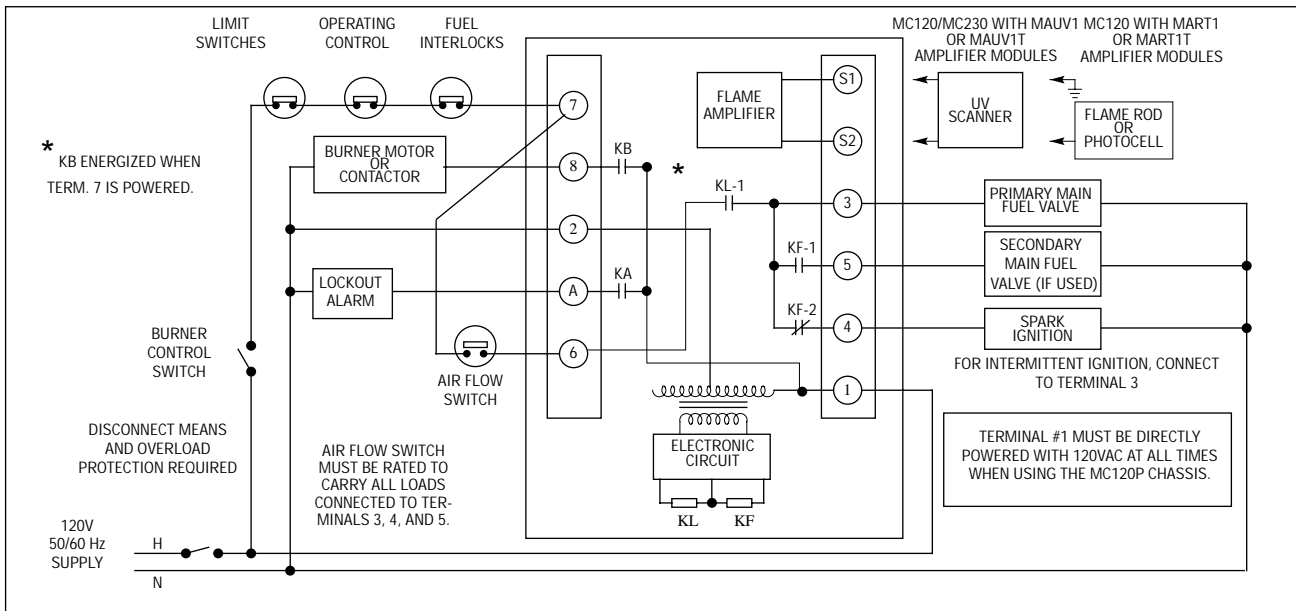


Use moisture resistant wire suitable for at least 90°C.



CAUTION: When powered, 560 VAC across S1, S2 with MAUV1 and MAUV1T; 260 VAC across S1, S2 with MART1 and MART1T.

FIGURE 7. TYPICAL MP100, MP100E, MP101, MP230, AND MP230H WIRING ARRANGEMENT FOR DIRECT SPARK IGNITED BURNER. MC120P CHASSIS ONLY.



Use moisture resistant wire suitable for at least 90°C.

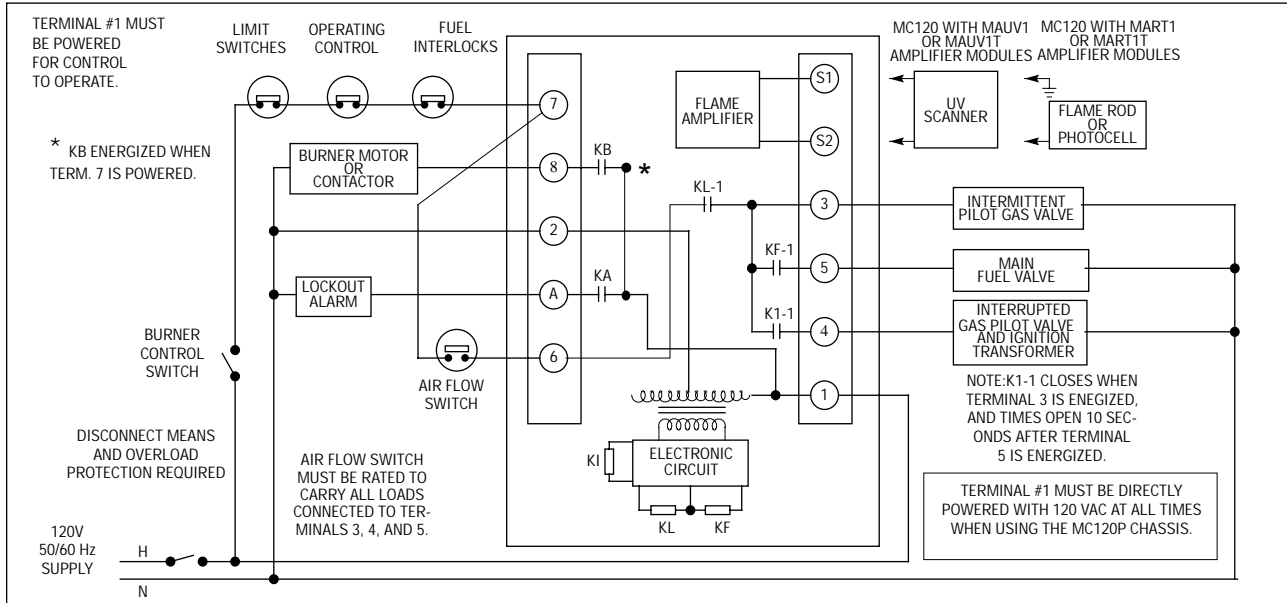


CAUTION: When powered, 560 VAC across S1, S2 with MAUV1 and MAUV1T; 260 VAC across S1, S2 with MART1 and MART1T.



CAUTION: Control wiring procedures which deviate from those shown in the diagrams may bypass safety functions designed in the control. Check with the Fireeye Representative before deviating from the recommended wiring diagrams.

FIGURE 8. TYPICAL MP560, MP561, MP562 WIRING ARRANGEMENT FOR PILOTED IGNITED BURNER. MC120P CHASSIS ONLY.

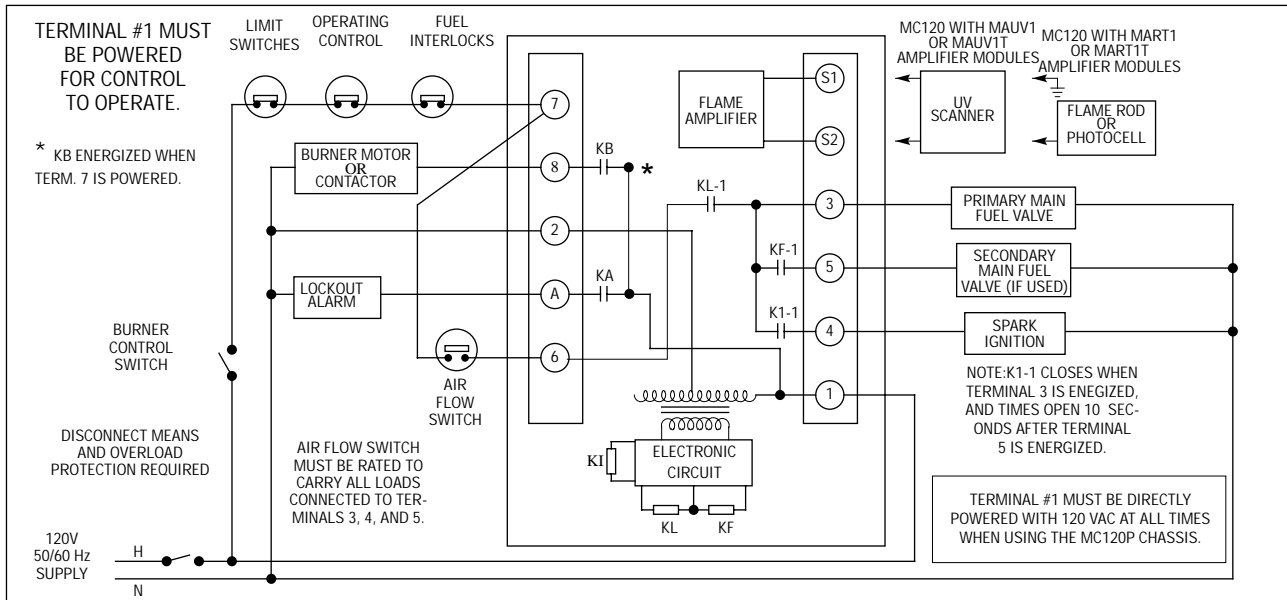


Use moisture resistant wire suitable for at least 90°C.



CAUTION: When powered, 560 VAC across S1, S2 with MAUV1 and MAUV1T; 260 VAC across S1, S2 with MART1 and MART1T.

FIGURE 9. TYPICAL MP560, MP561, MP562 WIRING ARRANGEMENT FOR DIRECT SPARK IGNITED BURNER. MC120P CHASSIS ONLY.



Use moisture resistant wire suitable for at least 90°C.



CAUTION: When powered, 560 VAC across S1, S2 with MAUV1 and MAUV1T; 260 VAC across S1, S2 with MART1 and MART1T.



CAUTION: Control wiring procedures which deviate from those shown in the diagrams may bypass safety functions designed in the control. Check with the Fireye Representative before deviating from the recommended wiring diagrams.

M-SERIES II CROSS REFERENCE LISTING

M-SERIES Part Number	M-SERIES II REPLACEMENT MODULES				Programmer Dipswitch #8
	Chassis	Amplifier	Programmer		
UVM1D	MC120	MAUV1T	MP100		N/A
UVM1F	MC120	MAUV1	MP100		N/A
TFM1D	MC120	MART1T	MP100		See Note #1
TFM1F	MC120	MART1	MP100		See Note #1
UVM2	MC120	MAUV1	MP230		OFF
TFM2	MC120	MART1	MP230		OFF
UVM3	MC120	MAUV1	MP230		ON
TFM3	MC120	MART1	MP230		ON
UVM3H	MC120	MAUV1	MP230H		ON
TFM3H	MC120	MART1	MP230H		ON
UVM5	MC120	MAUV1	MP560		ON
UVM6	MC120	MAUV1	MP560		See Note #2

- N/A — Not Applicable
 - Programmer Dipswitches apply to MP230, MP230H, and MP560 Programmers
 - Dipswitch #8 sets Recycle / Non-Recycle Operation. (ON = Non-Recycle, OFF = Recycle)
 - MP560 Programmer Module has "Check-Run" Switch.
 - Note 1: For standing pilot, clip out red jumper on MP100.
 - Note 2: Dipswitch #8 - ON when red jumper of UVM6 is clipped. Otherwise, Dipswitch #8 = OFF.

M-SERIES TIMING CARDS	M-SERIES II PROGRAMMER DIPSWITCH SETTINGS						
	#1	#2	#3	#4	#5	#6	#7
MT55	ON	OFF	OFF	OFF	OFF	ON	OFF
MT74	OFF	ON	OFF	OFF	OFF	ON	OFF
MT304	OFF	OFF	ON	OFF	OFF	ON	OFF
MT710	OFF	ON	OFF	OFF	OFF	OFF	ON
MT904	OFF	OFF	ON	ON	OFF	ON	OFF
MT3010	OFF	OFF	ON	OFF	OFF	OFF	ON
MT6010	OFF	OFF	OFF	ON	OFF	OFF	ON
MT9010	OFF	OFF	ON	ON	OFF	OFF	ON

- Dipswitches #1 through #5 set Purge Timing.
 - Dipswitches #6 and #7 set TFI Timing.

Dipswitch #	Off	On	
1	-	5	PURGE TIMING Values are Additive
2	-	7	
3	-	30	
4	-	60	
5	-	240	
6	-	5	TFI TIMING
7	-	10	
8	Recycle	Non-Recycle	



NOTICE

When Fireeye products are combined with equipment manufactured by others and/or integrated into systems designed or manufactured by others, the Fireeye warranty, as stated in its General Terms and Conditions of Sale, pertains only to the Fireeye products and not to any other equipment or to the combined system or its overall performance.

WARRANTIES

FIREYE guarantees for *one year from the date of installation or 18 months from date of manufacture* of its products to replace, or, at its option, to repair any product or part thereof (except lamps, electronic tubes and photocells) which is found defective in material or workmanship or which otherwise fails to conform to the description of the product on the face of its sales order. **THE FOREGOING IS IN LIEU OF ALL OTHER WARRANTIES AND FIREYE MAKES NO WARRANTY OF MERCHANTABILITY OR ANY OTHER WARRANTY, EXPRESS OR IMPLIED.** Except as specifically stated in these general terms and conditions of sale, remedies with respect to any product or part number manufactured or sold by Fireeye shall be limited exclusively to the right to replacement or repair as above provided. In no event shall Fireeye be liable for consequential or special damages of any nature that may arise in connection with such product or part.



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Derry, New Hampshire 03038
www.fireeye.com

C-4000
MAY 2002
(Supersedes July 2000)





MP100, MP100E, MP101, MP102, MP102E, MP230, MP230H, MP560, MP561, and MP562

PROGRAMMER MODULES FOR USE WITH THE
FIREYE MODULAR M-SERIES II CONTROL

Year 2000 Compliant in accordance with BSI document DISC PD2000-I:1998

DESCRIPTION

The Fireeye MP100, MP100E, MP101, MP102, MP102E, MP230, MP230H, MP560, MP561 and MP562 Programmer Modules are used with the Fireeye Modular M-Series II control. The operational characteristics of the control are determined by the selection of the programmer module (e.g. re-ignition, 2-stage capability, pilot cutoff, etc.). The programmer module incorporates a plug-in design for easy installation.

Some programmer modules (MP230, MP230H, MP560, MP561, and MP562) are equipped with a series of dipswitches to select Purge Timing, Pilot Trial for Ignition (PTFI) Timing, and Recycle or Non-Recycle operation. LED indicator lights are on all programmer modules, indicating the operating status of the control. A “check-run” switch is provided on the MP560, MP561 and MP562 programmer modules to assist in testing size and stabilization of the pilot.

Flame Failure Response Time (FFRT) is determined by the selection of the amplifier module. Test jacks are also provided on the flame amplifier module to permit flame signal measurement during operation. For proper and safe application of this product, you must refer to Fireeye bulletin C-4000 or C-4000E for a detailed description of the various programmer modules, including installation instructions, amplifier selection, operating sequences for each programmer module, etc.



WARNING: Selection of this control for a particular application should be made by a competent professional, licensed by a state or other government agency. Inappropriate application of this product could result in an unsafe condition hazardous to life and property. Installation should not be considered complete until pilot turndown and other appropriate performance tests have been successfully completed.

PROGRAMMER MODULE SELECTION

Part Number	DESCRIPTION
MP100/MP100E	Relight operation.
MP101	Same as MP100, except will ignore flame signal in off cycle.
MP102/MP102E	Operates like the MP100, except the standing pilot and relight features are eliminated. Ignition safety time is 5 seconds. Control will lockout on flame failure.
MP230	Selectable purge timing, trial-for-ignition timing, and recycle/non-recycle operation.
MP230H	Selectable purge timing, trial-for-ignition timing, pilot stabilizing period, and recycle/non-recycle operation. 10 second main flame trial-for-ignition. For use with two-stage burners.
MP560	Selectable purge timing, pilot-trial-for-ignition timing, pilot stabilizing period, and recycle/non-recycle operation. 10 second main flame trial-for-ignition, check-run switch.
MP561	Selectable purge timing, pilot-trial-for-ignition timing, and recycle/non-recycle operation. 10 second main flame trial-for-ignition, check-run switch.
MP562	Same as MP560, with lockout on loss of air flow. Non-recycle operation.
Programmers with the suffix “E” (e.g. MP100E) are for use with the MC230 and MC230R chassis only.	



WARNING: Remove power from the control and remove the control from its wiring base before proceeding.

INSTALLATION

The Programmer Modules are used with the Fireye modular M-Series II Chassis (P/N MC120, MC120E, MC120P, MC120R and MC120RE for 120VAC, MC230 and MC230R for 240 VAC). They are installed in the chassis by grabbing hold of the programmer module by the ridged finger grips on the side on the module, aligning the module with the guide slots on the opening farthest from the transformer, and inserting the module into the pin connectors.



The programmer modules are designed to fit in the proper slot only. **DO NOT FORCE THEM.**
Replaceable Fuse: The programmer modules are designed with a field-replaceable fuse. The fuse is located on the printed circuit board near the connectors. The fuse will open as a result of an overload condition on terminals 3, 4, or 5. In the event the fuse opens, remove the fuse (using a small screwdriver) and install a Fireye replacement fuse (P.N 23-176) or equivalent 2AG, 8 amp fuse (e.g. Littelfuse #225008) In programmers used with the MC230 and MC230R, use replacement fuse P.N 23-183 or equivalent (3.5 amp, 2AG, SLO-BLO) Littelfuse #22903.5.

APPROVALS

AGENCY APPROVALS						
	UL	CSA	FM	AGA	EN230	EN298
MP100	✓	✓	✓	✓	✓	✓
MP100E					✓	✓
MP101	✓	✓	✓			
MP102					✓	✓
MP102E					✓	✓
MP230	✓	✓	✓	✓		
MP230H	✓	✓	✓	✓		
MP560	✓	✓	✓	✓		
MP561	✓	✓	✓	✓		
MP562	✓	✓	✓			

Underwriters Laboratories Inc.
Canadian Standards Association:

Listed MCCZ File MP1537
 Guide 300-1-0.2 Class 2642 Oil File LR 7989
 Guide 140-A-2 Class 2632 Gas File LR7989
 Certification Report #C1715001

AGA
Factory Mutual
EN230 EN298

ANS Z21.20 Automatic Ignition Systems.

Approvals do not apply to MC230 and MC230R Chassis and associated programmers.



MART1, MART3, MART1T, MAUV1, MAUV3 and MAUV1T

AMPLIFIER MODULES
FOR USE WITH THE FIREYE MODULAR
M-SERIES II CONTROL



Year 2000 Compliant in accordance with BSI document DISC PD2000-I:1998

DESCRIPTION

The Fireeye MART1, MART3, MART1T, MAUV1, MAUV3 and MAUV1T are Amplifier Modules used with the Fireeye Modular M-SERIES II control. These amplifier modules provide flame scanning capabilities using any of the Fireeye standard ultraviolet scanners (self-check scanners not applicable), flame rods, and photocells. The Flame Failure Response Time (F.F.R.T.) of the control is determined by the selection of the amplifier module (see Ordering Information). Test jacks are provided on the amplifier modules to permit flame signal measurement during operation.

After scanner selection, the proper amplifier module **must** be used in the Modular M-SERIES II chassis (see Ordering Information). The amplifier module incorporates a plug-in design for ease of installation.

The programmer module determines the operational characteristics of the control (e.g. relight, purge timing, etc.).

For proper and safe application of this product, you must refer to bulletins C-4000 or C-4000E for a detailed description of the operation of the Modular M-SERIES II control, including installation instructions, operating sequences for the programmer modules, etc. Also follow the scanner installation and wiring instructions found in bulletins C-4000 or C-4000E for proper flame scanning operation.



WARNING: Selection of this control for a particular application should be made by a competent professional, licensed by a state or other government agency. Inappropriate application of this product could result in an unsafe condition hazardous to life and property. Installation should not be considered complete until pilot turndown and other appropriate performance tests have been successfully completed.



ORDERING INFORMATION

Flame Amplifier Selection:

P/N	DESCRIPTION	USE WITH SCANNER
MAUV1	UV amplifier, 2-4 second F.F.R.T.	UV1A, UV2, UV8A, 45UV3-1050
MAUV3	UV amplifier, 3 second F.F.R.T.	UV1A, UV2, UV8A, 45UV3-1050
MAUV1T	UV amplifier, .8 second F.F.R.T.	UV1A, UV2, UV8A, 45UV3-1050
MART1	Flame rectification amplifier 2-4 second F.F.R.T.	45CM1, 69ND1
MART3	Flame rectification amplifier, 3 second F.F.R.T.	45CM1, 69ND1
MART1T	Flame rectification amplifier .8 second F.F.R.T.	45CM1, 69ND1

FLAME SCANNER SELECTION



UV SCANNERS:	
UV1A3	1/2" NPT connector, 3' flex. cable
UV1A6	1/2" NPT connector, 6' flex. cable
UV2	3/8" NPT connector, 3' flex. cable
UV8A	1/2" NPT 90 degree angle head, 6' unshielded leads
45UV3-1050	3/4" sleeve/set screw mount

FLAME DETECTORS:	
45CM1-1000	Photocell with filter
45CM1-1000Y	Photocell without filter
69ND1-1000K4	12 inch flame rod, 1/2" NPT connector
69ND1-1000K6	18 inch flame rod, 1/2" NPT connector
69ND1-1000K8	24 Inch flame rod, 1/2" NPT connector



APPROVALS

AGENCY APPROVALS						
	UL	CSA	FM	AGA	EC230	EC298
MAUV1	✓	✓	✓	✓		
MAUV3					✓	✓
MAUV1T	✓	✓	✓	✓	✓	✓
MART1	✓	✓	✓	✓		
MART3					✓	✓
MART1T	✓	✓	✓	✓	✓	✓

Underwriters Laboratories Inc.: Listed Guide MCCZ — File MP 1537

Underwriters Laboratories Inc.: Recognized Components Guide MCCZ2 File MP1537

Canadian Standards Association: Guide 300-1-0.2 Class 2642 Oil File LR7989

Guide 140-A-2 Class 2632 Gas File LR 7989

American Gas Association

EN230

EN298

Factory Mutual

ANS Z21.20 Automatic Ignition Systems.

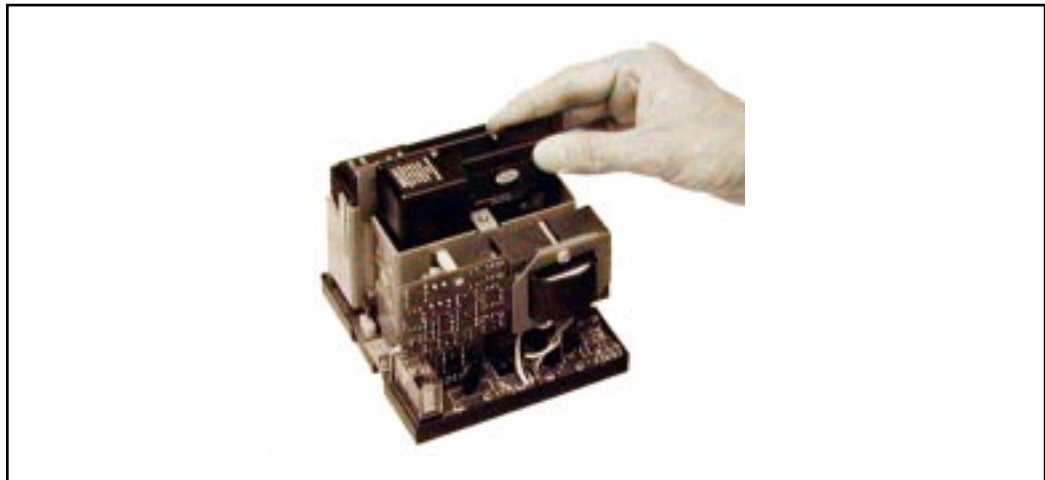


Remove power from the control and remove the control from its wiring base before proceeding.

INSTALLATION

The amplifier modules are used with the Fireeye Modular M-SERIES II Base Chassis (P/N MC120, MC120E, MC120P, MC120R, MC120RE for 120VAC, P/N MC230, MC230R for 240VAC). They are installed in the chassis by grabbing hold of the amplifier module by the edges of its printed circuit board, aligning the module with the guide slots on the opening in the middle of the chassis, and inserting the module into the pin connectors.

The amplifier modules are designed to fit in the proper slot only. **DO NOT FORCE THEM.**





NOTICE

When Fireeye products are combined with equipment manufactured by others and/or integrated into systems designed or manufactured by others, the Fireeye warranty, as stated in its General Terms and Conditions of Sale, pertains only to the Fireeye products and not to any other equipment or to the combined system or its overall performance.

WARRANTIES

FIREYE guarantees for *one year from the date of installation or 18 months from date of manufacture* of its products to replace, or, at its option, to repair any product or part thereof (except lamps, electronic tubes and photocells) which is found defective in material or workmanship or which otherwise fails to conform to the description of the product on the face of its sales order. **THE FOREGOING IS IN LIEU OF ALL OTHER WARRANTIES AND FIREYE MAKES NO WARRANTY OF MERCHANTABILITY OR ANY OTHER WARRANTY, EXPRESS OR IMPLIED.** Except as specifically stated in these general terms and conditions of sale, remedies with respect to any product or part number manufactured or sold by Fireeye shall be limited exclusively to the right to replacement or repair as above provided. In no event shall Fireeye be liable for consequential or special damages of any nature that may arise in connection with such product or part.

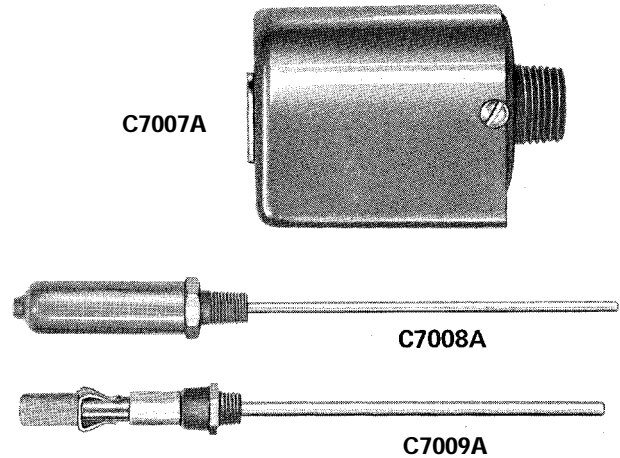


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C-4002
DECEMBER 1999
(Supersedes March 1999)

C7007A, C7008A, C7009A Flame Rod Holder & Flame Rod Assemblies

The small size of these devices enable their application to flame detection in installations where space is limited. The holder and flame rod assemblies facilitate **flame** proving on gas burners or gas-ignited oil burners which are controlled by electronic flame safeguard systems.



- The C7007A, C7008A, and C7009A may be used with flame safeguard controls utilizing the rectification principle of flame detection.
- The C7007A is a small, sturdy holder for a 3/16 inch [4.8 mm] diameter flame rod (flame rod ordered separately).
- n The holder is externally threaded (1/2- 14 NPT) for pipe mounting.
- n A collet chuck and setscrew position a flame rod securely. If additional support of the flame rod is required, the C7007A extension assembly is internally threaded (1/8-27 NPT) to accept a 1/8 inch iron support pipe.
- The C7008A is a miniature flame rod assembly with a threaded (external 1/4- 18 NPT) base, snap-on cover, and flame rod.
- The C7008A can be used without the cover and a coverless model is available.
- The C7008A is available with several lengths of flame rod. One end of the flame rod is threaded for insertion into the C7008A and the other end may be cut to an exact size.
- The C7009A is a smaller diameter flame rod assembly with an externally threaded (1/8-27 NPT) base and readily accessible Rajah electrical connection.
- The C7009A is available with a number of flame rod lengths of which one end is threaded and the other capable of being cut to an exact size.

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Checkout	6

Specifications

IMPORTANT: The specifications given in this publication do not include normal manufacturing tolerances. Therefore, this unit may not match the listed specification exactly. Also, this product is tested and calibrated under closely controlled conditions, and some minor differences in performance can be expected if those conditions are changed.

TRADELINE MODELS

MODEL: C7008A Flame Rod Assembly, straight pattern, with cover (can be used with or without cover).

FLAME RODS: C7008A1174, 12 inch [305 mm] Kanthal Al C7008A1182, 24 inch [610 mm] Kanthal Al see also, Accessories.

DIMENSIONS: See Fig. 2.

ELECTRICAL CONNECTION: Rajah male with companion connector.

MOUNTING: Equipped with external 1/4-18 NPT threads.

STANDARD MODELS

MODELS:

C7007A Flame Rod Holder.

C7008A Flame Rod Assembly: miniature flame rod assembly.

C7009A Flame Rod Assembly: small diameter flame rod assembly.

MOUNTING MEANS:

C7007A-external 1/2-14 NPT for pipe mounting.

C7008A-external 1/4-18 NPT for pipe mounting.

C7009A-external 1/8-27 NPT for pipe mounting.

FLAME ROD:

C7007A-Not furnished, refer to ACCESSORIES.

C7008A-Kanthal in 6, 12, 18, 24 inch [152, 305, 457, 610 mm] lengths.

C7009A-Kanthal in 4, 9 and 12 inch [102, 203, 305 mm] lengths.

ELECTRICAL CONNECTION:

C7007A-Terminal screw.

C7008A and C7009A-Rajah male, with companion connector.

APPROVALS:

Underwriters Laboratories listed: File No. MP268, Canadian Standards Association Certified: Master File No. LR 95329-1, Factory Mutual approved: C7008A, C7009A, Industrial Risk Insurers acceptable.

ACCESSORIES:

Flame Rods (Kanthal Al, 2200° F [1204° C] MAX.):

Use With	Part Number	Length In Inches [mm]	Thread
C7007A	102709A	1 2 [305]	None
	102709B	1 8 [457]	None
	102709C	2 4 [610]	None
	102709D	3 6 [914]	None
	102709E	4 8 [1219]	None
C7008A	105478A	6 [152]	6-32 UNS-2A
	105478B	1 2 [305]	6-32 UNS-2A
	105478C	1 8 [457]	6-32 UNS-2A
	105478D	2 4 [610]	6-32 UNS-2A
C7009A	105644Aa	4 [102]	3-56 NF-2A
	105644Ba	8 [204]	3-56 NF-2A
	105644Ca	12 [305]	3-56 NF-2A

a 105479B electrical terminal and 21107 washer included.

R1061012 Ignition Cable: for ignition installations in a high temperature environment. Rated at 350° F [177° C] for continuous duty, and up to 500° F [260° C] for intermittent use. Tested to 15,000 V.

R1298020 Cable: for flame detector "F" lead wire installations in a high temperature environment. Rated up to 400° F [204° C] for continuous duty. Tested for operation up to 600 V and breakdown up to 7500 V.

Ordering Information

When purchasing replacement and modernization products from your TRADELINE® wholesaler or your distributor, refer to the TRADELINE Catalog or price sheets for complete ordering number, or specify-

1. Model number.
2. Flame rod length.
3. Accessories, if required.

If you have additional questions, need further information, or would like to comment on our products or services, please write or phone:

1. Your local Honeywell Residential and Building Controls Division Sales Office (check white pages of your phone directory).
2. Residential and Building Controls Division Customer Satisfaction
Honeywell Inc., 1885 Douglas Drive North
Minneapolis, Minnesota 554224386 (612) 542-7500

(In Canada-Honeywell Limited, 740 Ellesmere Road, Scarborough, Ontario M1P 2V9) International Sales Offices in all principal cities of the world. Manufacturing in Australia, Canada, Finland, France, Germany, Japan, Mexico, Netherlands, Spain, Taiwan, United Kingdom, U.S.A.

Fig. 1-Dimensions in inches [mm] of C7007A flame rod holder.

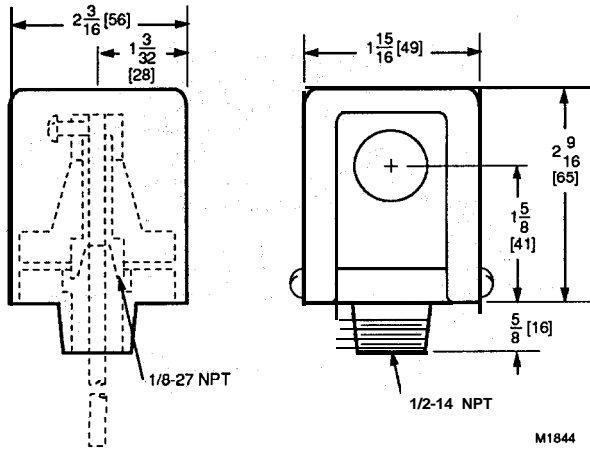


Fig. 2-Dimensions in inches [mm] of C7008A flame rod assembly.

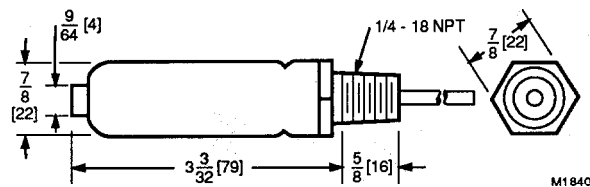


Fig. 3-Dimensions in inches [mm] of C7008A flame rod assembly, coverless model

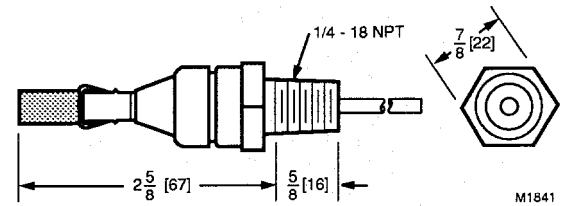
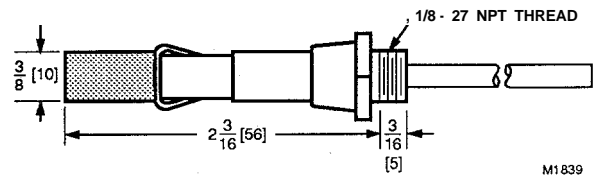


Fig. 4-Dimensions in inches [mm] of C7009A flame rod assembly.



Installation

WHEN INSTALLING THIS PRODUCT..

1. Read these **instructions** carefully. Failure to follow them could damage the product or cause a hazardous condition.
2. Check the ratings given in the instructions and on the product to make sure the product is suitable for your application.
3. Installer must be a trained, experienced flame safeguard technician.
4. After installation is complete, check out product operation as provided in these instructions.

MOUNTING

If the manufacturer of the burner has not provided a place for mounting the flame rod holder, the installer should select a suitable place on the burner faceplate or a place at the front of the boiler. See Figs. 6, 7, 8, and 9 for typical mountings on various burners. When selecting a location:

1. **Locate the** unit so that the flame rod will only prove a pilot flame that will safely and quickly light the main flame.
2. Locate the unit so that it will be clear of the fire door opening radius.
3. Locate the unit so that drafts will not blow the pilot flame away from the flame rod.
4. It is preferable to locate the unit so that the flame rod

will be vertical or at least angled downward. A rod so installed is less likely to sag at high temperatures.

NOTE: For extra electrode support, couple a length of 1/8 inch iron pipe to the extension assembly, which is already threaded (internal 1/8-27 NPT, C7007A only).

5. The unit may also be installed so the flame rod is horizontal or angled upward, but extra support is needed for rods over 12 inches [305 mm] long.

6. If the flame rod will be used to supervise a gas pilot for an oil burner installation, the rod must be located far enough from the oil flame to prevent oil spray from impinging and burning on the surface of the rod.

7. A horizontal or inclined flame rod should enter the pilot flame from the side. If the rod is located above and parallel to a horizontal or semi-horizontal pilot burner, it may falsely indicate that a weak or candler pilot flame is adequate for igniting the main burner. See Fig. 5.

CAUTION

Wrong position will provide inadequate pilot flame.

Fig. 5-Positions of flame rod with horizontal type pilot burner.

WRONG POSITION OF ROD

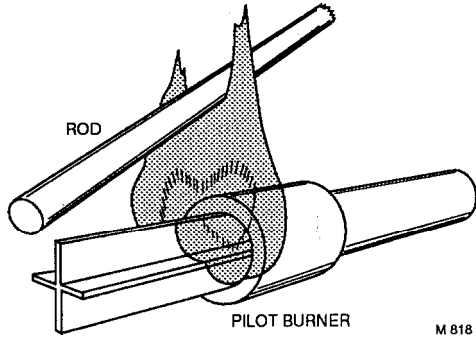


Fig. 6-Suggested installation of flame rod used to prove both main and pilot burners.

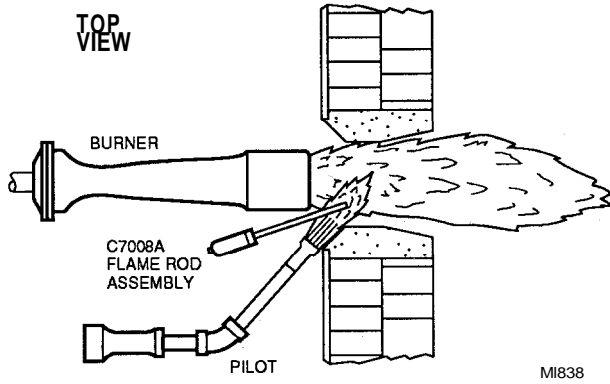


Fig. 7-Suggested installation on tunnel burner.

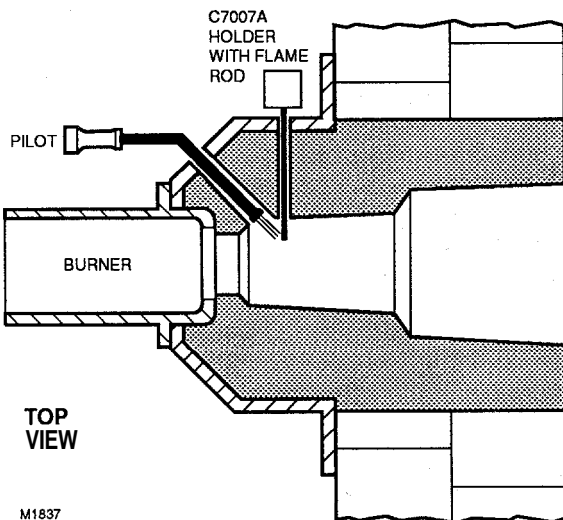


Fig. 8-Flame rod installed in cool combustion area of industrial burner.

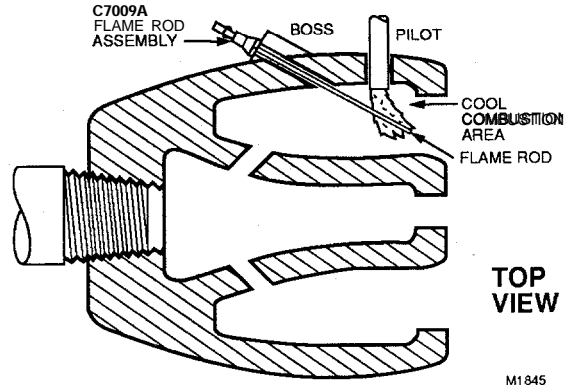
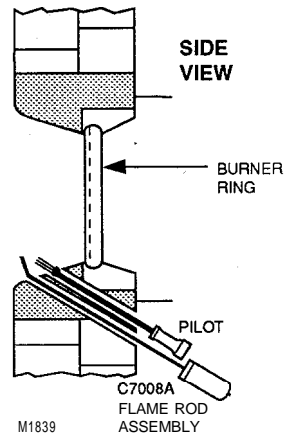


Fig. 9-Suggested installation on ring type burner.



After selecting the best location (if burner manufacturer has not provided a mounting place on burner), cut a hole large enough for the correct size pipe (See dimensions, Figs. 1-4) in burner faceplate or in the front of the boiler. Be sure to cut the hole at approximately the angle needed to bring flame rod into proper position to prove the flame.

Tack weld or temporarily cement a pipe into hole cut in burner faceplate or boiler wall. If a flange is used, place over hole and weld the pipe to the flange. Do not mount permanently until checkout is complete.

Check out entire unit (see checkout section, page 6) to insure that the flame rod is in proper position. Make this test under all conditions of actual firing for the type of flame supervision that will be used. In positioning the flame rod:

1. Avoid bending the flame rod.

2. Keep the flame rod as short as possible.
3. Keep the flame rod at least 1/2 inch [12.7 mm] away from hot refractory material.

When the **flame** rod has been properly positioned, weld or cement the pipe and/or flange permanently. Mount and screw the unit into the adapter pipe and tighten.

Connect the lead from the **flame** rod electrical connection to the proper terminal on the flame safeguard control.

NOTE: Even with high temperature stainless steel used in making grounding assemblies, the metal oxidizes when it is exposed to temperatures exceeding 2000° F [1093° C]. Where this deterioration cannot be avoided, a scheduled replacement program should be considered.

FLAME GROUNDING

The installer must provide an adequate electrical ground for the pilot flame. The grounding surface in actual contact with the flame must be at least four times greater than the area of the portion of the flame rod in contact with the flame. The ratio of ground to flame contact area with a raw gas pilot is usually less than a factor of four. In situations where the ground area available is inadequate, the ground area must be increased.

There are three proven methods for providing an adequate grounding surface (area): a) the bomb fin assembly; b) grounding rods threaded into the pilot nozzle; c) ground rods welded to a collar.

The bomb fin assembly can be made by welding two sections of high temperature stainless steel in the pattern illustrated in Fig. 10-a. Then, this assembly is welded directly over the pilot burner nozzle.

The threaded rod assembly is made by cutting a flame rod into six or seven sections each about four inches in length. The face of the pilot nozzle is to be tapped. The tappings being located equidistant from each other around the circumference of the nozzle (see Fig. 10-b). One end of the four inch

flame rod sections is threaded and screwed in place as shown in Fig. 10-b.

The welded rod assembly is made by cutting a flame rod into sections as described in the threaded rod assembly. The flame rod sections are then welded to a high temperature stainless steel collar as illustrated in Fig. 10-c. The assembly is then welded in place over the pilot nozzle.

If the flame rod is used to prove only the main flame, the flame contact area with the combustion chamber walls is generally adequate for grounding. In some situations, it may be necessary to provide a grounding target. A stainless steel fin or rod assembly similar to those illustrated in Fig. 10 should make an effective target.

In all cases, make sure the grounding area is securely connected to ground.

WIRING



Disconnect power supply before making wiring connections to prevent possible equipment damage or electrical shock.

All wiring must conform to applicable codes.

Protect the leadwire from excessive radiant or reflected heat. If any portion of the wire will be exposed to temperatures in excess of 125o F [51.6° C], a heat-resistant wire should be used (see Accessories). For wiring where temperatures do not exceed 125° F [52° wire with thermoplastic insulation may be used. If wire is enclosed in conduit, install a two foot flexible connection to the head of the unit. This permits easy removal of unit from combustion chamber.

FLAME ROD REPLACEMENT

To replace flame rod in the C7008A: remove the cover, pull off the Rajah connector with the wiring, remove (unscrew) the terminal nut and the lock washer at the base of flame rod assembly to free the flame rod. Pull out the old flame rod and insert the new rod. Then replace the lock washer, screw on the terminal nut, push the wiring connector back on, and replace the cover.

Procedure is the same for C7009A except that there is no cover.

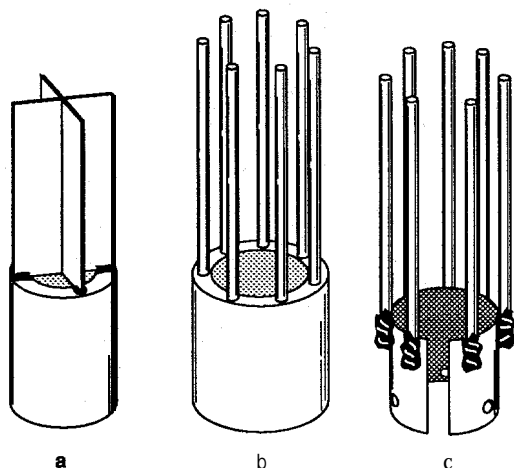
To replace flame rod in the C7007A: Remove the cover, loosen the flame rod setscrew, pull the flame rod out, insert the replacement rod, and tighten the setscrew. Replace the cover.

A NOTE ON OIL BURNER USAGE

If the flame rod is used to prove a gas pilot on an oil installation, oil or soot deposits must not be allowed to form on flame rod insulator. Such deposits might form leakage resistance paths, which in turn could cause nuisance shut-downs of main burner.

Flame rod and porcelain insulators should be periodically examined for oil or soot deposits. Such deposits should be cleaned off before unit is put back in place.

Fig. 1 O-a) Bomb fin assembly, b) Threaded rod assembly, c) Welded rod assembly.



The performance of the C7007A Holder (with flame rod) and C7008A, C7009A Flame Rod Assemblies can be determined by measuring the flame signal (current/voltage) during pilot burner operation.

Most existing Honeywell flame safeguard controls incorporate a flame signal jack on the amplifier or the control itself. The flame current measurement is made with a volt-ohm-meter such as the Honeywell W136A Meter or a microammeter with a zero to 25 microampere scale. A meter connector plug (part no. 196146, provided with the W136A) is used to adapt the W136A to the flame current jack on the flame safeguard control. The W136A Meter probes are connected to the two ends of the connector plug (red to red, black to black). The plug end of the connector inserts directly into the flame current jack of the flamesafeguard control (see Fig. 11). If the flame safeguard control does not have a meter jack, or if a meter connector plug is not available, a meter can be wired in series with the "F" lead of the flame detector circuit. During the burner run cycle, the minimum acceptable flame current is two microamperes.

The Honeywell BCS 7700 and 7800 SERIES controls provide for a voltage flame signal measurement. A 20,000 ohm/volt meter with a zero to 5 or 10 Vdc scale is recommended for the BCS 7700 measurement and a one megohm/volt meter is suggested for the 7800 SERIES controls. The flame signal measurement is made by inserting the positive (red) meter probe into the control positive (+) jack and the negative (black) probe into the negative (-) jack of the BCS

7700 or the (-) jack of the 7800 SERIES control (see Figs. 12, 13). With the system in operation, the minimum acceptable flame signal voltage is 1.25 Vdc for the 7800 SERIES controls and 2.2 Vdc for the BCS 7700 control.

A low flame signal reading indicates the photocell is not receiving sufficient visible flame radiation. Low flame currents can be the result of an improperly positioned sight pipe, restricted field of view, contaminated protective window or focusing lens, or a defective photocell. Flame signals of 4 to 6 microamperes for existing controls and up to 5 Vdc for the BCS 7700 and 7800 SERIES controls can be expected on good applications/installations.

Fig. 11-Measuring microamp flame signal.

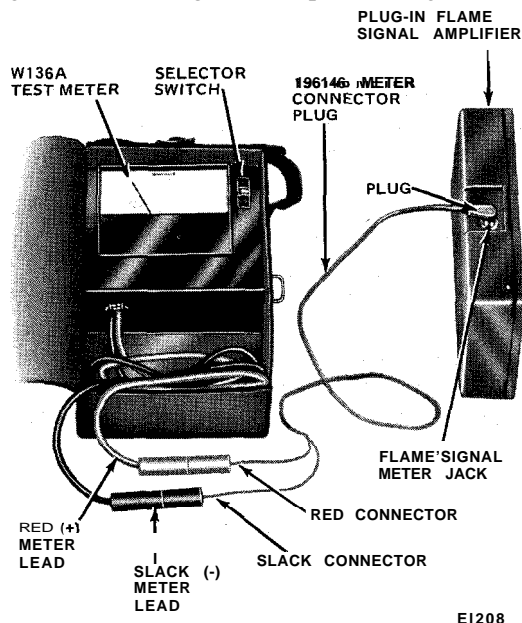


Fig. 12-Measuring BCS 7700 controls flame signal voltage.

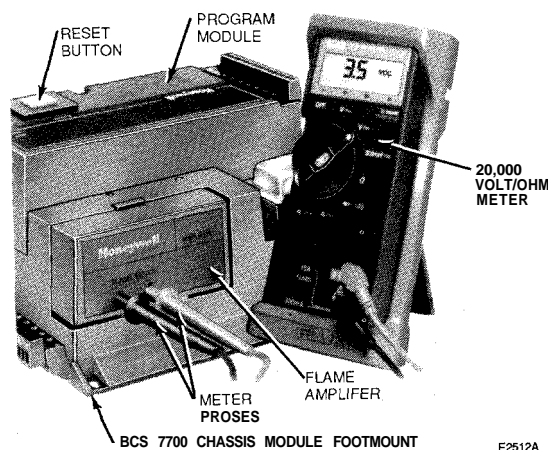
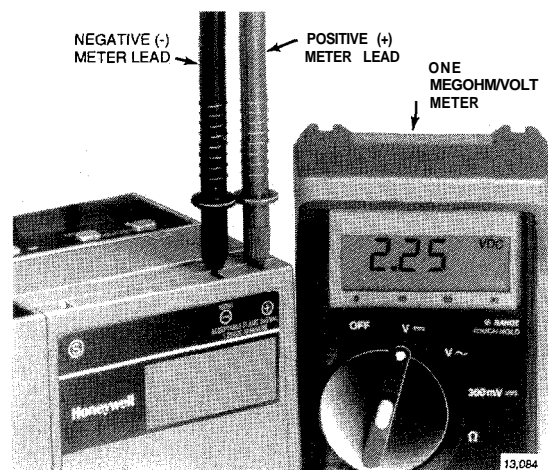


Fig. 13-Measuring 7800 SERIES controls flame signal voltage.



Honeywell

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Honeywell Inc.
1985 Douglas Drive North
Golden Valley, MN 55422

Residential and
Building Controls Division
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Scarborough, Ontario

Helping You Control Your World



Fisher Controls

Instruction Manual

912 Series Pressure Regulators



May 1991

Form 5124

WARNING

To avoid injury or equipment damage, these regulators should be installed, operated, and maintained in accordance with federal, state and local codes, rules and regulations, and Fisher instructions. Only a qualified person must install or service a regulator. Be certain the control spring range label is updated to accurately indicate any field changes in equipment, materials, service conditions, or pressure settings.

Immediately call a qualified technician in case of trouble. If venting occurs, or a leak develops in the system, it indicates that service is required. Failure to correct the situation immediately may create a hazardous condition.



W2217

Figure 1. Type 912 Regulator

close the inlet. Pressure in excess of the relief valve spring force opens the relief valve, allowing excess pressure to bleed through the screened vent in the spring case.

INTRODUCTION

Scope of Manual

This manual provides installation, maintenance, and parts information for the 912 Series pressure regulators (figure 1) as used in industrial/natural gas applications.

Description

The 912 Series pressure regulators are self-operated, spring-loaded devices built to provide accurate, sensitive control suited to a variety of applications.

As outlet pressure begins to exceed the set pressure, the diaphragm inside the regulator lifts, operating a lever to

Specifications

Specifications for the 912 Series pressure regulators are listed in table 1.

INSTALLATION

WARNING

Personal injury or equipment damage may result if the regulator is installed where service conditions could exceed the pressure or temperature specifications in table 1. The regulator must not be used for hazardous gas service in a closed area unless the vent is piped to a safe

Table 1. Specifications

AVAILABLE CONFIGURATIONS	See table 2	INTERNAL RELIEF PERFORMANCE	Approximate Internal Relief Valve Start-to-Discharge Point: See table 2 Capacity: Adequate only for relieving minor buildup situations such as are caused by chips or dirt blocking the seat partly open; for major malfunctions, external relief is required according to the Installation section.
BODY SIZES AND END CONNECTION STYLES	Inlet: 1/4-inch NPT screwed Outlet: ■ 1/4 or ■ 3/8-inch NPT screwed	MATERIAL TEMPERATURE CAPABILITIES	-20 to 160°F (-29 to 71°C)
MAXIMUM ALLOWABLE INLET PRESSURE	250 psig (17 bar)	PRESSURE REGISTRATION	Internal
OUTLET PRESSURE RANGES	See table 2	APPROXIMATE WEIGHT	1.3 pounds (0.6 kg)
MAXIMUM ALLOWABLE OUTLET PRESSURE	Maximum Emergency Outlet Pressure: 20 psig (1.4 bar) Maximum Recommended Outlet Pressure to Avoid Internal Part Damage: 3 psi (0.21 bar, differential) above outlet pressure setting		

Table 2. Outlet Pressure Range Data

AVAILABLE CONFIGURATION	OUTLET PRESSURE RANGE	APPROXIMATE POINT ABOVE OUTLET PRESSURE SETTING AT WHICH INTERNAL RELIEF STARTS TO DISCHARGE	CONTROL SPRING SELECTION	
			Part Number	Color Code
Type 912 without handwheel	3 to 7 inches w.c. (7 to 17 mbar)	5 to 21 inches w.c. (12 to 52 mbar)	1B7843 27222	Red
	5 to 10 inches w.c. (12 to 25 mbar)	8 to 30 inches w.c. (20 to 75 mbar)	1B7844 27222	Orange
	9.25 to 13 inches w.c. (23 to 32 mbar)	16 to 39 inches w.c. (40 to 97 mbar)	1L5079 37022	Cadmium
	12 to 24 inches w.c. (30 to 60 mbar)	17 inches w.c. to 3 psig (42 to 210 mbar)	1B7845 27222	Blue
Type 912H without handwheel	1 to 2.5 psig (69 to 172 mbar)	0.7 to 6.8 psig (0.05 to 0.47 bar)	1B7846 27222	Yellow
	2.7 to 5 psig (186 to 340 mbar)	3.8 to 12.5 psig (0.26 to 0.86 bar)	1B7847 27222	Green
912 Series with handwheel	0 to 1 psig (0 to 69 mbar)	0 to 3 psig (0 to 210 mbar)	1C5804 27222	Black
	0 to 5 psig (0 to 340 mbar)	0 to 12.5 psig (0 to 0.86 bar)	1C5805 27012	Brown

area. The vent opening on the regulator or the opening on the remote vent pipe (if one is used) should be pointed down to minimize clogging from collected moisture, corrosive chemicals, or other foreign material. Overpressuring the downstream system (and risk of explosion) could result from a clogged vent.

Overpressuring any portion of a regulator or associated equipment may cause leakage, part damage, or personal injury due to bursting of pressure-containing parts or explosion of accumulated gas.

Like most regulators, the 912 Series regulators have an outlet pressure rating lower than the inlet pressure rating. Downstream protection is required if the actual inlet pressure can exceed the regulator outlet pressure rating or the pressure rating of any downstream equipment.

Regulator operation within ratings does not preclude the possibility of damage from external sources or from debris

in the lines. A regulator should be inspected for damage periodically and after any overpressure condition.

Ensure that the regulator is undamaged and contains no foreign material. Install the regulator so that flow through it leaves the outlet port (marked on the body). The regulator may be installed in any position, however, the spring case vent should be pointed down. Spring case/vent orientation can be changed by rotating the spring case with respect to the body.

For an indoor installation, if the regulator controls a gas that is flammable or otherwise hazardous, a spring case with the optional tapped vent should be used so that the exhaust can be piped away. Provide protection on a remote vent by installing a screened vent cap into the remote end of the vent pipe. The vent should be pointed down.

Apply a good grade of pipe compound to the pipe threads before making the connections. Install piping into the 1/4-inch NPT inlet connection and the 1/4-inch or 3/8-inch NPT outlet connection.

Each regulator is factory-set for the pressure setting specified on the order. If no setting was specified, the outlet pressure is factory-set at the mid-range of the control spring. The procedure for adjusting the output pressure is given in the Startup section.

STARTUP

Key numbers are referenced in figure 2.

With installation completed and downstream equipment properly adjusted, slowly open the upstream and downstream shutoff valves while monitoring the regulator output pressure.

WARNING

For the 912 Series constructions with no drive screw in the spring case, never adjust the control spring to produce an outlet pressure higher than the outlet pressure range for that particular spring. Doing so could overpressure the system and cause personal injury or equipment damage. If the desired outlet pressure is not within the range of the control spring, install a spring of the proper range according to the Maintenance section.

If outlet pressure adjustment is necessary, monitor the outlet pressure with a gauge while performing the following procedure:

1. For units without a handwheel, unscrew the closing cap (key 3) and insert a screwdriver blade into the adjusting screw (key 4).
2. Slowly turn the adjusting screw or handwheel clockwise to increase or counterclockwise to decrease the output pressure setting.
3. With the output pressure adjusted to the desired value, replace the closing cap on units without a handwheel.

SHUTDOWN

Close the nearest upstream shutoff valve, then close the nearest downstream shutoff valve, and vent pressure from the outlet of the regulator.

MAINTENANCE

Regulator parts are subject to normal wear and must be inspected and replaced as necessary. The frequency of inspection and replacement of parts depends on the severity of service conditions or the requirements of local, state, and federal rules and regulations.

WARNING

To avoid personal injury or equipment damage, do not attempt any maintenance or disassembly without first isolating the regulator from system pressure and relieving all internal pressure from the regulator.

This procedure is to be performed if changing the control spring for one of a different range, or for inspecting, cleaning, or replacing any other parts. Key numbers are referenced in figure 2.

Note

If sufficient clearance exists, the regulator body (key 1) can remain in the line during spring replacement or other maintenance procedures.

Control Spring Replacement

On units without the handwheel, unscrew the closing cap (key 3) and turn the adjusting screw out of the spring case. Lift out the control spring (key 5).

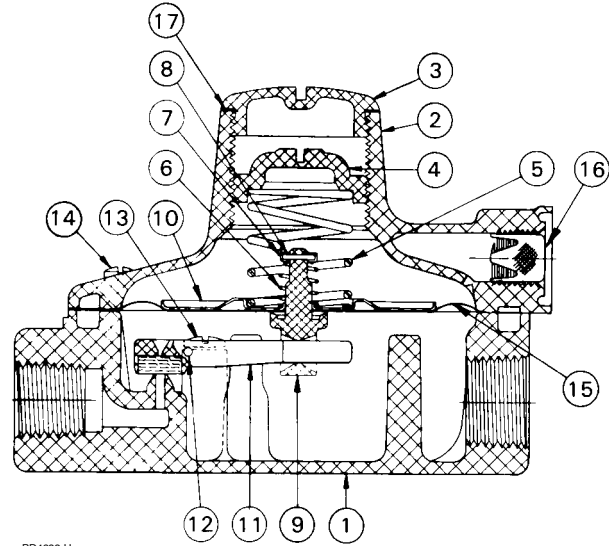
On units with a handwheel, turn the handwheel counterclockwise until the tension is relieved from the control spring. Unscrew the nut at the base of the handwheel and lift the handwheel off the spring case. Lift out the adjusting screw and the control spring.

Replace the control spring and complete the assembly by replacing the adjusting screw and the closing cap or handwheel. Adjust the spring tension as described in the Startup section.

Diaphragm and Relief Valve Replacement

Remove cap screws (key 14) and separate the spring case from the valve body. Remove the control spring (key 5) and the diaphragm (key 15) along with the diaphragm head (key 10), the relief valve seat (key 9) and the relief valve spring (key 6). Separate these parts by removing the pin (key 8) and the spring seat (key 7). Remove the disk holder assembly (key 11) by removing two screws (key 13).

To re-assemble the regulator, first assemble the relief valve spring assembly, then replace the relief valve spring assembly, the disk holder assembly, the diaphragm, the diaphragm head, and fit the spring case to the body. Install and tighten cap screws (key 14) in a criss-cross manner. Adjust the control spring tension as described in the Startup section.



BD4632-H

Figure 2. 912 Series Pressure Regulator Assembly

PARTS ORDERING

When corresponding with the Fisher representative about this regulator, include the type number, date of manufacture, and all other pertinent information from the labels. Specify the eleven-character part number when ordering new parts from the following parts list.

PARTS LIST			Key	Description	Part Number	Key	Description	Part Number
1	Body, zinc 1/4 x 1/4-inch NPT 0.073 inch (1.8 mm) port dia 1/4 x 3/8-inch NPT 0.073 inch (1.8 mm) port dia	3D3771 44042	2	Spring Case, zinc For use with control springs 1B7847 27222 (complete with drive screw) Untapped 1/8-inch NPT tapped vent	1B7840 T00012 T10895 T00012	3	Closing Cap 912 Series w/handwheel, brass All others, plastic	1C2344 14012 T10276 06992
4	Adjusting Screw 912 Series w/handwheel, zinc & steel All others, plastic	1B7992 000A2 T10277 06992	5	Regulator Spring, steel pl. 9.25 to 13 inch w.c. (23 to 32 mbar), cad. 3 to 7 inch w.c. (7 to 17 mbar), red 5 to 10 inch w.c. (12 to 25 mbar), orange 10 inch w.c. to 1 psi (25 to 69 mbar), blue 0.5 to 2.7 psig (35 to 186 mbar), yellow 0 to 1 psig (0 to 69 mbar), black 0 to 5 psig (0 to 340 mbar), brown	1L5079 37022 1B7843 27222 1B7844 27222 1B7845 27222 1B7846 27222 1C5804 27222 1C5805 27012	6	Relief Valve Spring, steel pl	1B7848 27012
			7	Spring Seat, steel pl	1B7834 25072	7*	Closing Spring, SST, 912 Series w/handwheel, only	1E3020 37022
			8	Pin, SST	1B7835 35032	8	Spacer Ring, brass, 912 Series w/handwheel, only	1C5807 14012
			9	Relief Valve Ass y, brass/zinc	1C3650 X0012	9	Lockwheel, brass, 912 Series w/handwheel, only	1C2346 14012
			10	Diaphragm Plate, steel Zn pl	1B7838 24132	10	Warning Label (not shown)	1P4879 06032
			11	Disk Holder Ass y, zinc/nitrile	1E3003 000A2	11	Spring Range Label (not shown) 1 to 2.5 psi (69 to 172 mbar) 2.7 to 5 psi (186 to 340 mbar)	T10800 06992 T10801 06992
			12	Fulcrum Rod, SST	0U0914 35032	12	0 to 1 psi (0 to 69 mbar)	T10802 06992
			13	Machine Screw, steel pl (2 req d)	1A3461 28982	13	0 to 5 psi (0 to 340 mbar)	T10803 06992
			14	Machine Screw, steel pl (6 req d)		14	Spring Seat, brass, 912 Series w/handwheel	1C2345 14012
			15	Diaphragm, rubber		15		
			16	Vent Screen, Monel		16		

*Recommended spare part.

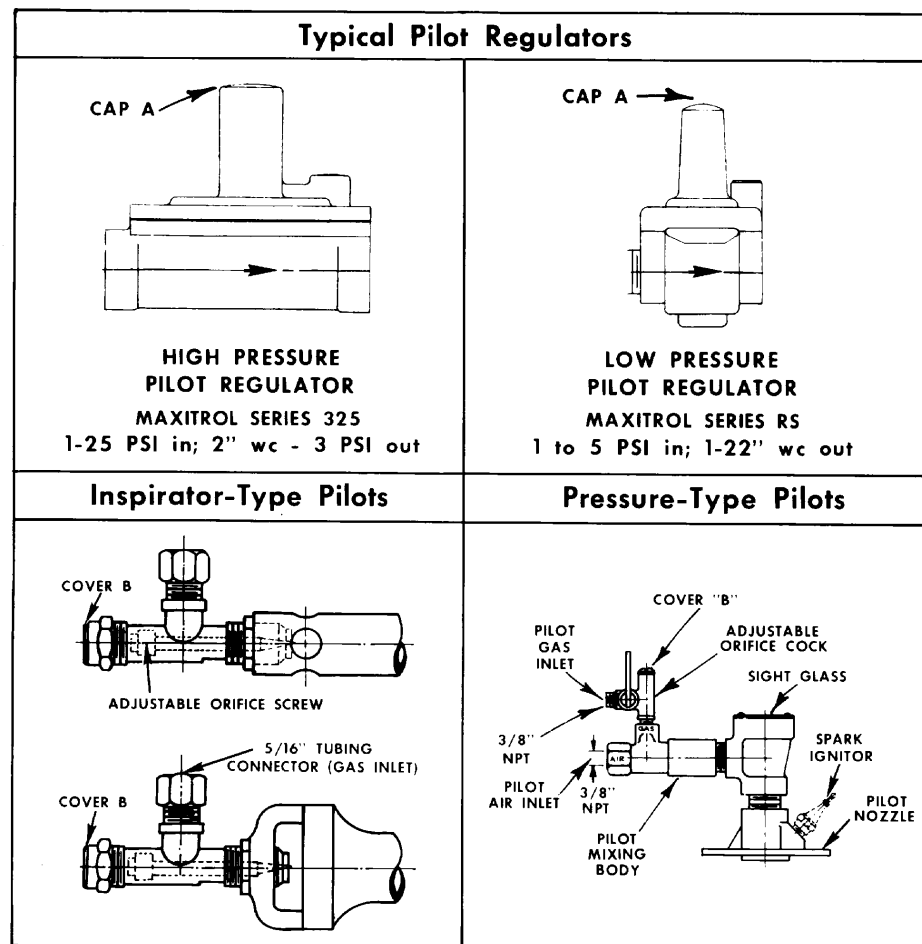
While this information is presented in good faith and believed to be accurate, Fisher Controls does not guarantee satisfactory results from reliance upon such information. Nothing contained herein is to be construed as a warranty or guarantee, express or implied, regarding the performance, merchantability, fitness

or any other matter with respect to the products, nor as a recommendation to use any product or process in conflict with any patent. Fisher Controls reserves the right, without notice, to alter or improve the designs or specifications of the products described herein.

Installation/Start-up Instructions

Maxon supplies a broad range of pilots and pilot pipe train components. Typical items are shown below indicating the nomenclature used in the following installation and start-up instructions.

1. **Check the bill of material** to be sure that all items of a complete pilot system (pilot nozzle, spark electrode, mixing body, shut-off cock with or without adjustable orifice, gas pressure regulator and pilot solenoid valve) are present, or their absence justified.
2. **Install the pilot** as indicated by main burner installation instructions, keeping pilot piping (including regulator and solenoid valve) as close to the pilot as possible. Pilot take-off from the main burner gas line should be made upstream of the main gas regulator.
3. **Connect the gas supply** with regulators installed for proper flow direction and piping turns kept to a minimum.
4. **Connect pilot air** supply line (where required), again using a minimum of turns and oversize piping where necessary to assure adequate flow. In cases where the pilot is "interrupted," the pilot air solenoid valve should be installed to operate simultaneously with the pilot gas solenoid.
5. **Set gap** on 10 mm or 18 mm spark ignitors (where used) for .05" to .06" then connect lead from ignition transformer to ignitor.
6. **Purge** the entire unit with gas supply off. This means opening main burner air control valve to full-open position and running all fans and blowers long enough to give full system purge. Return main burner air control to minimum position after purge is complete.
7. **Bleed gas line** following main burner start-up instructions or those of local gas company representative. Note that the small pilot flow cannot quickly bleed long runs of long gas piping.



Installation/Start-up (cont'd.)

8. **Preadjust pilot regulator** by removing cap "A" and turning setting screw *counter-clockwise* to its uppermost or top position.
9. **Preadjust adjustable orifice** by removing cover "B" and turning the adjusting screw *clockwise* until seated (closed position).
10. **Light and adjust pilot** by energizing spark ignitor (or holding small flame to pilot) and opening pilot gas cock. Turn adjustable orifice screw counter-clockwise slowly until ignition occurs (this may take several seconds). If you do not get ignition, close the gas cock and check out these potential problem areas:
 - A. *Lack of spark*. Recheck gap, inspect for cracked porcelain or bad transformer and correct any problems found.
 - B. *Lack of gas*. Check for closed gas cock, air in gas line, regulator in line backwards, or insufficient gas pressure, then correct as necessary.
 - C. *Too much gas*. Close adjustable orifice and reopen slowly while attempting ignition.

Note that the first several turns of the adjustable orifice screw comprise most of the available adjustment. Pilot regulators work best when the adjustable screw is near the top of its range. Increase pilot gas pressure by turning downward (clockwise) only if required under point "B" above.

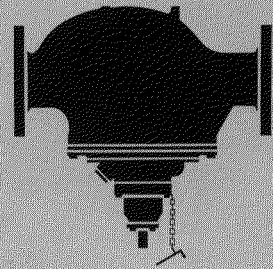
Pilot flame should normally be blue and stable. A very light blue coloration indicates a lean condition (not enough gas) while a green center and/or luminous tips generally indicate a rich flame (too much gas). Normal adjustment procedure would involve adjusting the flame slightly rich and reducing the amount of pilot gas just until the green disappears and a deep blue predominates.

11. **Replace** regulator cap "A" and adjustable orifice cover "B" *then proceed with lighting and adjusting main burner in accordance with instructions supplied for it.*

Instructions for INSTALLATION OPERATION MAINTENANCE

of the SELAS AUTOMATIC FIRECHECK

SERIES AF-A
AFS-A
AFSE-A



Selas Automatic Firechecks are employed in piping systems carrying gas-air mixture for the purpose of stopping and extinguishing backfires and for protecting combustion equipment from possible resulting damage. **CAUTION: A flashback can be explosive and dangerous. It is important that these instructions be understood and followed by responsible operating personnel.**

UNCRATING

The spring-loaded valve disc No. 7, Fig. 1 in the Automatic Firecheck is shipped in the closed position to prevent damage to valve stem and other internal parts during handling and shipment. Do not open this valve until Firecheck is installed.

INSTALLATION

1. LOCATION

For maximum protection, the Factory Mutual Approved Selas Automatic Firecheck should be installed in the piping system as close as possible to the burner or other potential backfire starting point. Maximum downstream piping length should be limited to 40 feet (12m) (sizes 8A through 20A), and 20 feet (6m) (size 24A), when used with gases containing up to 40% hydrogen.

For gases with hydrogen content in excess of this value, or for piping configuration which deviates from the above recommendation, contact the Engineering Department of Selas Corporation of America for advice.

A full throated gas cock or gate valve should be placed on the inlet side (upstream) of the Automatic Firecheck allowing mixture to be shut off while the valve is being reset or maintained.

NOTE: Factory Mutual approval is only valid on the above equipment if the downstream piping is no greater than the pipe size of the Firecheck in piping systems operating up to 6 psig. (.42 KG/cm²)

2. POSITION

The Firecheck can be installed in any position throughout 360°. The only stipulation is that enough clearance be made available for removal of the cartridge assembly Nos. 1 through 39, Fig. 1. (Clearance requirements given in Dimension H.) Installations with the reset stud No. 20 pointing down require additional force to overcome the weight of the check valve No. 34. For this reason, capacities for such applications will be approximately 80% of those shown on graph in Fig. 2.



3. WIRING

Series AFS-A and AFSE-A have precision snap action Micro switches mounted, adjusted and tested at our factory. The contact arrangement is single pole double throw and can be wired for normally closed or normally open circuits. See separate instructions in micro-switch housing. A 1/2"-14 N.P.S.M. internally tapped connection is located at one end of the switch enclosure. Provision should be made to disconnect the switch from the conduit line when removing the cartridge assembly. Flexible conduit is recommended. Series AFS-A is equipped with a Micro switch suitable for applications where the splash of oil, water or other coolants is present. Series ASFE-A has an explosion-proof switch listed by Underwriters' Laboratories for use in hazardous atmosphere of Class I, Group C and Group D; Class II, Group E, Group F and Group G.

4. PRESSURE TESTING

CAUTION: Although the AF-A Series Firecheck is equipped with an "O"-ring seal No. 15, we recommend you do not exceed 15 psig (1.05 KG/cm²) (or the pressure limit of other auxiliary equipment) when pressure testing the system. Should leaks develop at the surfaces between the cartridge No. 33 and the body No. 40 and the cartridge and the bottom cover No. 12, disassemble, clean machined surfaces and regrease with Esso "Andok B" or equivalent grease. Refer to MAINTENANCE section for correct assembly.

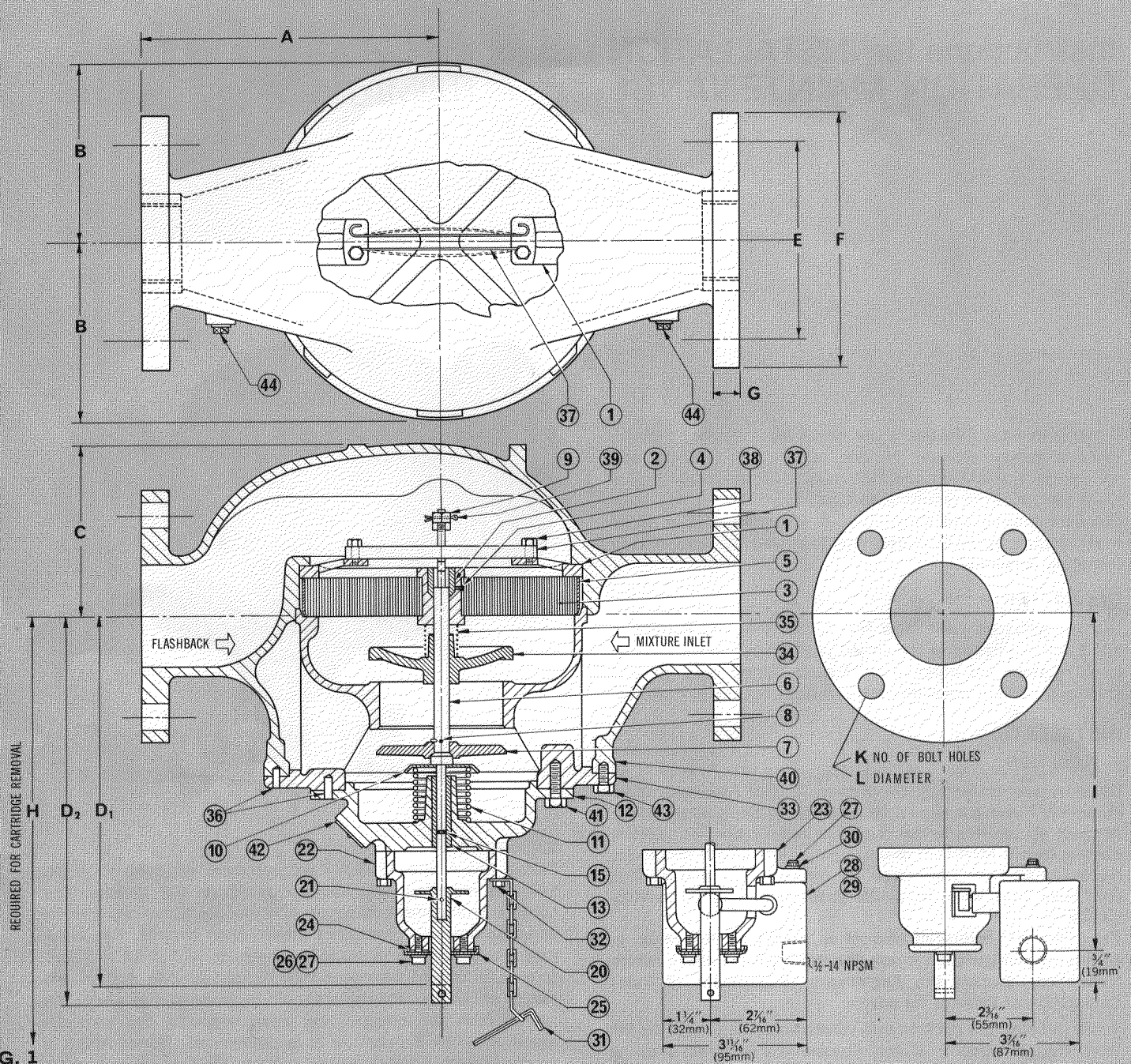


FIG. 1

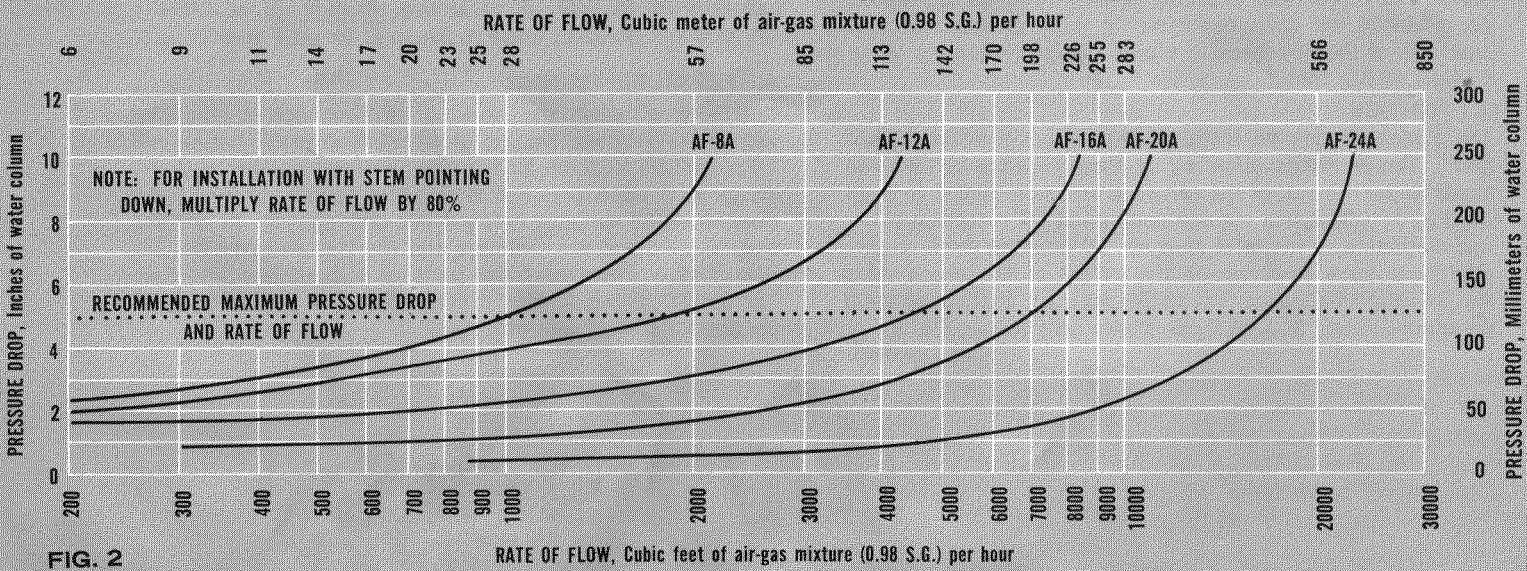


FIG. 2

PARTS LIST

INDEX NO.	NAME OF PART	NUMBER NEEDED ON			INDEX NO.	NAME OF PART	NUMBER NEEDED ON			INDEX NO.	NAME OF PART	NUMBER NEEDED ON		
		AF-A	AFS-A	AFSE-A			AF-A	AFS-A	AFSE-A			AF-A	AFS-A	AFSE-A
1	Spool	1	1	1	21	3/2 x 7/16 Spring Pin	1	1	1	33	Cartridge	1	1	1
2	Bushing	1	1	1	22	Cap	1	0	0	34	Check Valve	1	1	1
3	Screen	1	1	1	*23	Cap	0	1	1	35	Spring	1	1	1
4	Drive Screw	1	1	1	24	TEST-SET Disc	1	1	1	36	3/16 x 5/8 Spring Pin	2	2	2
5	Band	1	1	1	25	Manual Test Disc	1	1	1	37	Bimetal Strip	2	2	2
6	Valve Stem	1	1	1	26	#10 Pattern Washer	2	2	2	38	Strip Holder Screw	4	4	4
7	Valve Disc	1	1	1	27	#10-32 x 1/2 Soc. Hd. C.S.	2	4	4	39	Cotter Pin	1	1	1
8	Cotter Pin	1	1	1	*28	Micro Switch	0	1	0	40	Body	1	1	1
9	Positioning Nut	1	1	1	*29	Micro Switch	0	0	1	41	Hex Head Machine Screw	See B/M		
10	Spring Socket	1	1	1	*30	#10 Shakeproof Washer	0	2	2	42	Nameplate	1	1	1
11	Spring	1	1	1	31	Wrench Ass'y	1	1	1	43	Hex Head Machine Screw	See B/M		
12	Bottom Cover	1	1	1	32	1/4-20 x 1 Fil. Hd. C.S.	4	4	4	44	1/8 Pipe Plug	2	2	2
13	Bushing	1	1	1										
15	"O"-Ring	1	1	1										
20	Reset Stud Ass'y	1	1	1										

‡ Recommended spare parts
 * Required to convert AF-A to AFS-A

DIMENSION SCHEDULE

* AF

Automatic Firecheck without Micro switch

AFS
 Automatic Firecheck with enclosed Micro switch

AFSE
 Automatic Firecheck with explosion-proof Micro switch

CATALOG NO.*	PART NUMBER	PIPE SIZE	A	B	C	D ₁	D ₂	E	F	G	H	I	K	L
AF-8A AFS-8A AFSE-8A	75374-01 75374-02 75374-03	1"	4 1/2" 115	3 1/4" 83	3 1/2" 89	8 3/4" 222	9 1/4" 235	—	—	—	15" 381	7 5/8" 194	—	—
AF-12A AFS-12A AFSE-12A	75375-01 75375-02 75375-03	1 1/2"	5 1/2" 140	3 5/8" 92	3 11/16" 94	9 1/2" 242	10 1/8" 257	—	—	—	16" 406	8 1/2" 216	—	—
AF-16A AFS-16A AFSE-16A	75376-01 75376-02 75376-03	2"	6 3/4" 172	4 1/8" 105	4 1/8" 105	9 1/2" 242	10 5/8" 257	4 3/4" 121	6" 153	5/8" 16	16" 406	8 1/2" 216	4	3/4" 19
AF-20A AFS-20A AFSE-20A	75377-01 75377-02 75377-03	2 1/2"	8" 204	4 3/4" 121	4 3/4" 121	10" 254	10 5/8" 270	5 1/2" 140	7" 178	1 1/16" 18	18" 457	9" 229	4	3/4" 19
AF-24A AFS-24A AFSE-24A	71186-01 71186-02 71186-03	3"	9 1/2" 242	5 13/16" 148	6 5/8" 168	11 3/4" 299	12 5/8" 321	6" 153	7 1/2" 191	1 5/16" 24	20" 508	10 3/4" 273	4	3/4" 19

(Light figures=mm)

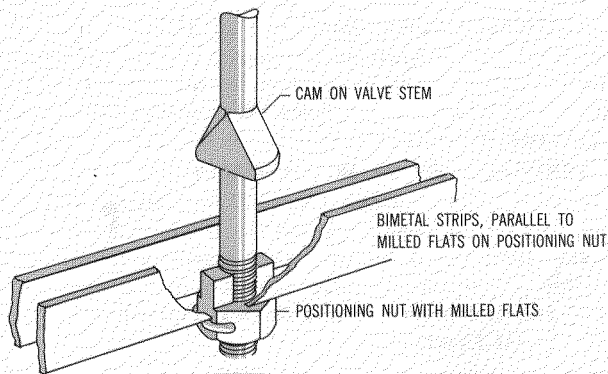


FIG. 3a
 ASSEMBLY VERTICALLY DOWN

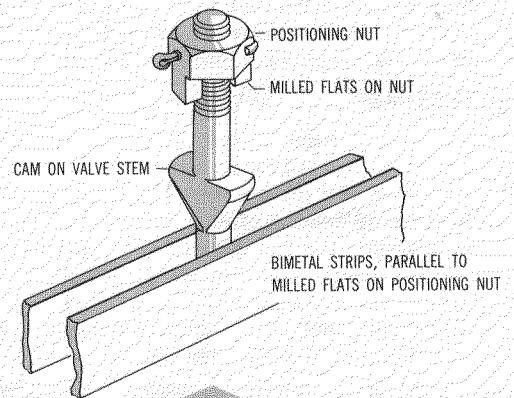
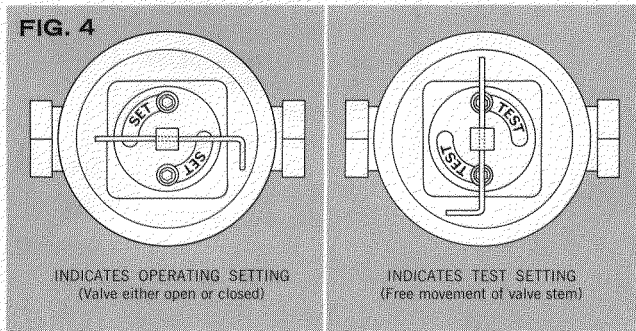


FIG. 3b
 ASSEMBLY VERTICALLY UP OR HORIZONTALLY

OPERATION

1. INITIAL SETTING

To prepare the Firecheck for normal operation, TEST-SET disc No. 24 must be in the SET position. See Fig. 4 on page 4. Insert wrench No. 31 through hole in reset stud No. 20 and pull. This will cock valve disc No. 7 in the open position.



2. FUNCTION

When backfire occurs in piping protected by the Automatic Firecheck, any resulting shock wave will immediately close the check valve No. 34 as the impulse moves upstream. Combustion will be arrested by the cooling effect of the wound metallic screen No. 3 above which the flame is held. While burning at this point, the flame heats the bimetal strips No. 37 which move to the dotted position shown on the top view in Fig. 1. This releases the spring-loaded valve stem No. 6, causing valve disc No. 7 to shut off mixture supply, thereby extinguishing flame. If a switch No. 28 or 29 is attached to the Firecheck, it will function when the valve closes to sound alarms, turn off a Combustion Controller or perform other intended operations. Series AF-A can be converted to employ a switch by replacing cap No. 22 with cap No. 23, which has provisions for mounting switch.

3. RESETTING

After a backfire, and before resetting Automatic Firecheck, close the gas cock on the upstream side and examine the combustion system to determine and correct the cause of backfire. When the bimetal strips No. 37 have cooled, insert wrench No. 31, through hole in reset stud No. 20 and pull to reset the Automatic Firecheck. If the reset stud fails to remain in the extended position, check the bimetal strips for possible damage. Distortion of any kind or discoloration due to overheating (light blue to blue black in color) will require the installing of new bimetal strips. Damaged or distorted bimetal strips must be replaced. Refer to MAINTENANCE section for correct assembly. After the Automatic Firecheck has been correctly reassembled, it can be reset by pulling out reset stud No. 20, which will cock valve disc No. 7 in the open position. The Firecheck is now ready for operation, and burners may be relighted according to normal procedure.

TESTING

It is important that all tests for proper operation of Automatic Firechecks (except for pressure loss) be made without gas-air mixture in the piping. Monthly tests are recommended for determining freedom of valve movement. These tests are made by loosening the two socket head cap screws No. 27, which hold the manual test disc No. 25 secure; and turning disc as far as slots will allow to TEST position, whereupon the valve should snap shut. If the valve is sluggish or fails to shut, the valve stem No. 6 and screen bushing No. 2 should be cleaned

and the test repeated. After a satisfactory test, the manual test disc No. 25 must be returned to the SET position and locked by tightening the two socket head cap screws No. 27. The valve is now ready to be reset. Check clearance between reset stud No. 20 and TEST-SET disc No. 24. Sufficient clearance is required to prevent binding.

Pressure loss through the Firecheck can be measured by using the two plugged pipe connections No. 44, located near the inlet and outlet of the Firecheck. The graph in Fig. 2 should be used as a guide. If the pressure drop through the device exceeds the graph values by 50%, it is recommended that the screen No. 3 be cleaned.

MAINTENANCE

1. CARTRIDGE REMOVAL

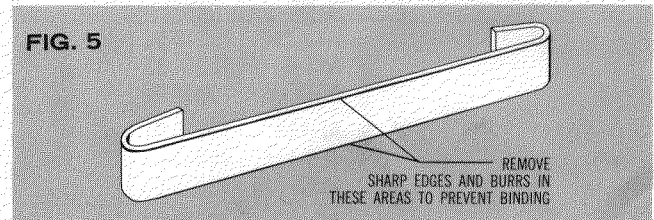
The cartridge assembly, consisting of Nos. 1 through 39, is removed as a unit by removing hex head screws No. 41. Two threaded holes are available, if necessary, to use as jack screws.

2. CLEANING THE SCREEN

Rinse the screen thoroughly in a solvent, blow through with compressed air, then wipe dry.

3. INSPECTION OR REPLACEMENT OF BIMETAL STRIPS

Inspect bimetal strips No. 37 periodically. More frequent inspections will be required if repeated or violent backfires occur. Sharp edges and burrs must be removed, (Fig. 5) since these may cause defective operation and binding of the valve stem No. 6. Bimetal strips distorted or discolored (lite blue to blue black) due to overheating, must be replaced.



REASSEMBLY

1. CLEANING

Flange surfaces on cartridge No. 33 and Bottom Cover No. 12 must be cleaned, and then coated with Esso "Andok B" or equivalent grease. All internal parts must be clean and dry, free from grease.

2. POSITIONING OF BIMETALS

Figure 1 shows the correct positioning of bimetals and their assembly to spool No. 1.

Move TEST-SET disc No. 24 to the SET position. Rotate screen spool assembly No. 1 so that bimetals No. 37 are parallel to milled flats on positioning nut No. 9 (Angular deviations of plus or minus 20° will not affect the operation of the valve).

2a. VERTICALLY DOWN (Refer to Fig. 3a.)

Bimetals No. 37 will rest on positioning nut No. 9, parallel with and straddling the milled flats on the nut. Insert the cartridge and locate the bolt holes. With screws No. 41, bolt the cartridge assembly to valve body No. 40.

2b. VERTICALLY UP OR HORIZONTALLY

(Refer to Fig. 3b.) Bimetals No. 37 are parallel with the milled flats on the positioning nut No. 9 and below the cam on valve stem No. 6 (Screen spool assembly is seated in cartridge). Insert the cartridge assembly in the valve body No. 40 and fasten with screws No. 41. Pull out reset stud No. 20 to set Firecheck.

APPENDIX B

TECHNICAL INFORMATION

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Figure 4 – Electrical schematic for 120V Flare Stack - Page 1 of 2

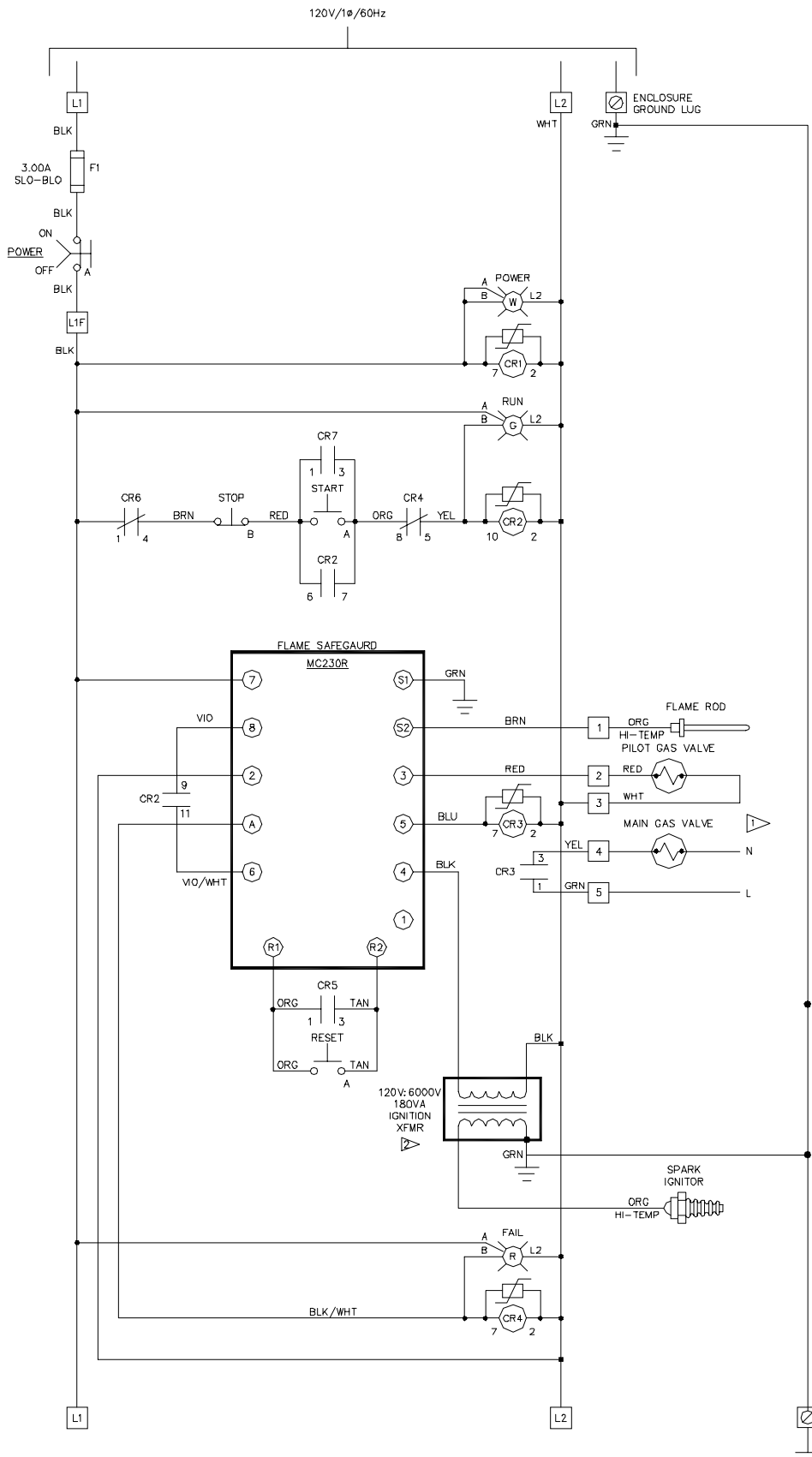


Figure 5 – Electrical schematic for 120V Flare Stack - Page 2 of 2

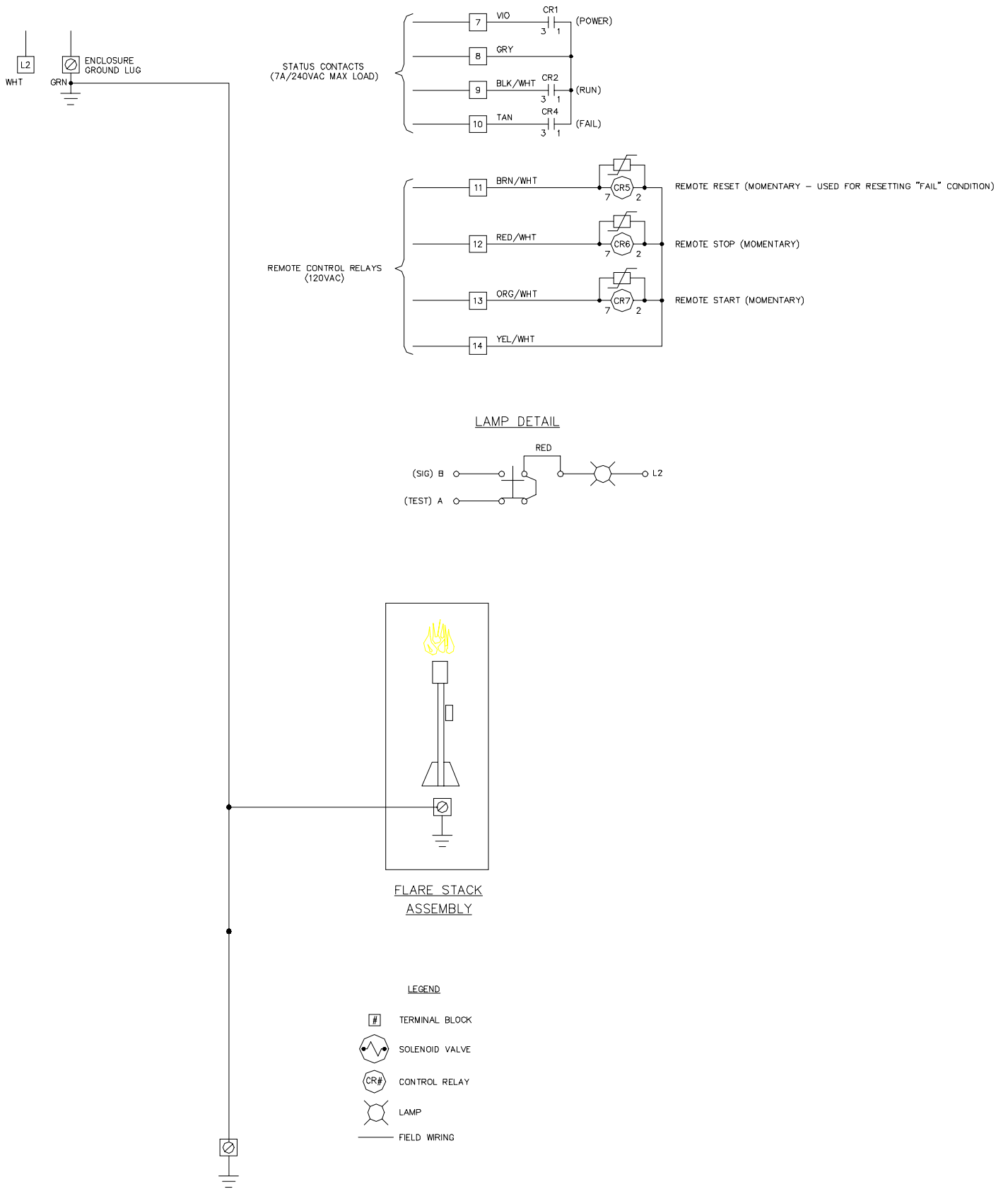


Figure 6 – Electrical schematic for 220V Flare Stack - Page 1 of 2

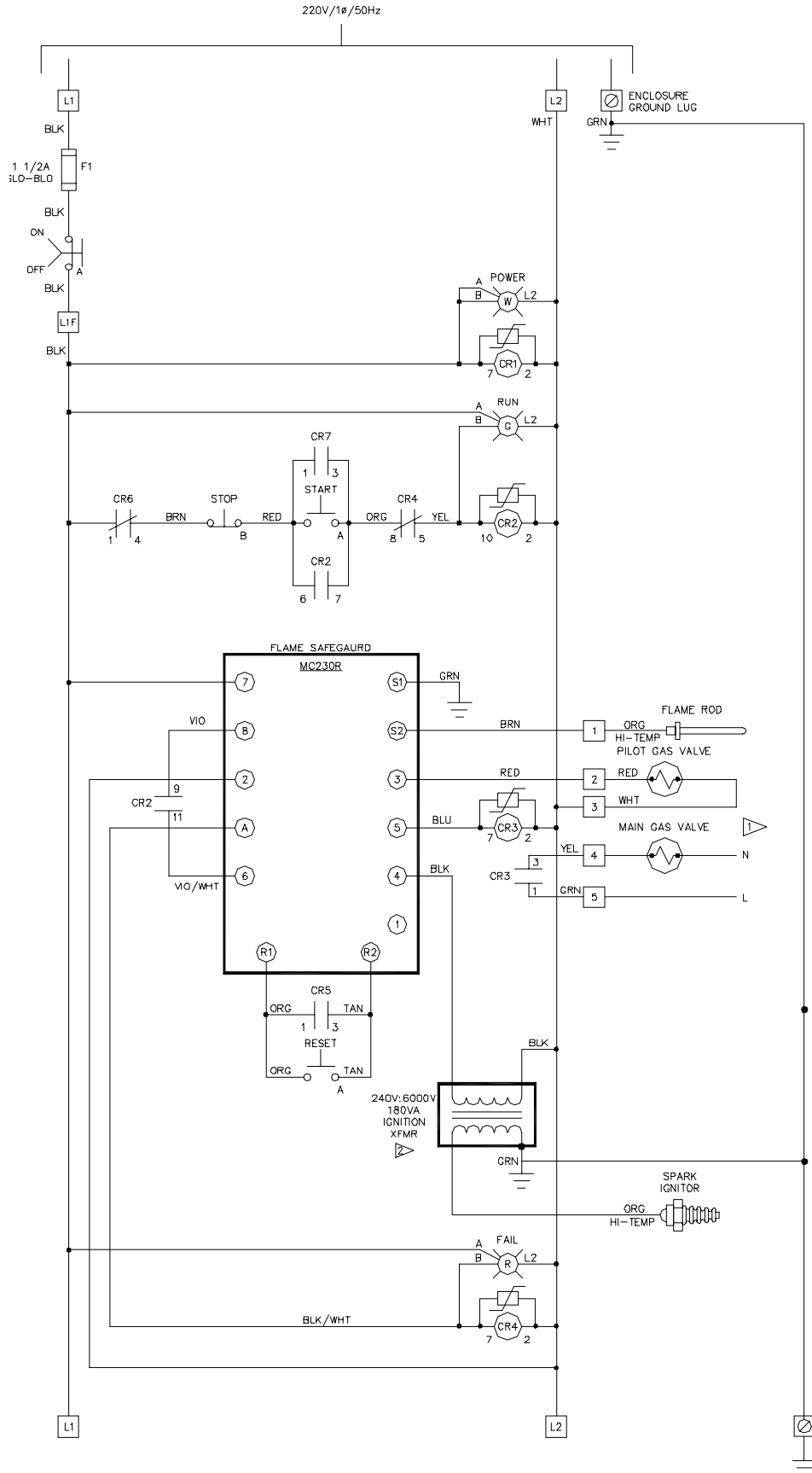
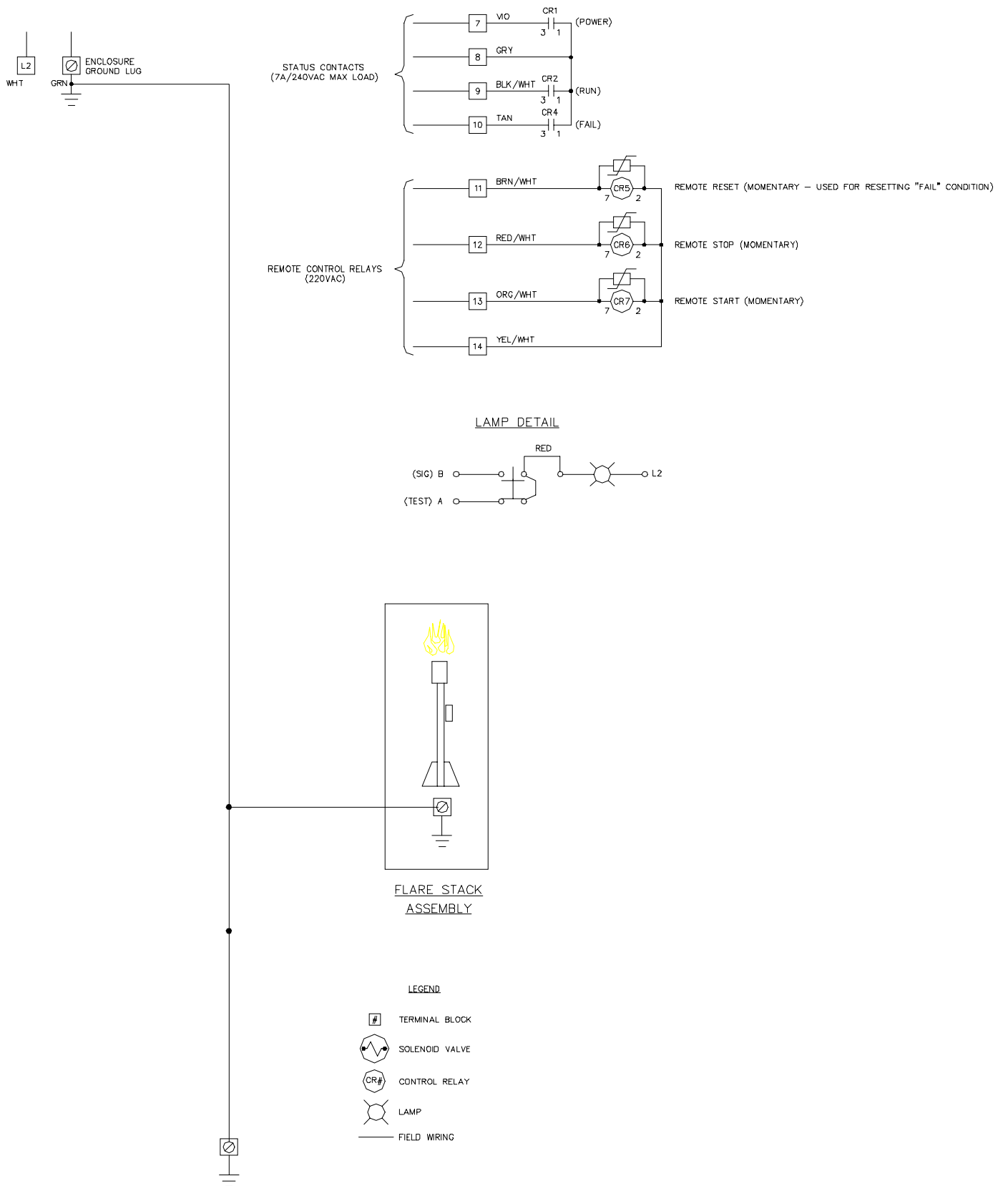


Figure 7 – Electrical schematic for 220V Flare Stack - Page 2 of 2





Innovative Liquid Vaporizing and Gas Mixing Solutions

WARRANTY REGISTRATION

Type of Equipment: _____ Serial Number: _____
 ASDI Sales Order #: _____ Order Date: _____
 Purchased By: _____

To help us give you better service, please fill out this warranty registration form and return it to ASDI to register your purchase and for follow up on the performance of ASDI equipment. We are dedicated to producing a quality product and if a problem occurs, ASDI wants to know about it.

Please help us with a small amount of information about your company and how the equipment will be used. When contacting ASDI, please have the type of equipment and the serial number handy so we can give you accurate information. If you have had any kind of problem with this equipment, or you have any comments, please attach a separate sheet to this form. Keep a copy for your records.

End Customer/Company Name: _____
 Address: _____ Tel: _____
 City: _____ Fax: _____
 State: _____ Zip: _____

Name of individual to contact for follow up information: _____
 Title: _____

Usage - Circle one: Base Load Standby System Peak Shaving
 Other: _____

In what application is the equipment being used? _____
 When was the equipment put in service? _____ / _____ / _____

Note: If you have more than one piece of ASDI equipment, fill out one warranty sheet and staple the others to it, ASDI will do the rest.

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