MANUAL

Application, Operation, Maintenance

PyroGuard™

CXC-System

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FACTORY MUTUAL APPROVED SYSTEM
FMRC Approval is limited to installations with maximum duct diameters of 48 inches and maximum air velocities of 10,000 fpm.
The AL daylight detector is not currently FMRC Approved.

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CLARKE'S PyroGuard™ SPARK DETECTION AND SUPPRESSION SYSTEM

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1.1 THE FIRE AND EXPLOSION PROBLEM

Fires and explosions, caused by sparks, are an everyday occurrence in industry. These fires cause millions of dollars in property damage annually, not to mention the danger to human life and lost production.

When working with combustible material, fires and explosions occur again and again in blow pipes, bag houses, sanders, planers, dryers, bucket elevators and screw conveyors. Sparks, the cause of most fires, occur in the process machinery and in dust transfer systems. Dust bins are especially vulnerable to fires.

1.2 SOLVING THE PROBLEM

Clarke's **PyroGuard**™ Spark Detection and Suppression System is designed to detect and extinguish a spark before it reaches process or filtration equipment, eliminating the potential for fires and explosions.

PyroGuard™ is especially effective in applications such as pneumatic and mechanical conveying systems, raw material storage systems, filtration equipment, or other hazardous dust-laden environments.

Clarke's **PyroGuard**™ Spark Detection System's high level of safety, excellence, and manufacturing quality is unprecedented in the spark detection field.

1.3 THE CONTROL CONSOLE

The control console is a microprocessor-based unit that receives the alarm signal from the spark sensor and immediately triggers the suppression system. Audio and visual alarms are activated automatically and production machines can be shut down.

The control console is programmed to allow the suppression system to function without interrupting production, providing minimum volume of water necessary for suppression and/or to shut down production equipment during continuous suppression or upon detection of a pre-determined number of sparks within a pre-set period of time.

EXAMPLE: *System shutdown may be affected by detection of 100 sparks within 10 seconds.*

The control console also provides a visual readout of the number of suppressions, sparks detected and the number of sensor tests performed. A battery back-up emergency power supply ensures continued operation during a power failure.

1.4 THE SPARK SENSOR

1. The standard Sensor units (**-LP** & **-HT**) are installed in ducts susceptible to sparks. These infrared sensors are responsive to radiation in the 440-1100 nanometer range.

   The highly sensitive electronic photodiodes detect the tiniest of sparks and in turn activate the suppression system and the alarm outputs on the control console.

   Due to their extreme sensitivity, a total of two sensors effectively monitor up to 78"φ ducts.

   Shielded cable is not required on the CLARKE'S **PyroGuard**™ CXC-System because the system is electronically stable. This is due to the long exposure time of the spark signal to the photodiode. For example, on a 30"φ duct two sensors cover 100% of the duct for a 50" length, providing confirmation of the signal.

   The spark sensors are flush mounted to the duct by means of sensor mounting adapters or mounting bands. The air flow inside the duct actually helps prevent material build-up on the sensor's photodiode protective lens.

2. The Ambient Light Sensor units (**-AL**) are not responsive to ambient light. They are responsive to infrared radiation in the 1500-3000 nanometer range with all the features of the standard sensors.

1.5 THE SUPPRESSION SYSTEM

1. The automatic suppression system uses a finely atomized water spray as the suppression agent. The duration of atomized water spray is regulated by the control console. Pressurized water as the suppression agent is inexpensive, safe and effective. However, other suppression agents may be used as required.

2. The suppression system includes a filter, solenoid valve with coil, flow/pressure switch, and special spray nozzles.

3. The spring loaded nozzles are mounted from the outside of the duct using special mounting adapters to provide a flush mounting of the nozzles with the inside surface of the duct, providing a contamination free, multiple spray pattern for unprecedented spark suppression. This mounting system does not require the installation of access doors in the dust.

4. The system is capable of establishing the water spray pattern in the pipe within approximately 0.30 seconds from time of detection. This combination of fast reaction time and unique multiple spray pattern makes Clarke's **PyroGuard**™ CXC-System a totally unequalled system for spark suppression.

SECTION 2.0 INDEX

ENGINEERING APPLICATION

2.1 CONSOLE SELECTION

The Clarke's **PyroGuard**™ CXC-System console is a microprocessor-based unit that is manufactured in two (2) models.

1. **SINGLE ZONE CONSOLE, *CXC-1***

   The Single Zone C-1 console is capable of operating two (2) sensors, and one (1) suppression unit. This console has input terminals for one (1) water flow switch contact, one (1) external reset contact, and one (1) external trouble contact. All input contacts must be normally open (**N.O.**). The console also has five (5) TRAIC alarm outputs and one (1) 24 VDC alarm output *(See Drawing No. 26-231)*. The alarm outputs are rated at 0.5 amp and are for **control voltage ONLY**.

   NOTE: *Clarke's recommended fusing all alarm outputs at 0.5 amps.*

2. **DOUBLE ZONE CONSOLE, *CXC-2***

   The Double Zone CXC-2 console is capable of operating four (4) sensors, and two (2) suppression unit. This console has input terminals for two (2) water flow switch contact, one (1) external reset contact, and one (1) external trouble contact. All input contacts must be normally open (**N.O.**). The console also has eight (8) TRAIC alarm outputs and two (2) 24 VDC alarm output *(See Drawing No. 26-232)*. The alarm outputs are rated at 0.5 amp and are for **control voltage ONLY**.

   NOTE: *Clarke's recommended fusing all alarm outputs at 0.5 amps.*

3. **TRIAC ALARM OUTPUTS**

   TRIAC alarm outputs are 120/240 volt AC control circuits with a **MAXIMUM** of 0.5 amp current rating. These outputs are for control voltage only; **APPLY NO VOLTAGE DIRECTLY** to these outputs. These outputs activate by either spark detection or trouble conditions **ONLY** - never under testing procedures *(See Section 3.3.1, and Chart III Sec. 3.5)*.

TERMINAL FOUR (4) is a summation output. This output activates upon detection of a spark by any of the sensors.

TERMINAL FIVE (5) is a delayed alarm output for sensors #3 and #4 (CXC-2 only). This output activates when sensor #3 or #4 reaches the *factory set threshold* of twenty (20) sparks within a twenty (20) second period. This threshold can also be programmed by the customer. The programmable time range is from 9.9 to 99 seconds, the spark counting range is from 1 to 255 sparks *(See Data Base Information this section)*.

TERMINAL SIX (6) is a delayed alarm output for sensors #1 and #2. This output is identical to terminal five in function.

TERMINAL SEVEN (7) is an instantaneous alarm output for sensor #4 (CXC-2 only). This output is activated upon detection of one (1) spark by sensor #4.

TERMINAL EIGHT (8) is an instantaneous alarm output for sensor #3 (CXC-2 only). This output is activated upon detection of one (1) spark by sensor #3.

TERMINAL NINE (9) is an instantaneous alarm output for sensor #2. This output is activated upon detection of one (1) spark by sensor #2.

TERMINAL TEN (10) is an instantaneous alarm output for sensor #1. This output is activated upon detection of one (1) spark by sensor #1.

TERMINAL ELEVEN (11) The CXC-System continually monitors the sensors, suppression, and battery charge circuits as well as the water flow switch (for continuous water flow condition) and the external trouble circuit (Terminal 19 when used). *(See Drawings 26-231 or 26-232)*

This output (Terminal 11) activates immediately upon the detection of a fault in one of these circuits.

4. 24 VOLT DC ALARM OUTPUTS

TERMINAL TWELVE (12) is an instantaneous alarm output for sensors #3 and #4 (CXC-2 only). This output activates when either sensor #3 or sensor #4 detects a spark.

TERMINAL THIRTEEN (13) is an instantaneous alarm output for sensors #1 and #2. This output activates when either sensor #1 or sensor #2 detects a spark.

TERMINAL FOURTEEN (14) & FIFTEEN (15) are 24 volt DC power supply connection points.

Clarke's recommends fusing these terminals at 0.5 amps.

5. INPUT TERMINAL CONNECTION

TERMINAL SIXTEEN (16) is the water flow switch input for the Zone 1 valve circuit. Using the two wires coming from the flow/pressure switch, connect one wire to terminal sixteen (16) and the second wire to P.S.C. (Power Supply Common, terminals 20 thru 23).

TERMINAL SEVENTEEN (17) is the water flow switch input for the Zone 2 valve circuit. Using the two wires coming from the flow/pressure switch, connect one wire to terminal seventeen (17) and the second wire to P.S.C. (terminals 20 thru 23).

TERMINAL EIGHTEEN (18) is the remote alarm reset input. Use normally open (N.O.) switch contacts of a momentary switch with one wire connected to terminal eighteen (18) and the second wire connected to P.S.C. (terminals 20 thru 23). This allows all alarm outputs to be reset from a remote location.

CAUTION: NOTE THAT WHILE THIS CONTACT IS CLOSED THE ENTIRE SYSTEM IS DISABLED.

NOTE: *If an alarm condition exists when the reset switch is released, the horn and alarm output (Terminal 4) will reactivate.*

TERMINAL NINETEEN (19) is the remote trouble input, i.e., a low

temperature monitor or pressure switch on the suppression water system. Using normally open (N.O.) switch contacts with one wire connected to terminal nineteen (19) and the second wire connected to P.S.C. (terminals 20 thru 23) the trouble alarm output (terminal #11) can be activated. This is ideal for use with water source pressure switches and/or temperature monitors on the heat tape.

6. TECHNICAL DATA SPECIFICATIONS

CONSOLES

ITEM	SPECIFICATION
1. Power	120/240 VAC+10% 50-60 Hz 15 amp service
2. Suppression Zone	CXC-1 (1-zone) CXC-2 (2-zones)
3. Sensors per line (zone)	Two (2)
4. Suppression time after last spark	Adjustable, *-factory setting is (5) sec*.
5. Standby Power	24 VDC 02 Hours 2-BA-12 24 VDC 24 Hours 4-BA-13
6. Operating Temperature	0◦ F to 120◦ F
7. Dimensions	W = 14.3/16" x H = 12" x D = 5"
8. Weight	Thirteen (13) Pounds
9. Color	Gray
10. Standard Enclosure	NEMA 12 Dust Proof

2.2 SENSOR SELECTION

1. **TOTALLY DARK ENVIRONMENT**

Low Temperature/Low Pressure: If the gas/air temperature is ambient to 140◦ F. two (2) **-LP** sensors will provide protection in ducts up to 78"φ.

NOTE: *Heavily loaded, low pressure systems, augers, conveyors transfer chutes may require three or four sensors depending on view angle limitation and material loading.*

High Temperature: If the gas /air temperature is between 141◦ F. and 450◦ F. one (1) **-HT** sensor with fiber optic will provide protection in ducts up to 48"φ. For diameters up to 78" a second **-HT** and polyp is required. Also for heavily loaded ducts, increased sensitivity can be obtained by utilizing the **PyroGuard**™ light guides in place of the polyps. The light guides can be used in temperatures up to 600◦ F. in duct up to 78"φ.

NOTE: *Diameter measurement must be to the outside of insulation or wrapping.*

High Pressure: All high pressure systems require **-HT** sensors with polyps or light guides.

2. **AMBIENT LIGHT ENVIRONMENT**

When protection is required in an area where sunlight or artificial light is present two (2) **-AL** sensors are required. These sensors will provide protection for ducts up to 78"φ with a gas/air temperature up to 122◦ F.

CAUTION: ***Do not expose -AL sensor to direct light.***

3. SENSOR TECHNICAL DATA, SPECIFICATIONS

LP SENSOR	SPECIFICATIONS
Operating Temperatures	-40◦ F to 140◦ F
Operating Voltage	22.0 to 13.0 volts DC
Power Consumption	10 ma @ 20 Volts DC
Spectral Response	440 - 1100 nm
Peak Wave Length	900 nm
Effective Sensitive Area	233 mm²
Viewing Area	120◦ @ 50% of 136uW signal
Sensitivity	Source Power = 136uW Distance = 1 meter

AL SENSOR	SPECIFICATIONS
Operating Temperatures	-40◦ F to 122◦ F
Operating Voltage	22.0 to 13.0 Volts DC
Power Consumption	10 ma @ 20 Volts DC
Spectral Response	1900-3000 nm
Peak Wave Length	2500 nm
Effective Sensitive Area	2.5 mm²
Viewing Angle	120◦ @ 50% of 628u W signal
Sensitivity	Source Power = 628u W Max setting Distance = 1 meter Med setting Distance = 85% of max setting Min setting Distance = 65% of max setting

SENSOR TECHNICAL DATA, SPECIFICATIONS (continued)

HT SENSOR WITH POLYP	SPECIFICATIONS
Operating Temperatures	-40◦ F to 450◦ F
Operating Voltage	22.0 to 13.0 volts DC
Power Consumption	10 ma @ 20 Volts DC
Spectral Response	440 - 1100 nm
Peak Wave Length	900 nm
Effective Sensitive Area	233 mm²
Viewing Area	82◦ @ 50% of 136uW signal
Sensitivity	Source Power = 136uW Distance = 60 centimeters

HT SENSOR W/LIGHT GUIDE	SPECIFICATIONS
Operating Temperatures	-40◦ F to 600◦ F
Operating Voltage	22.0 to 13.0 Volts DC
Power Consumption	10 ma @ 20 Volts DC
Spectral Response	440-1100 nm
Peak Wave Length	900 nm
Effective Sensitive Area	233 mm²
Viewing Angle	110◦ @ 50% of 136u W signal
Sensitivity	Source Power = 136u W Distance = 80 centimeters

2.3 SENSOR PLACEMENT

1. **S**ENSOR-**V**ALVE-**D**ISTANCE (**SVD**) is measured from the centerline of the sensor to the suppression nozzle's centerline. The (**SVD**) is determined from the ***"Field Data Sheet"*** information and is supplied by Clarke's Sheet Metal on the ***"System Calculation Sheet"*** *(See Section 2.7)*

2. Sensor should not be positioned on the bottom of a duct but at 90° from the vertical axis, exactly 180° apart.

> **NOTE:** *Placement of sensors in vertical ducts or pipe, is not as critical as it is on horizontal ducts.* ***Clarke's advises against placing sensors at points of high abrasion, for example, at or near elbows or fan scrolls.*** *(See illustrations A.B.C.D of sensor installation procedures in the Installers Guide)*

2.4 SUPPRESSION UNIT SELECTION

1. To determine the number of suppression nozzles needed consult:

Clarke's PyroGuard™ Division **Phone: 541-343-3395**
P. O. Box 2428 **Telefax: 541-345-1447**
660 Conger Street
Eugene, Oregon 97402 USA

   The nozzle requirements are calculated from the information supplied by the customer on the ***"Field Data Sheet"*** *(See Section 2.7)*

2. **PyroGuard™** suppression valves will accommodate a flow/pressure switch that can signal the console when water is flowing through the valve and nozzles.

3. SUPPRESSION TECHNICAL DATA, SPECIFICATIONS

EXTINGUISHMENT	SPECIFICATIONS
Power consumption	Two 12 volt coils in series: 1 amp @ 28 volts One 24 volt coil: 0.5 amp @ 28 volts
Operating temperature	35◦ F to 140◦ F
Full spray response	<300 ms
Operating Range (1) 24V coil, (2) 12V coil	28.0 to 16.0 volts DC

SU-1 EXTINGUISHING UNIT

Specifications	1" Valve W/1 C45 Nozzle
Operating Temp.	35◦ to 140◦ F
Minimum PSI	40 PSI @ nozzle @ flow
Maximum PSI	150 PSI @ valve-static
Minimum GPM	22.0

SU-2 EXTINGUISHING UNIT

Specifications	1" Valve W/2 C16 Nozzle	1" Valve W/2 C30 Nozzle	1" Valve W/2 C45 Nozzle
Operating Temp.	35◦ to 140◦ F	35◦ to 140◦ F	35◦ to 140◦ F
Minimum PSI	40 PSI @ nozzle @ flow	40 PSI @ nozzle @ flow	40 PSI @ nozzle @ flow
Maximum PSI	150 PSI @ valve-static	150 PSI @ valve-static	150 PSI @ valve-static
Minimum GPM	19.0	34.0	42.0

SU-2 EXTINGUISHING UNIT (continued)

Specifications	1½" Valve W/2 C45 Nozzle	1½" Valve W/2 C65 Nozzle
Operating Temp.	35◦ to 140◦	35◦ to 140◦
Minimum PSI	40 PSI @ nozzle @ flow	40 PSI @ nozzle @ flow
Maximum PSI	150 PSI @ valve-static	150 PSI @ valve-static
Minimum GPM	43.0	60.0

SU-3 EXTINGUISHING UNIT

Specifications	1½" Valve W/2 C45 Nozzle	1½" Valve W/6 C45 Nozzle
Operating Temp.	35◦ to 140◦ F	35◦ to 140◦ F
Minimum PSI	40 PSI @ nozzle @ flow	40 PSI @ nozzle @ flow
Maximum PSI	150 PSI @ valve-static	150 PSI @ valve-static
Minimum GPM	66.0	95.0

NOZZLE C_v RATINGS

Nozzle	C_v
C16	2.0
C30	2.6
C45	3.5
C65	4.8

2.5 WATER REQUIREMENTS

1. ***WATER MUST BE CLEAN!*** It is **VERY IMPORTANT** that no grease or oil is in the water. Failure to eliminate such contamination may cause valve malfunction. The valves are designed for optimum performance when the water temperature is 33◦ to 140◦F. Prolonged higher water temperatures can cause valve deterioration.

2. Optimum water spray pattern is obtained with 90 psi at the valve assembly prior to nozzles. The total GPM required at 90 psi is calculated using the information supplied by the customer on the *"Field Data Sheet"*. If deficiencies in water pressure and volume requirements exist, then special design considerations must be met regarding pipe size, valve size, nozzle adjustment and assurance of continuous water volume. The total actual GPM must equal or exceed the GPM required at 90 psi on the *"System Calculation Sheet"* provided by Clarke's.

3. The valve should be mounted along side of the duct as per Installers Guide drawings. Heat tape and insulation on suppression plumbing are recommended.

4. Due to variables of installation, such as the vertical rise, length, number of elbows and diameter of the supply line , pressure and gallons per minute water requirements for each system must be considered on an individual basis.

5. If the water pressure or GPM is inadequate, a pressure booster unit is required. Clarke's offers a standard 10 HP booster pump and control assembly, including starters, disconnects and required pressure control devices.

6. There are two options for pressure booster tank assemblies:

    1. CBP-52 52 gallon, 10 HP, 230/460/phase

    2. CBP-104 104 gallon, 10 HP, 230/460/phase

    NOTE: ***The maximum reservoir operating pressure is 150 PSIG.***

2.6 ELECTRICAL REQUIREMENTS

1. The console if factory wired for 120 volts AC, 60 Hz. or 240 volts AC, 50/60 Hz., a separate 15 amp circuit breaker is recommended.

   NOTE: *It is recommended that in certain installations where power surges are common that an isolation transformer and power conditioner be installed in the AC power supply line.*

2. **ALL** sensor and valve working voltages, internal and external are **D.C.**

3. It is recommended that **NON-SHIELDED COPPER CABLE** be used: using one cable from the cabinet to each sensor and one from the cabinet to each suppression unit.

4. All wiring many be contained in a common conduit without consequence, except for the **AC** input and control wires.

   NOTE: *NO AC voltage is to be in the conduit with the sensor/valve wiring.*

5. Each sensor requires three (3) conductors and comes with a 6 Ft. long 16 ga 3 wire S.O. cord as standard equipment.

6. Each suppression unit requires four (4) conductor, two (2) for the coil and two (2) for the flow/pressure switch. The wires may run in the same conduit as the sensor wires.

7. If a booster pump is used, four (4) additional conductors are required for interconnection of flow and pressure switches, between the pump/console,

8. Wire sizes and distance limitations:

   18 ga. Stranded wire, 356 Ft. MAX
   16 ga. Stranded wire, 565 Ft. MAX
   14 ga. Stranded wire, 870 Ft. MAX
   12 ga. Stranded wire, 1200 Ft. MAX

9. Each CXC-System console comes with a standard (2-BA-12) two hour battery back-up installed inside the console. An optional external (4-BA-13) twenty four hour battery backup unit is available for customers that need to conform with N.F.P.A. 72 requirements.

BATTERY BACKUP

SPECIFICATIONS	2-BA-12	4-BA-13
Operating Temperature	32◦ F - 120◦ F	32◦ F - 120◦ F
Power	24 VDC @ 1.2 Ah	24 VDC @ 13.6 Ah
Battery	Two (2) 1.2 Ah @ 12 VDC	Four (4) 6.8 Ah @ 12 VDC

2.7 REQUIRED DATA FOR SYSTEM CALCULATIONS

*The **"Field Data Sheet"** on the following page of this manual or supplied by the distributor needs to be filled out as accurately and completely as possible. One **"Field Data Sheet"** is required for each zone or area of protection. This data is required prior to shipment, as components selection and installation are based on the processing of this data. The data can either be sent or called into Clarke's **PyroGuard**™. The following steps will help to define the data required. Data may be in metric.*

1. Determine maximum velocity and temperature in the conveying duct, pipe, etc. Velocity readings should be in inches, H^2O or FPM and temperatures in degrees F. A pitot tube and nanometer or magnehelic gauge can be used to take velocity pressure reading.

2. Measure the duct to determine the cross sectional area. Note the diameter or circumference and wall thickness if duct is round. If dust is square, record height width, and wall thickness.

3. ACFM of system can be obtained using the following formula:

   ACFM = Area of duct (sq. ft.) X air/gas velocity (ft/min)

4. Abort gate activation time is the major factor in determining the sensor to abort gate distance and should be confirmed prior to construction.

CLARKE'S PYROGUARD
Spark Detection and Suppression System

Field Data Sheet

==========

Customer name:_____ End User name:_____
Address:_____ Address:_____
_____ _____
Contact person: _____ Contact person: _____
Title: _____Title: _____
Phone # (_____) _____Phone # (_____) _____
Fax # (_____) _____Fax # (_____) _____

==========

Zone # _____
System Description _____

==========

GENERAL INFORMATION:
Is this a low pressure system? [ ] yes [ ] no
Under normal conditions does the system operate below 176°F
[ ] yes [ ] no
Plant elevation ..... _____ Feet above sea level
Plant water pressure ..... _____ PSI (static/residual)

PIPE INFORMATION:
Diameter ..... _____ inches
Wall thickness ..... _____ gauge/inches
Insulation thickness ..... _____ inches

PNEUMATICS INFORMATION:
(fill in one of the following)
Maximum Standard Cu. Ft./Min. _____ SCFM
Maximum Actual Cu. Ft./Min... _____ ACFM
Velocity Pressure ..... _____ " H2O @ _____ °F
Maximum Velocity (FPM) ..... _____ Feet Per Minute

SYSTEM TEMPERATURE:
Maximum temperature at sensors _____ °F
Normal operating temperatures (minimum) _____ (maximum) _____

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SKETCH SYSTEM:

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Submitted by:_____ Date: _____

SECTION 3.0 INDEX

GENERAL OPERATION

Page

3.1 GENERAL OPERATION

1. START-UP OPERATION

Be certain your **PyroGuard**™ CXC-System has been installed in accordance with the Installer's Guide provided with the console. A commissioning service call by a qualified Clarke's Technician is recommended before system start-up.

a. Remove bottom console panel to expose the terminal blocks. Take a resistance reading of the valve circuit(s). *(Refer to drawing 26-231 /26-232 in the appendix for terminal locations).* For zones with a single 24V coil, resistance should be 50 ohms. When two (2) 12V coils are required, resistance should be 25 ohms.

NOTE: *Do not apply power to console until the approximate values are achieved.*

b. Turn the console on via the toggle switch above the AC power-in terminals. Notice the horn gives a short beep and some of the faceplate LED's blink momentarily. The four digit display will read three zeros with a flashing period ***"0.00"***, and the ***"24 Hour Clock"*** and ***"AC Power"*** LED's illuminate. If your console does not respond as described above, see the Troubleshooting Section 5.

c. Press the *"Lamp Test"* button at the lower right of the key pad to ensure all faceplate LED's are capable of illumination.

d. Proceed through testing and clock setting procedures below. If any response is different than described, refer to the Troubleshooting Section 5. If system still will not respond correctly, call Clarke's **PyroGuard**™ at **541-343-3395**.

2. **NORMAL OPERATION OF THE CXC-System**

During normal operation the console will display the following:

a. The *Normal AC Power* light below the key pad will illuminate.

b. The *Digital Display* will be on and displaying the function illuminated below the display, **24 Hour Clock, Sensor Test Count, Sensor Spark Count, and Valve Activations.**
(see section 3.1.5 for Digital Display operation).

c. If the **Sensor Test Count, Sensor Spark Count, or Valve Activations**, function is displayed, then one of the **Sensor Alarm** lights in the upper center of the console will also be illuminated.

d. The **Test With Valve** light, in the lower center of the console, may be on during normal operation without altering system performance. When illuminated, this light indicates that the suppression unit will be activated in conjunction with the sensor test procedure.

e. All other lights should be off during normal operation.

3. **TESTING PROCEDURES**

NOTE: *The TRIAC outputs,* ***Terminals 4-11*** *and 24 VAC* ***Terminals 12-14*** *will not activate during testing.*

a. The **Lamp Test** button, located in the lower right section of the console, when pressed will illuminate all lights and the display will read **8.8.8.8.**

b. The **Sensor Test** buttons are located in the lower right section of the console. **Testing must be done while in the 24 HOUR CLOCK mode.** To test the sensors, push the test switch that corresponds to the sensor to be tested. The following indications will occur:

The sensor OK light above the depressed **Sensor Test** switch will illuminate.

The **Sensor Alarm** light for the corresponding sensor will illuminate.

If the **Sensor Trouble** light for the sensor being tested and the horn comes on during the test, the sensor or its circuit is defective. *(See Troubleshooting Section 5.7)*

c. The **Test With Valve** switch is located in the lower left section of the console. *To test the Suppression Unit* push the **Test With Valve** switch, illuminating the **Test With Valve** light under the sensor testing portion of the console, then follow the Sensor Test Procedures. The following will occur in addition to the sensor test indications:

The **Valve On** light under the valve status portion of the console will illuminate.

The **Water Flow** light located under the valve status portion of the console will illuminate.

The **Valve Trouble** light under the valve status portion of the console illuminates and the horn sounds, then a problem exists with the valve circuit or the water flow circuit. *(See Troubleshooting Section 5.9.3)*

4. **ALARM CONDITION**

a. When a sensor detects a spark the following will occur.

The horn will sound in rapid pulses.

The **Sensor Alarm** light will illuminate indicating which sensor is detecting the spark.

The **Valve On** light will illuminate, indicating that the valve is activated.

The **Water Flow** light will illuminate, indicating that the suppression is in progress.

Five (5) seconds after the **Last** spark is detected the valve and water flow lights will turn off.

The corresponding alarm outputs will activate. *Refer to section 3.3*.

NOTE: *See console outputs and inputs sections 2.1.3, 2.1.4, 2.1.5 and drawings 26-231 and 26-232*.

A twenty -second **Window** opens looking for continuous sparks. A factory set threshold of twenty (**20**) sparks is set that will activate **Delay Alarm** terminal contacts. *(See Section 3.5, 2.1.3 and drawings 26-231 and 26-232)*. Both the twenty-second time and twenty spark count can be altered via the data base *(See Section 3.2)*.

5. **DIGITAL DISPLAY OPERATION**

a. The digital display will display the following:

The time of day in a 24 hour format in the **24 Hour Clock** mode.

The number of test performed on each sensor in the **Sensor Test Count** mode.

The number of sparks detected by each sensor in the **Sensor Spark Count** mode.

The number of valve actuations by each suppression unit in the **Valve Activations** mode.

Data base information (See Data Base Section 3.2)

b. The **24 Hour Clock, Sensor Test Count, Sensor Spark Count** and **Valve Activations** information is available through the use of the **Step** and **Sensor Selection Buttons**. This procedure is as follows:

The illuminated light under the digital display indicates which function is currently being displayed.

The **Step** switch is used to select the functions to be displayed.

When the **Step** switch is pushed, the light by the function moves to the next function and the display will indicate its value. *(This information corresponds to the sensor with the illuminated **Sensor Alarm** light)*.

The **Spark Select Button** is used to select which sensor information is to be displayed.

6. **SETTING THE CLOCK**

The time may be set by pushing the **Load** switch when in the 24 hour clock mode, then entering the time *(24 hour format)* via the key pad, and then push the **Store** switch.

7. **ALARM RESET BUTTON**

Silences horn and reset all alarm outputs.

CAUTION: ***WHILE THE CONTACT IS CLOSED THE CXC-System IS DISABLED.***

8. **COUNT RESET BUTTON**

a. The **Count Reset Button** will reset the sensor test, spark, and valve count for each sensor and suppression unit.

b. To reset the counters, display the information *(See Section 3.5.b)* that is to be reset and push the **Counter Reset Button** switch.

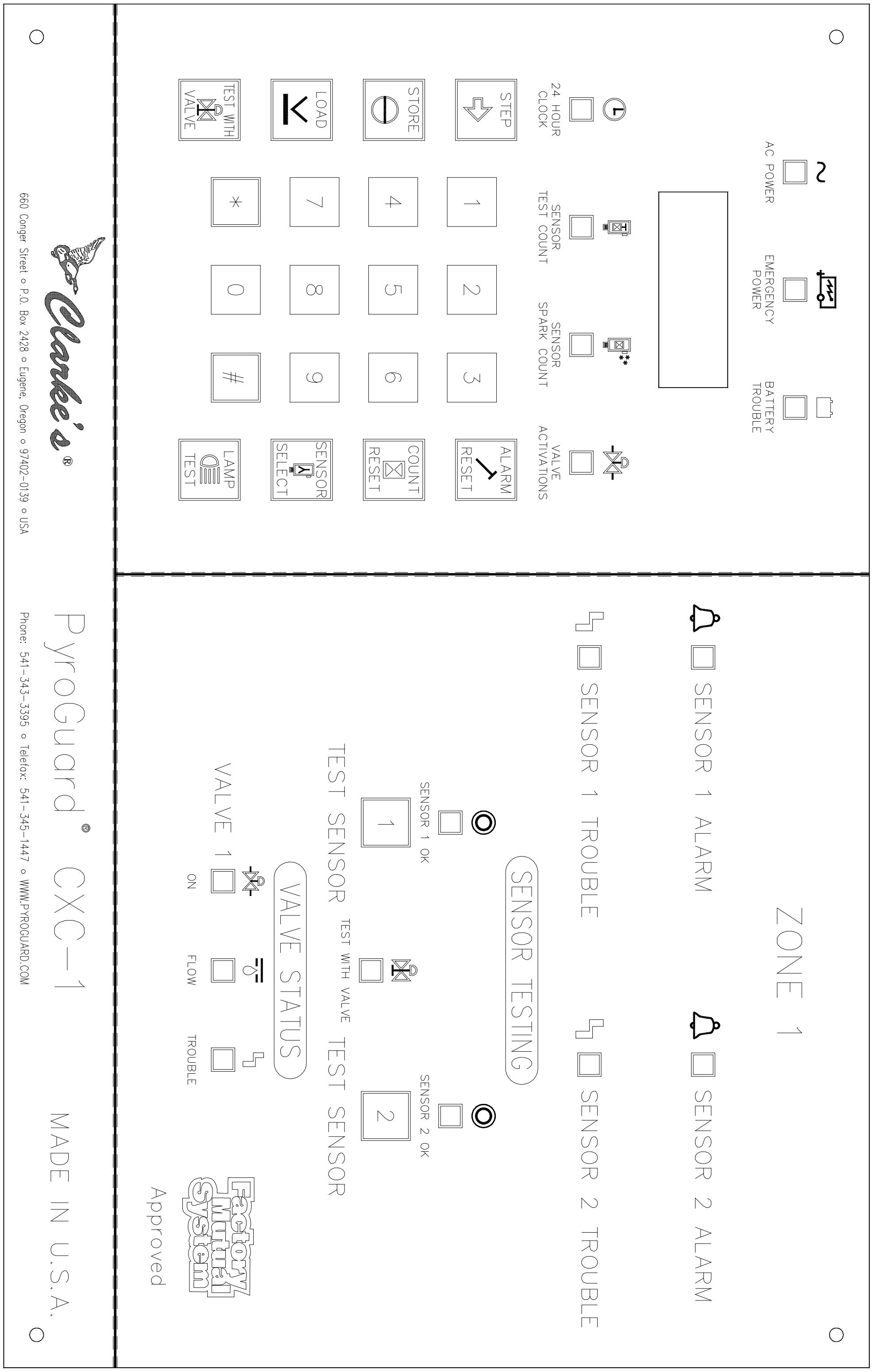
9. **EMERGENCY POWER ON LIGHT**

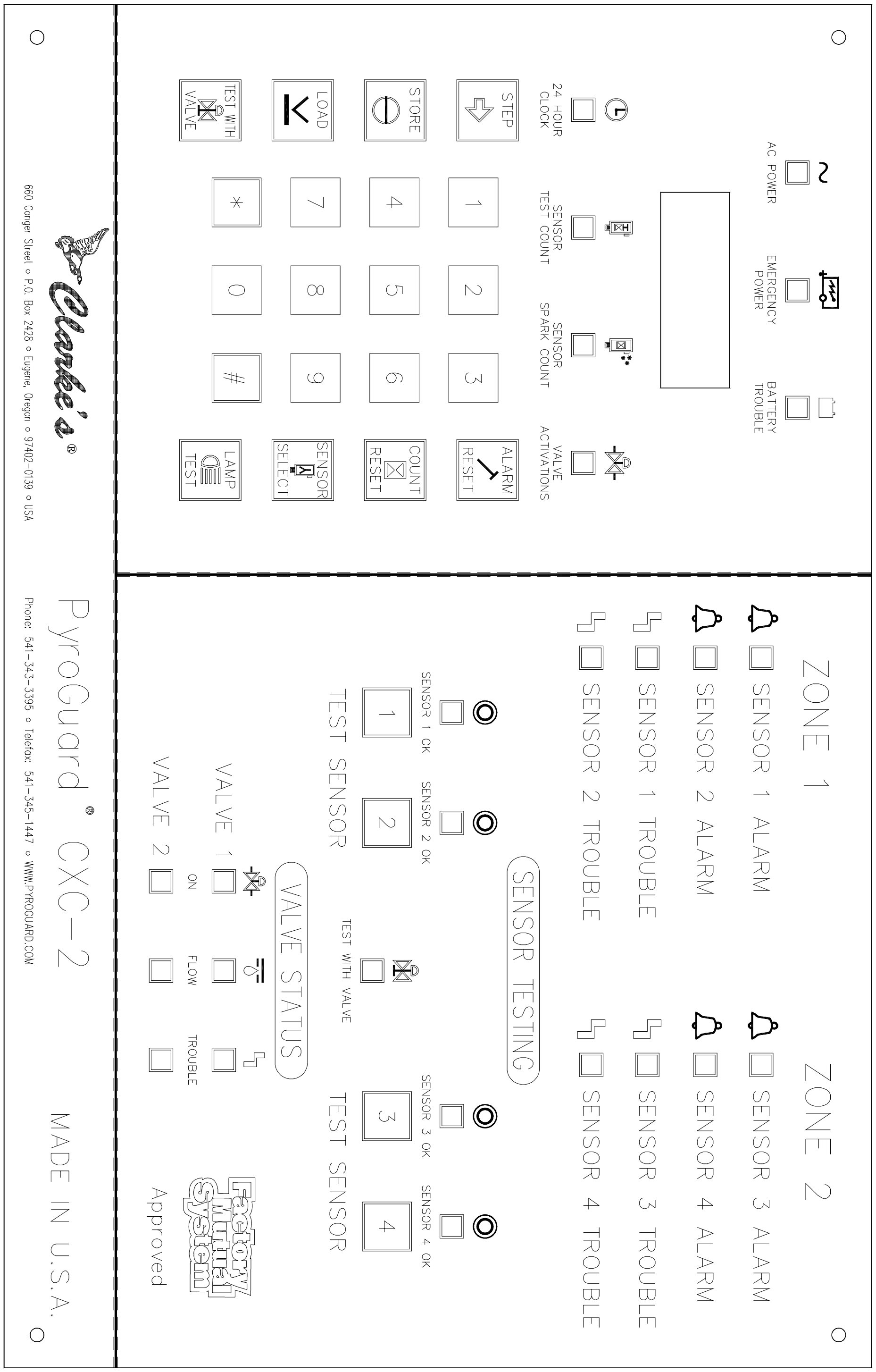
When the **Emergency Power** light is illuminated this indicates that the system is operating on the battery back-up system, and that there is no 120 volt AC power to the console. The horn is also sounding a continuous tone.

IMPORTANT NOTE: *After very prolonged operation without AC power the faceplate will go blank indicating the system is offline. The horn will stay on, however.*

10. **BATTERY TROUBLE LIGHT**

When the **Battery Trouble** light is on, this indicates weak batteries or a problem with the battery charging circuit. The horn is also sounding a continuous tone.


AC POWER
EMERGENCY POWER
BATTERY TROUBLE
24 HOUR CLOCK
SENSOR TEST COUNT
SENSOR SPARK COUNT
VALVE ACTIVATIONS
STEP
STORE
LOAD
TEST WITH VALVE
1
2
3
4
5
6
7
8
9
*
0
#
ALARM RESET
COUNT RESET
SENSOR SELECT
LAMP TEST
Clarke's
660 Conger Street o P.O. Box 2428 o Eugene, Oregon o 97402-0139 o USA
ZONE 1
SENSOR 1 ALARM
SENSOR 2 ALARM
SENSOR 1 TROUBLE
SENSOR 2 TROUBLE
SENSOR TESTING
SENSOR 1 OK
SENSOR 2 OK
1
2
TEST SENSOR
TEST WITH VALVE
TEST SENSOR
VALVE STATUS
VALVE 1
ON
FLOW
TROUBLE
Approved
PyroGuard CXC-1
Phone: 541-343-3395 o Telefax: 541-345-1447 o WWW.PYROGUARD.COM
MADE IN U.S.A.


AC POWER
EMERGENCY POWER
BATTERY TROUBLE
24 HOUR CLOCK
SENSOR TEST COUNT
SENSOR SPARK COUNT
VALVE ACTIVATIONS
STEP
STORE
LOAD
TEST WITH VALVE
1
2
3
4
5
6
7
8
9
*
0
#
ALARM RESET
COUNT RESET
SENSOR SELECT
LAMP TEST
Clarke's®
660 Conger Street o P.O. Box 2428 o Eugene, Oregon o 97402-0139 o USA
ZONE 1
SENSOR 1 ALARM
SENSOR 2 ALARM
SENSOR 1 TROUBLE
SENSOR 2 TROUBLE
ZONE 2
SENSOR 3 ALARM
SENSOR 4 ALARM
SENSOR 3 TROUBLE
SENSOR 4 TROUBLE
SENSOR TESTING
SENSOR 1 OK
SENSOR 2 OK
SENSOR 3 OK
SENSOR 4 OK
TEST SENSOR
TEST WITH VALVE
TEST SENSOR
VALVE STATUS
VALVE 1
VALVE 2
ON
FLOW
TROUBLE
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Factory Mutual System
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3.2 DATA BASE INFORMATION

1. DATA BASE

The data base is a storage area within the memory which may be user programmed. The information stored in the data base is used for such things as analog input calibration, alarm set points, timers, etc., for your specific applications.

CAUTION: BEFORE CHANGING ANY DATA BASE INFORMATION, KNOW WHAT THAT DATA IS USED FOR.

***VERY IMPORTANT NOTE*: TURNING THE CONSOLE OFF WILL ELIMINATE ANY ENTERED DATA AND RETURN TO ORIGINAL FACTORY SET DATA (SEE SEC. 3.3). *YOU MUST ALWAYS RE-ENTER YOUR UNIQUE DATA AFTER POWER-UP*.**

2. DATA BASE CHANNELS

A Lock-Out channel is utilized to help prevent accidental changes to the stored data. Data base information is listed on channel numbers one (1) through twenty (20). A list of channel descriptions and data is included in the manual charts and may be used to view pre-set data. *Refer to Charts I & II, Section 3.3 and 3.4.*

3. CHANGING INFORMATION IN DATA BASE

(Programming)

To help prevent the accidental changes to the stored data, channel number "0" is used as a Lock-out channel. Data cannot be changed when a "00" is stored in the Lock-out channel. Data may be changed by entering a <1> in the Lock-out channel. Entering a <1> will allow data change, but the Lock-out channel will automatically reset itself back to "00" when you leave data base.

Entering a <2> in the Lock-out channel will also allow data change, however the Lock-out channel will have to be manually reset to "00" when data change has been completed to reactivate the lock-out feature. To change information in data base proceed as follows:

Program

1. Push <**#**> key on keypad.

2. Push <**LOAD**> switch. *(Display will show "0000")*

3. Push <**5**> then <**2**> then <**3**> using the keypad. (if the wrong code is entered go back to 2.).

4. Push <**STORE**> switch. *(Display will show "**C**" in left digit and a channel number in right digit(s))*

5. Push <**LOAD**> switch. *(Display will show "C000")*

6. Push <**0**> on the keypad.

7. Push <**STORE**> switch.

8. Push <**LOAD**> switch.

9. Enter a <**1**> or a <**2**>. If the wrong number is entered by mistake go back to (8). This will set the display back to "**C000**".

10. Push <**STORE**> switch.

11. Push <**LOAD**> switch. Enter the channel number you wish to change by using the keypad. For example, if you wish to change the data in channel 14, push <**1**> then <**4**>.

12. Push <**STORE**> switch.

13. Push <**LOAD**> switch.

14. Enter new data by using the keypad. If the wrong information is entered go back to 11. This will set the display back to "**C000**". *See Chart I, page 19, for channel descriptions. See Chart II, page 20, for the sensor assignment codes.*

15. Push <**STORE**> switch.

16. To change information in other channels, go back to 11 and repeat.

4. **LEAVING DATA BASE**
   (Return To Normal Display Mode)

   Push <**#**> key on keypad. You are now out of data base and back to normal display mode.

5. **SIMPLIFIED DATA BASE INSTRUCTIONS**

   NOTE: *The **FACTORY SET DATA CODE** will be displayed when viewing the corresponding channel. If the number displayed is different from the factory set code, then verify that the data codes meet your system engineering requirements. See Chart I.*

   1. TO ENTER DATA BASE:

      <**#**><**LOAD**><**5**><**2**><**3**><**STORE**>.

   2. TO REVIEW DATA:

      Enter Data Base
      <**LOAD**> **CHANNEL NUMBER** <**STORE**>
      (Display now shows Channel Data)
      <**STORE**>
      *(Display now shows Channel Number with "**C**" in left digit of the display. Repeat key sequence for each channel to be reviewed)*
      Push <**#**> To Exit Data Base.

   3. TO CHANGE DATA BASE:

      Enter Data Base
      <**LOAD**><**0**><**STORE**>
      <**LOAD**><**1**><**STORE**>
      a) <**LOAD**> **CHANNEL NUMBER** <**STORE**>
      b) <**LOAD**><**DATA**><**STORE**>
      Repeat A & B For Each Additional Change
      Push <**#**> To Exit Data Base

3.3. CHART I, CHANNEL ASSIGNMENTS

CHANNEL DATA CODE	FACTORY SET DATA	NUMBER
00	00	Lock-out channel
01		Hours of the day in 24 hour format
02		Seconds
03		Date: Month/ Day of Month
04		Year
05	1	Number of flow switches
06	clock.	Seconds per day compensation for real time
07		Factory use ONLY
08		Voltmeter for 5 volt power supply
09		Voltmeter for 24 volt power supply
10	3	Valve 1 sensor assignment
11	12	Valve 2 sensor assignment, "**CXC-2" ONLY**
12	5	Valve on time in seconds (one spark)
13	3	Delay alarm 1, sensor assignment,
14	20	Delay alarm 1, continuous valve on time in seconds before alarm activates.
15	12	Delay alarm 2, sensor assignment, **"CXC-2" ONLY**
16	20	Delay alarm 2, continuous valve on time in sec before delay alarm activates, **"CXC-2" ONLY**
17	3	Zone 1 First spark DC output, Sensor Assignment
18	12	Zone 2 First spark DC output, Sensor Assignment
19	20	Number of sparks required within Delay alarm time-frame to activate the alarm (*both zones)*. Refer to Page 10
20	20	Delay alarm spark threshold must be reached within this time-frame (seconds) to activate the alarm (*both zones*). Refer to Page 10

3.4 CHART II, SENSOR ASSIGNMENT DATA CODES

Enter the data code in the appropriate channel to select the sensors assigned to that channel.

SENSOR NO.	DATA CODE
None	= 0
1	= 1
2	= 2
1 and 2	= 3
*3	= 4
*1 and 3	= 5
*2 and 3	= 6
*1, 2 & 3	= 7
*4	= 8
*1 and 4	= 9
*2 and 4	=10
*1, 2 & 4	=11
*3 and 4	=12
*1, 3 & 4	=13
*2, 3 & 4	=14
*1, 2, 3 & 4	=15

*** "CXC-2" ONLY**

3.5 CHART III, TERMINAL BLOCK ASSIGNMENTS

TERM BLK NO:	ASSIGNMENT *** "CXC-2" ONLY**
1	AC Ground
2	120 VAC L-1 or 220 VAC L1
3	120 VAC L-2 (neutral) or 220 VAC L2
4	Alarm (any zone)(120/220 VAC)
*5	Delayed ALARM #2 Sensors 3 & 4 Zone #2 (120/220 VAC)
6	Delayed ALARM #1 Sensors 1 & 2 Zone #1 (120/220 VAC)
*7	Sensor Four (4) Alarm Output (120/220 VAC)
*8	Sensor Three (3) Alarm Output (120/220 VAC)
9	Sensor Two (2) Alarm Output (120/220 VAC)
10	Sensor One (1) Alarm Output (120/220 VAC)
11	Trouble Alarm Output (120/220 VAC)
*12	Zone 2 Alarm Output (24 VDC)
13	Zone 1 Alarm Output (24 VDC)
14	+ 27 V DC
15	+ 27 V DC
16	Flow Switch 1 *(must be jumpered to terminal "F" when no flow switch is installed)*. See drawing No. 26-231.
*17	Flow Switch 2 *(must be jumpered to terminal "F" when no flow switch is installed.)* See drawing No. 26-232.
18	Remote Reset (Input #1)
19	Remote Trouble (Input #2) *(i.e. pressure switches, temperature monitors)*
F	Flow terminal for 16 and/or 17 when no flow switch is present
20-23	Power Supply Common (P.S.C.)*(B terminal on Sensor)*
24	Sensor 1 Test *(A terminal on Sensor)*
25	Sensor 1 Positive *(C terminal on Sensor)*
26	Sensor 2 Test *(A terminal on Sensor)*
27	Sensor 2 Positive *(C terminal on Sensor)*
*28	Sensor 3 Test *(A terminal on Sensor)*
*29	Sensor 3 Positive *(C terminal on Sensor)*
*30	Sensor 4 Test *(A terminal on Sensor)*
*31	Sensor 4 Positive *(C terminal on Sensor)*
*32	Valve 2 Source (+)
33	Valve 1 Source (+)
*34	Valve 2 Control (-)
35	Valve 1 Control (-)
36	IN+
37	IN-
38	OUT- \ EXTERNAL PRINTER
39	OUT+ / EXTERNAL PRINTER

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SECTION 4.0 INDEX

MAINTENANCE

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4.0 MAINTENANCE INFORMATION

1. INTRODUCTION

Your **PyroGuard**™ CXC-System is custom designed for your application and can be different from others, therefore we offer guide lines for you to follow until you can establish optimum procedures to fit your own maintenance schedule. Feed-back from our field technicians indicates that some sensors and suppression units are never inspected. We strongly urge you to develop a regular preventive maintenance schedule to ensure the constant integrity of your spark detection system.

It is essential that a regular maintenance schedule be developed and followed for testing and manually inspecting all suppression units. It is also critical that the "Y" strainers be flushed for two (2) minutes each week to ensure clean water flow through the solenoid valve. All **PyroGuard**™ CXC-System components are under warranty for two years for manufacturing defects, *but not for mechanical problems caused by lack of regular maintenance.*

All tests of sensors and valves using the console test buttons are to be performed in the "**24 Hour Clock**" mode *(See Section 3.1).*

ANY FIELD ADJUSTMENTS OF THE SENSORS BY ANYONE OTHER THAN CLARKE'S TECHNICAL PERSONNEL WILL VOID ALL WARRANTY.

4.2 MAINTENANCE SCHEDULE

ITEM	OPERATION	DAY	WK	MO	6MO	COMMENT
Console	Clean			√		See Control Console Maintenance Sec. 4.2.1
Emergency Power Supply	Test				√	See Battery Test Procedure Sec. 5.3.2
Sensor and Valve	Test	√				See Sensor Test Procedure sec. 3.1.3 b
Sensor	Maintain		√			Clean and Inspect
Water Lines	Flush out pipes at each 'Y' strainer		√			Flush for two (2) minutes
Spray Nozzles	Visual Inspection				√	Clean and Inspect
OPTIONAL: Booster Pump	Test			√		Refer to Booster Pump Manual

1. CENTRAL CONTROL CONSOLE MAINTENANCE

Monthly: Care should be taken to keep the Central Control Console as clean as possible.

The outside of the console should be wiped off.

2. SENSOR MAINTENANCE

Weekly: (Minimum depending on application and material being conveyed.)

Check Sensor Lens
1. Check for broken or cracked lens.
2. Clean lens with a few drops of alcohol or solvent.

6 Months:

1. Check sensor box for cracks.
2. Check inside of sensor for moisture.

Desiccant capsules should be removed and baked at 120◦F. for 24 hours to disperse any moisture absorbed, then reinstalled, or replaced as required.

3. SUPPRESSION SYSTEM

Daily: Check water flow.

Weekly: Flush the "Y" strainer by opening ball valve full open allowing water to run 1-2 minutes.

Monthly: Shut off water supply to "Y" strainer. Remove the strainer's screen and inspect and clean as required.

Visually inspect valve and heat tape. Make certain that the water temperature is held within the optimum 40◦ - 140◦ F. temperature range and there is no contamination of oil or grease.

NEVER *attempt to lubricate the interior of the valve with silicone or any other type of oil.*

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SECTION 5.0 INDEX

TROUBLESHOOTING

Page

5.0 CXC-SYSTEM TROUBLESHOOTING

5.1 FACEPLATE DOES NOT ILLUMINATE WITH CONSOLE SWITCH ON

1. Turn power switch off momentarily and determine if terminal block is engaged properly to backboard. Then turn it back on.

2. Check the AC voltage to the console. Terminal **G** to **L2** should be 0 volts and terminal **G** to **L1** should be 120 Volts AC (240 volts AC outside the U.S. and Canada).

3. Check the AC fuse directly above the AC power switch (see drawing 26-231 or 26-232).

4. Disconnect wiring to the suppression unit(s). If this allows console operation, check for shorts or reversed wiring in the suppression unit(s).

5. Disconnect wiring to all alarm and trouble outputs and all inputs. If this allows console operation, check for shorts in wiring.

5.2 EMERGENCY POWER INDICATION

1. Check the AC voltage to the console. Terminal **G** to **L2** should be 0 volts and terminal **G** to **L1** should be 120 Volts AC (240 volts AC outside the U.S. and Canada).

2. Check the AC fuse directly above the AC power switch (see drawing 26-231 or 26-232).

5.3 BATTERY TROUBLE INDICATION

1. Disconnect the battery leads at the side of the console and check the voltage across the two opposing leads. It should be between 24 to 27.5 volts. If the voltage is low or high, call ***Clarke's*** for adjustment.

2. **Battery testing**. Remove the batteries from the console and check each battery separately. With a volt meter, measure the battery voltage. It should be around 12 to 13 volts DC. Connect a 50 ohm 10 watt resistor across the battery for one minute and measure the voltage. **CAUTION**: *The resistor will become hot.* If the voltage drops more than 1.5 volts, replace the battery.

5.4 SENSOR TROUBLE INDICATION

1. With system in the **24 Hour Clock** mode, check the sensor's voltage between the positive (**C**) and negative (**B**) leads of the console terminal strip *(Refer to terminal strip dwg. 26-231/232 for sensor assignment)*. The voltage should be around 20 volts DC.

    a. If the voltage is over 22 volts, there is a loose or broken connection to the sensor positive or negative leads. Check to see that all connections are clean and making proper contact.

    b. If the voltage is between 0-9 volts there is a short or partial short to the positive lead. The most common fault in a new installation is a strand of wire shorting between the (**A**) and (**C**) terminals inside the console terminal block compartment. Partial shorts can be caused by water intrusion in the sensor or faulty external wiring.

2. Check all wiring and see that it is correct and that all connections are clean and making proper contact.

3. Check to see if water is present in the sensor or junction boxes. Water has been the most common problem with outside installations especially when both sensors of a zone show trouble.

4. If none of the above, the problem can be either with the console or sensor.

    a. **Console**: Turn off the console and disconnect the sensor's wires from the terminal strip and place a 2K resistor between the positive and negative terminals where the sensor was connected. Turn on the console and see if the sensor trouble light turns on. If the sensor trouble light does turn on, the main board is in need of repair.

    b. **Sensor**: If the console checks out good, the sensor is faulty. Disconnect the sensor from its location and do a sensor check as described in the sensor bench test procedure.

5. If both the sensor and the console check good, try swapping sensors around to see if the trouble moves to another location. If the trouble location does not move, there may still be a wiring problem. If the trouble location does move, the problem is with the sensor.

5.5 **SENSOR DOES NOT TEST**

1. Be sure test is performed in the "**24 Hour Clock**" mode and that a sensor-not a resistor-is wired to the sensor location on the console terminal block. Confirm sensor wiring at Terminals (**A**) and(**C**).

2. Check the voltage to the sensor test lead (**A**) at the terminal strip while pressing the sensor test button *(Refer to terminal strip dwg. for sensor assignment)*. The voltage should be around 24 to 26 volts DC.

   a. If the voltage to the test lead is not correct, check the 5 pin molex connector coming from the main board going to the faceplate for proper fit. Also check wires terminal points on back board and face plate for damage.

   biff the voltage is correct, check the switch setting inside the sensor compartment. It should be in the 24 volt position (the 24 volt position is marked on the terminal board).

3. If the voltage and the switch are correct, there can be a bad connection to the sensor's (**A**) terminal or the sensor test circuit could be at fault.

4. Check the test voltage between terminals (**A**) and (**B**) at the sensor while having someone at the console pressing the sensor test button. Again the voltage should be around 24 to 26 volts. If the voltage is not correct, there is an open test wire. If the voltage is correct, the sensor is at fault and needs to be sent in for repair.

5.6 **CONTINUOUS SPARK INDICATION**

1. With system in 24 hour clock mode check for alarm condition.

2. Check sensor voltage between the positive (**C**) and negative (**B**) terminals of the console terminal strip *(Refer to terminal diagram for sensor assignment)*. If the voltage is anywhere from 18 to 9 volts DC, the sensor could have water intrusion or it could be seeing daylight.

   a. Check for any daylight leaks in the duct. One way of finding a pin hole leak is to take a tarp and drape it over sections of the duct. Keep moving the tarp until the sensor stops detecting light.

b. Check for water intrusion in sensor box, junction boxes, and all conduit runs. Check for shorts between wires and conduit.

c. Excessive vibration can also cause false spark. Check for a white powder on the photocell lens of the sensor. If present, replace sensor. If you suspect vibration as a cause, call Clarke's for assistance.

d. Disconnect the sensor from its location and do a sensor check as described in the sensor bench test procedure.

5.7 SENSOR TROUBLE DURING TEST

1. Be sure the test is performed in the "**24 Hour Clock**" mode.

2. Check the sensor's negative (**B**) and test (**A**) leads at the console terminal strip and switch them around *(Refer to terminal diagram for sensor assignment)*. This is a common mistake made in new installations.

5.8 SYSTEM SHUTS DOWN ON SENSOR WITH VALVE TEST OR WHEN A VALVE IS BEING ACTIVATED

1. Turn off the system immediately. Valve wires on the coil could be shorted.

   If two 12 VDC coils are used they must be connected in series.

   a. **Check the coils**. Disconnect the valve wires at the console and remove the plug from the coil. Check the resistance of the coils with the plug removed. The values should be approximately 50 ohms for a 24 VDC coil and 25 ohms for a 12 VDC coil.

   b. Check the wiring. With the wires still disconnected from the console and the coil, check the resistance between the two black wires from the coil plug and from each to ground. The readings should be a high resistance *(almost infinity).* A short will be indicated by a low resistance in both directions and an open will be indicated by a high reading in both directions. From each lead to ground you should get a reading of infinity.

   c. Re-connect plug to coil.

5.9 VALVE TROUBLE INDICATION

1. With the system in 24 hour clock mode, check the voltage from ground *(pin 20 of the console terminal strip)* to the valve negative terminal. The voltage should be around 26 to 27 volts. If the voltage is near ground potential (0 volts), there is a loose or broken connection to the positive or negative leads, or there could be a blown fuse on the board.

2. Make certain the coil ratings are correct: A single suppression valve coil has 24V on the side. Two suppression valve coils have 12V on the side.

3. If valve "**Trouble**" light illuminates momentarily during test with valve, water flow may be obstructed or an open wiring condition to the flow/pressure switch exists. Field inspection is required.

4. If the valve "**Trouble**" light illuminates momentarily after a successful test with valve, the valve is not closing as fast as it should. This is indicative of dirty or clogged ports in the diaphragm.

5.10 CONTINUOUS WATER FLOW AND VALVE TROUBLE INDICATIONS

1. Check for alarm condition.

2. Check if the water is actually flowing. If it is, and the there are no sparks being detected, the valve has stuck open due to contaminated water. Valve inspection and rebuilding may be called for. Rebuild kits are available from Clarke's **PyroGuard**™.

5.11 NO VALVE ACTIVATION ON TEST WITH VALVE OR ALARM CONDITION

1. Check valve fuses above right terminal block.

2. **Check Data Base** location (**10**) or (**11**) for proper sensor valve assignment *(Section 3.2.5)*.

3. In some installations all four sensors are assigned to one valve. Each time the system loses complete power, the Data Base sensor valve assignments revert to factory settings.

5.12 **SENSOR BENCH TEST PROCEDURE**

1. **Equipment**:
   Volt meter
   Two 9 volt transistor batteries
   Flashlight/cigarette lighter (-AL only)
   50 ohm resistor

2. **-LP** and **-HT** Sensors:

   Cover the sensor's lens with black electrical tape. Take off the sensor's box cover. With the two 9 volt batteries connected in series a 50 ohm *(any wattage)* resistor also in series, connect the battery positive lead to the sensor's (**C**) terminal and connect the battery negative lead to the (**B**) terminal *(Refer to figure 1)*.

   With the batteries connected to the sensor, the voltage across the leads should be around 18 volts DC. Expose the lens to light by untaping the lens. When the lens is exposed to light the voltage across the leads should drop to between 16.5 and 10 volts DC depending on the charge of the batteries. Also, the red LED *(see figure 1 for location)* should start to flicker on and off. This is a good indication that the sensor is working well. If the voltage does not drop and the LED does not light, the sensor is bad.

   NOTE: *For the Red LED to flicker, you must move your hand back and forth in front of the sensor lens. This makes and breaks the light source.*

3. **-AL Sensor**:

   Connect the -AL sensor the same way as mentioned above except the lens does not require taping. Set the sensitivity switch to the center position *(see Figure 1 for location)*.

   With the batteries connected to the sensor, the voltage across the leads should be around 18 volts DC. With a flashlight or a cigarette lighter, expose the lens to light. The voltage across the leads should drop to between 17.5 and 10 volts DC depending on the charge of the batteries. Also, the red LED should start to flicker on and off. It is sometimes hard to see the voltage drop with an -AL sensor, but if the LED does light there is a good chance the sensor is good. If the LED does not light, the sensor is bad.

   NOTE: *You must move the light source back*

and forth in front of the lens for the Red LED to flicker.

DO NOT REPAIR THE SENSOR. ANY REPAIR ATTEMPT WILL VOID THE WARRANTY AND THE LIABILITY.

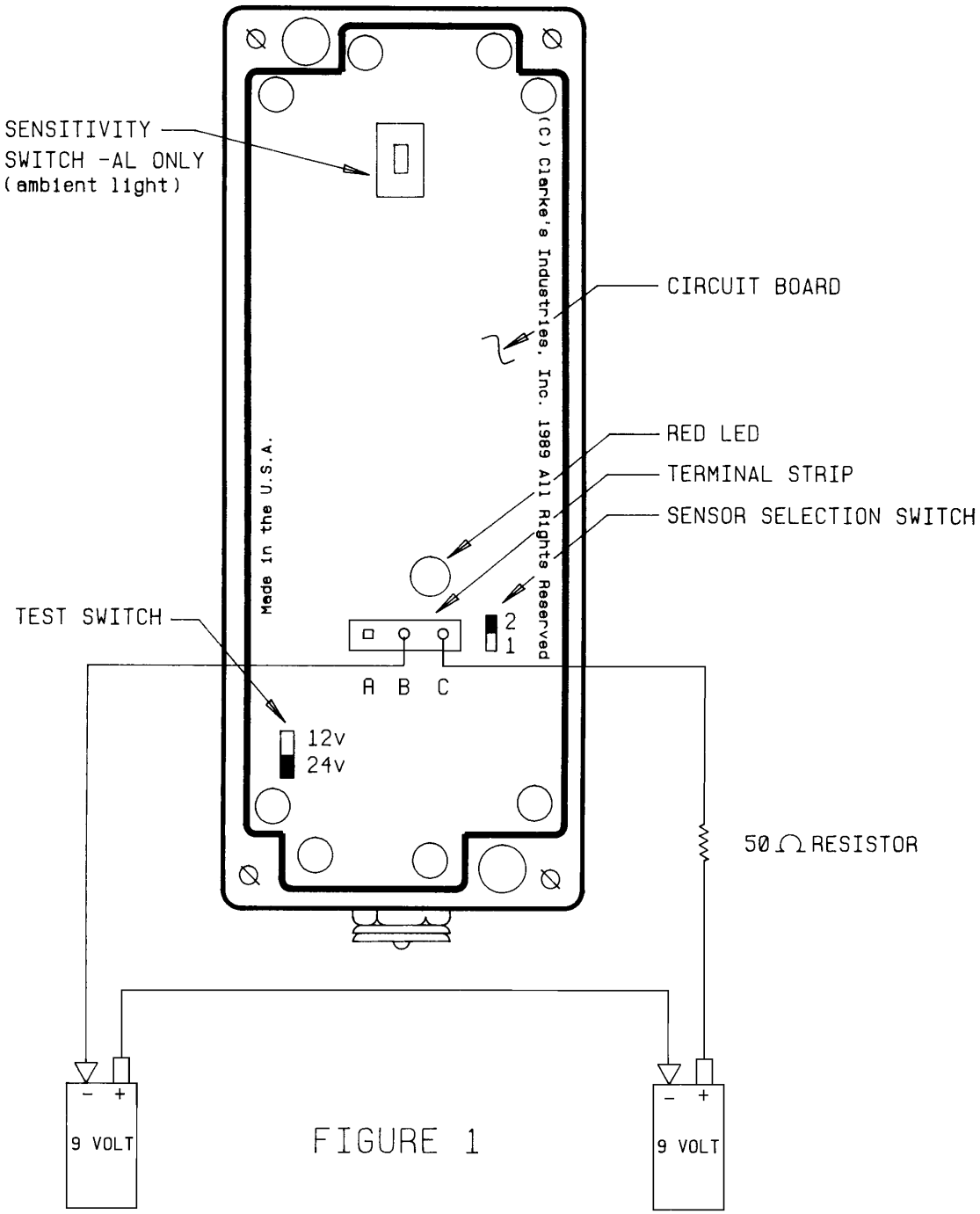

SENSITIVITY
SWITCH -AL ONLY
(ambient light)
(C) Clarke's Industries, Inc. 1989 All Rights Reserved
Made in the U.S.A.
CIRCUIT BOARD
RED LED
TERMINAL STRIP
SENSOR SELECTION SWITCH
TEST SWITCH
2
1
A B C
12v
24v
50Ω RESISTOR
9 VOLT
9 VOLT

FIGURE 1

6.0 CLARKE'S STANDARD CONDITIONS OF SALE & WARRANTY

The conditions stated herein shall be a part of any contract resulting from a purchase order placed with Clarke's Sheet Metal, Inc. (hereinafter called CSM). Any statement made on any form issued by Purchaser shall not operate to defeat the intent of these conditions.

1. **TAXES:** Prices are subject to any addition which may be necessary to cover any taxes, duty, fees or charges now existing or imposed at a later date by Federal, State or Municipal authorities upon equipment or services covered by the contract or the production, sale, distribution, or delivery of them, or upon any feature of this transaction.

2. **ERRORS:** CSM reserves the right to correct all typographical or clerical errors which may be present in the prices or specifications of its quotations.

3. **PAYMENT TERMS:** Payment shall be made in full thirty (30) days from dates of invoices to be issued following each shipment or in accordance with the payment schedule as stated in the quotation.

4. **CANCELLATION:** Purchaser may cancel purchase order by written notice received by CSM by paying cancellation charges on the basis of the percentage of work and/or material completed on the date cancellation notice is received by CSM.

5. **SHIPMENTS AND DELIVERY:** Title and risk of loss or damage to the equipment shall pass from CSM to Purchaser upon delivery by CSM to the possession of the carrier, unless otherwise agreed in the contract. Any claims for loss or damages after risk of loss has passed in this manner described shall be filed by Purchaser with the carrier. CSM shall not be liable for loss or damage from delay in delivery or failure to manufacture due to causes beyond its reasonable control. Shipping and delivery dates are approximate and based on prompt receipt by CSM of all necessary information, including final agreement on details, specifications, on such dates or with such lead times as may be specified by CSM.

6. **INSTRUCTIONS:** Two (2) copies of applicable instructions for operation and maintenance are normally included with each shipment. One (1) Installer's Guide is included with the console for new installers and with additional equipment when another zone is adder later. Additional copies will be furnished at extra charge.

7. **INSTALLATION:** All equipment shall be installed by and at the expense of Purchaser.

8. **COMMISSIONING OF SYSTEM:** CSM requires a two (2) week notice to furnish an engineer/technician to supervise or check-out the installation, prior to start-up. It is recommended that customers needing commissioning include this option with the system purchase order.

9. **WARRANTIES:**

   a) *MATERIAL AND WORKMANSHIP:* CSM warrants Purchaser that all equipment bearing CSM **PyroGuard**™ trademark shall be free from defects in material and workmanship. CSM shall at its option replace or repair, free of charge, any equipment covered by this warranty which shall be returned to the original shipping point, transportation charges prepaid, with in two (2) years from date of original shipment and which, upon examination by CSM, proves to be defective in material or workmanship. Equipment furnished by CSM, but identified as another manufacturer's product, shall bear on the warranty given by such other manufacture. CSM shall not be obligated to pay any costs or charges including "back charges" incurred by Purchaser or by any other party except as may be agreed upon in writing in advance by an authorized CSM representative. CSM shall not be liable for defects in workmanship for any equipment supplied by it in the event such defects may be the result of work, rework, or adjustment on the equipment by any person other than an authorized CSM representative.

b) *SCOPE:* CSM expressly warrants the equipment manufactured by it as set forth herein. CSM makes no other warranties, either expressed or implied *(including without limitation warranties as to merchantability and fitness for a particular purpose)*. In addition, the remedies set forth herein shall constitute the exclusive remedies of Purchaser for any breach by CSM of its warranties.

10. **CONSEQUENTIAL DAMAGES:** In no event will CSM be liable for consequential damages, downtime, or lost production for any breach of contract either real or alleged.

11. **IMPROVED DESIGN:** CSM reserves the right to change or modify the design and construction of any CSM equipment in due course of our manufacturing procedure, without incurring any obligation to furnish or install such changes or modifications on products previously or subsequently sold.

7.0 COMPONENT RETURN PROCEDURES

1. Please call Clarke's office before returning components for any of the following reasons:

    a) Warranty
    b) Non-Warranty
    c) Exchange/Replacement
    d) Credit

    We may be able to help your plant personnel solve the problem without sending the suspect components(s) in for repair, thereby reducing your down time.

2. Accompany all returned components with a P.O. number to cover all non-warranty repairs or services.

3. Include statement of reason for returning components. If parts are defective, describe defect or problem.

4. Ship Components to:

CLARKE'S SHEET METAL, INC.
PyroGuard™ Division
660 Conger Street
Eugene, Oregon 97402.0139 USA

Phone: 541-343-3395 **Website**: http://www.pyroguard.com
Fax: 541-345-1447 **E-Mail**: quality@pyroguard.com

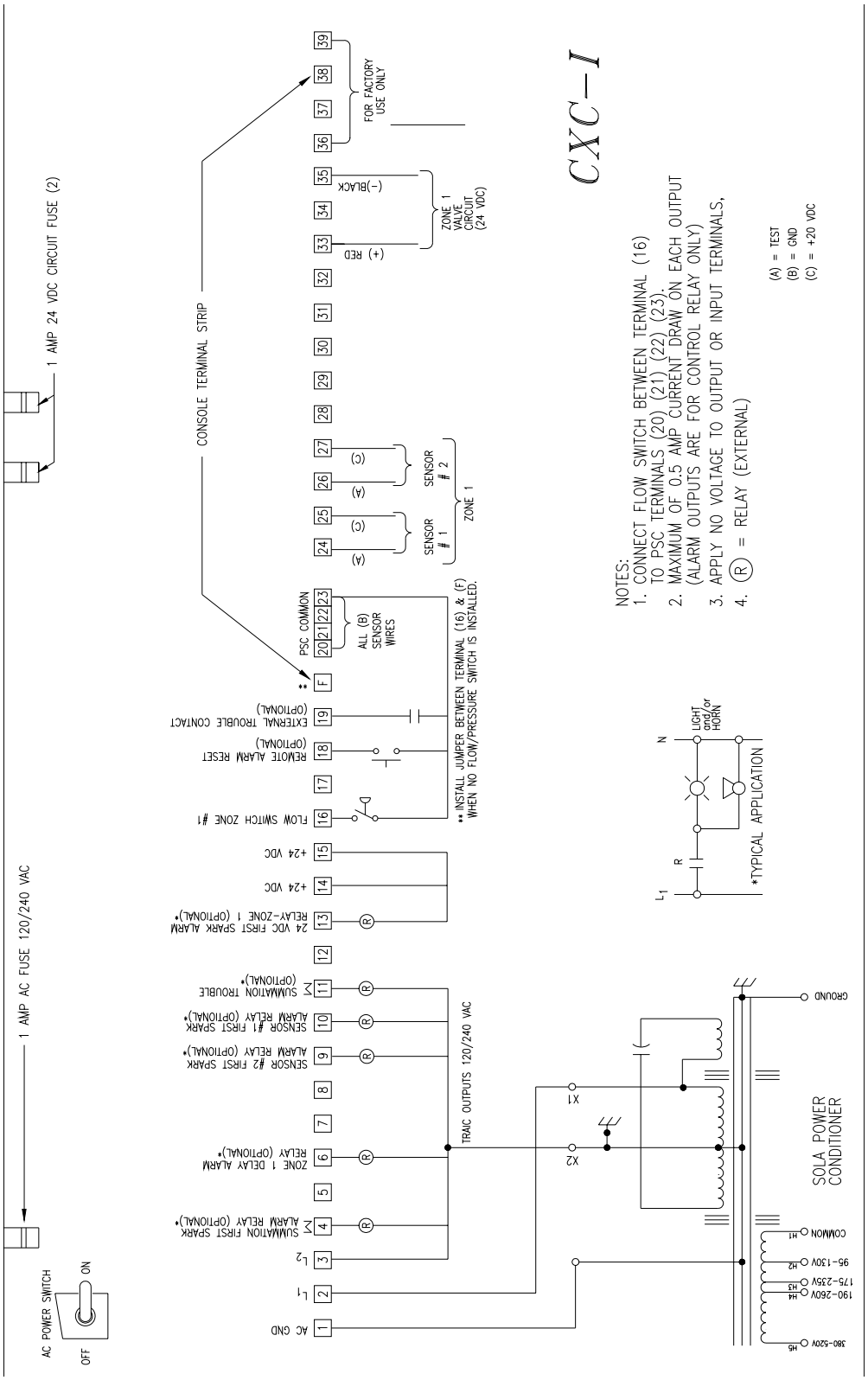
SECTION 8.0 INDEX

TECHNICAL DATA

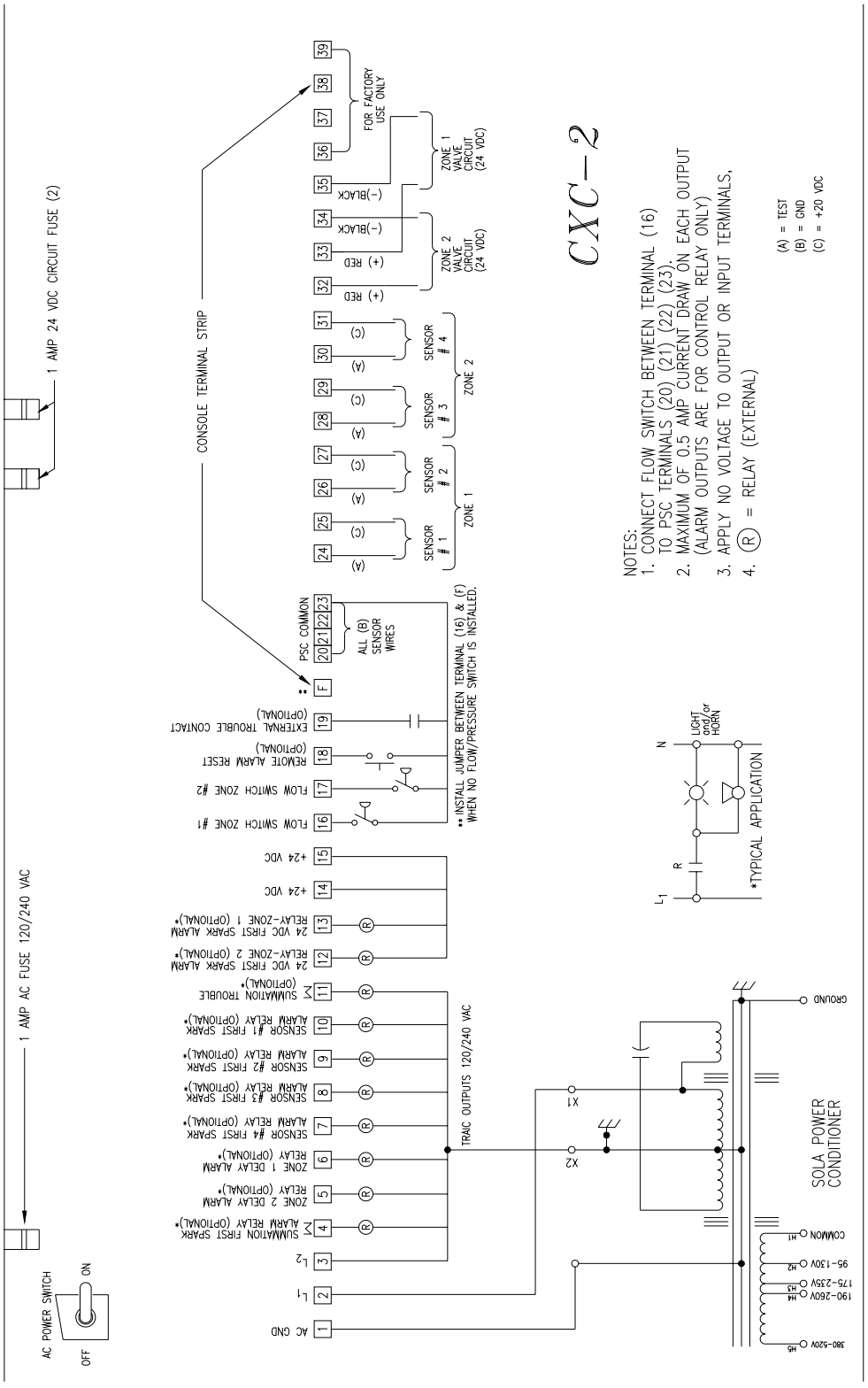
Page

8.1 ELECTRICAL DRAWING INDEX

DWG 26-231 CXC-1 Console Terminal Strip

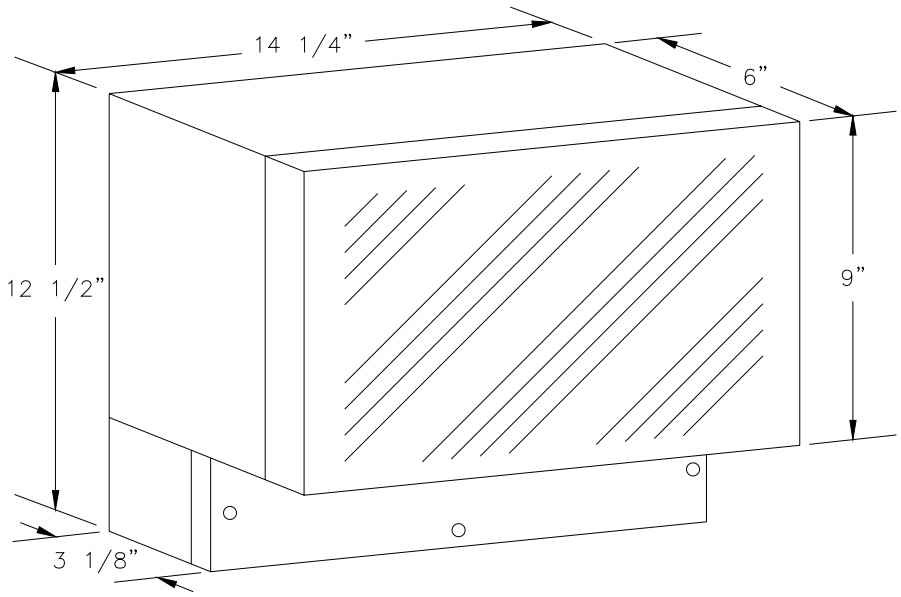


DWG 26-232 CXC-2 Console Terminal strip

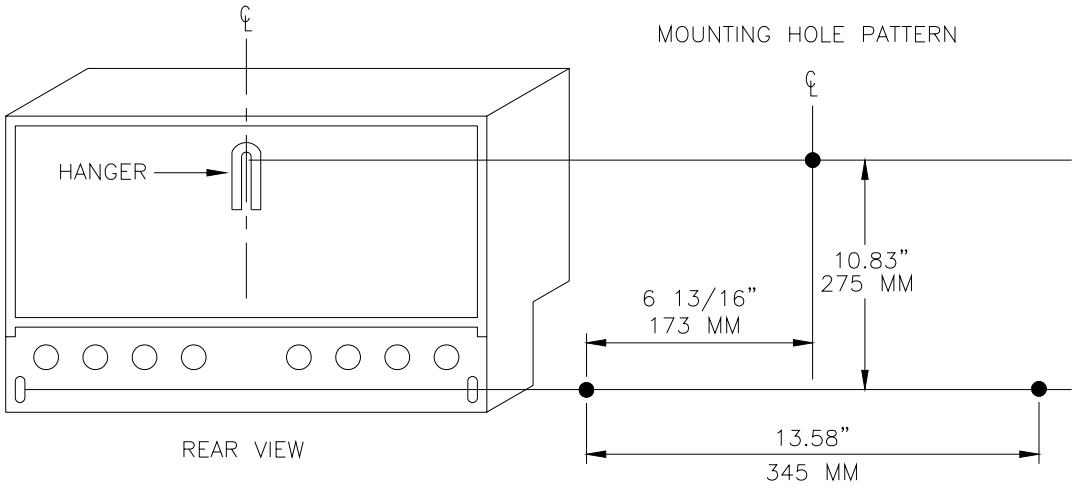


8.2 TECHNICAL DRAWINGS INDEX

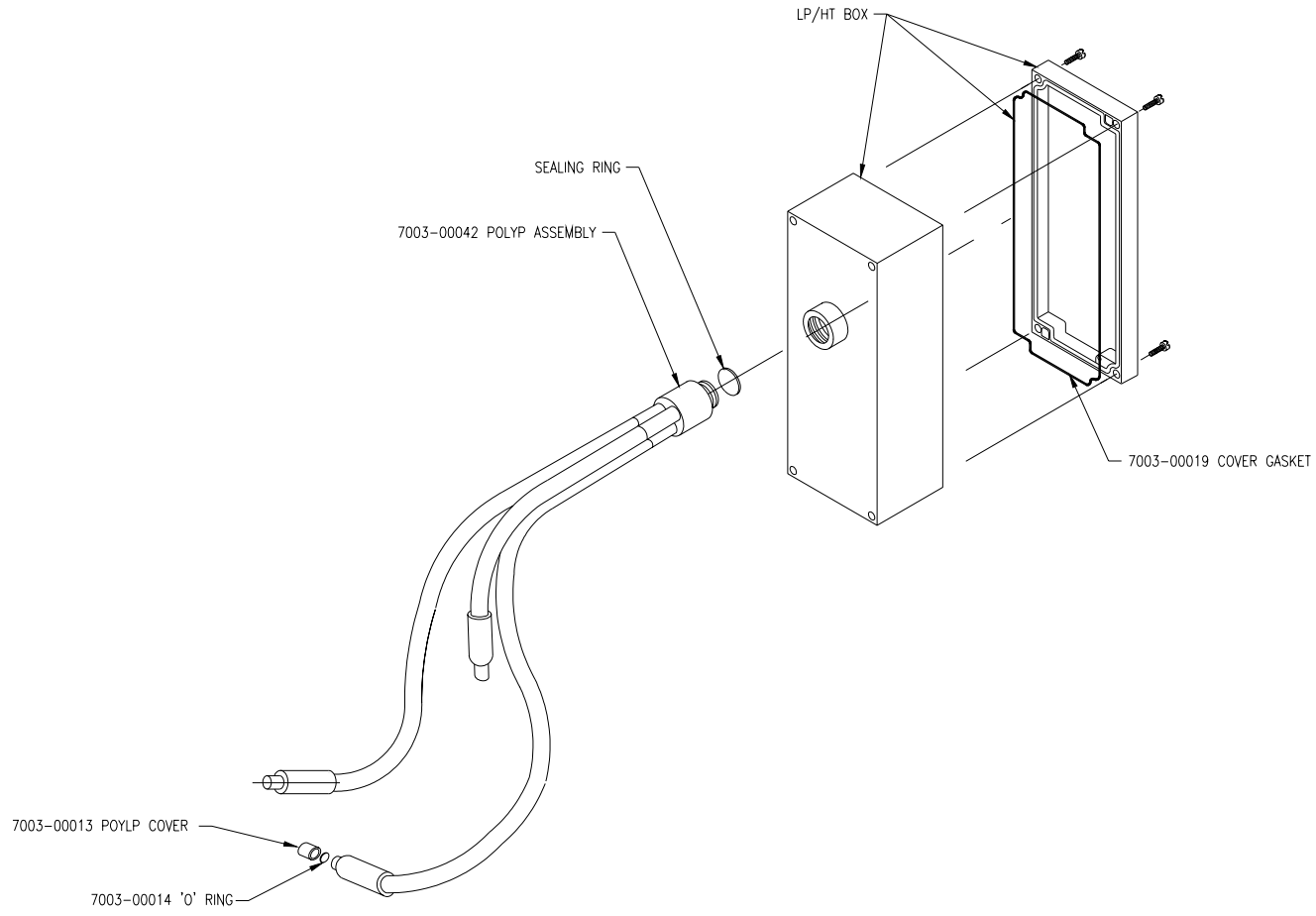
DWG 26-230 C-System Control Console Dimensions



CXC SYSTEM



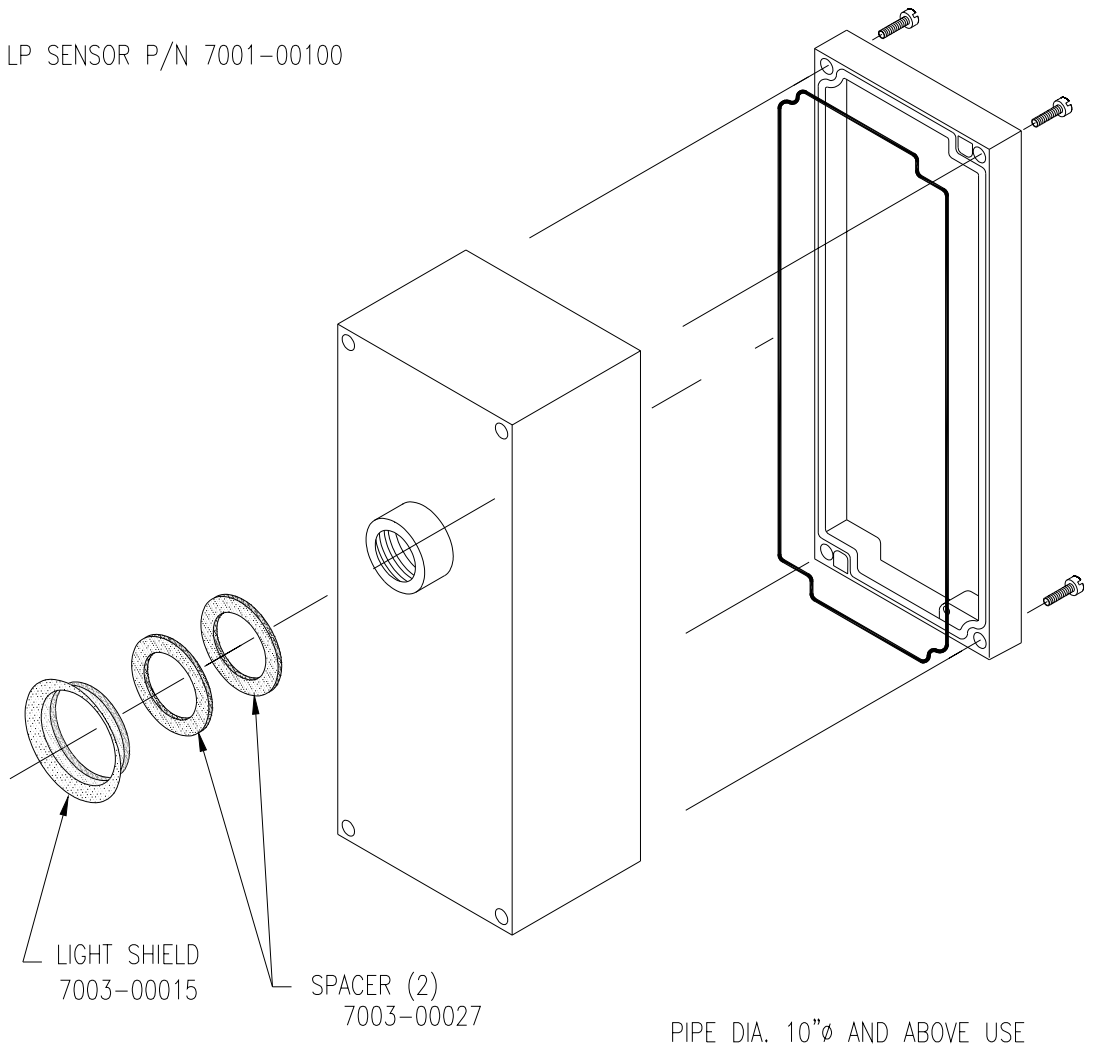
DWG 26-702 High Temperature/High Pressure Sensor (HT) With Polyp Assembly



PARTS LIST

ITEM	DESCRIPTION
7003-00001	BOX ASSEMBLY
7003-00010	SENSOR TO POLYP COUPLING
7003-00011	POLYP ASSEMBLY
7003-00012	POLYP SEAL
7003-00013	POLYP LENS COVER
7003-00014	LENS O-RING
7003-00019	COVER GASKET

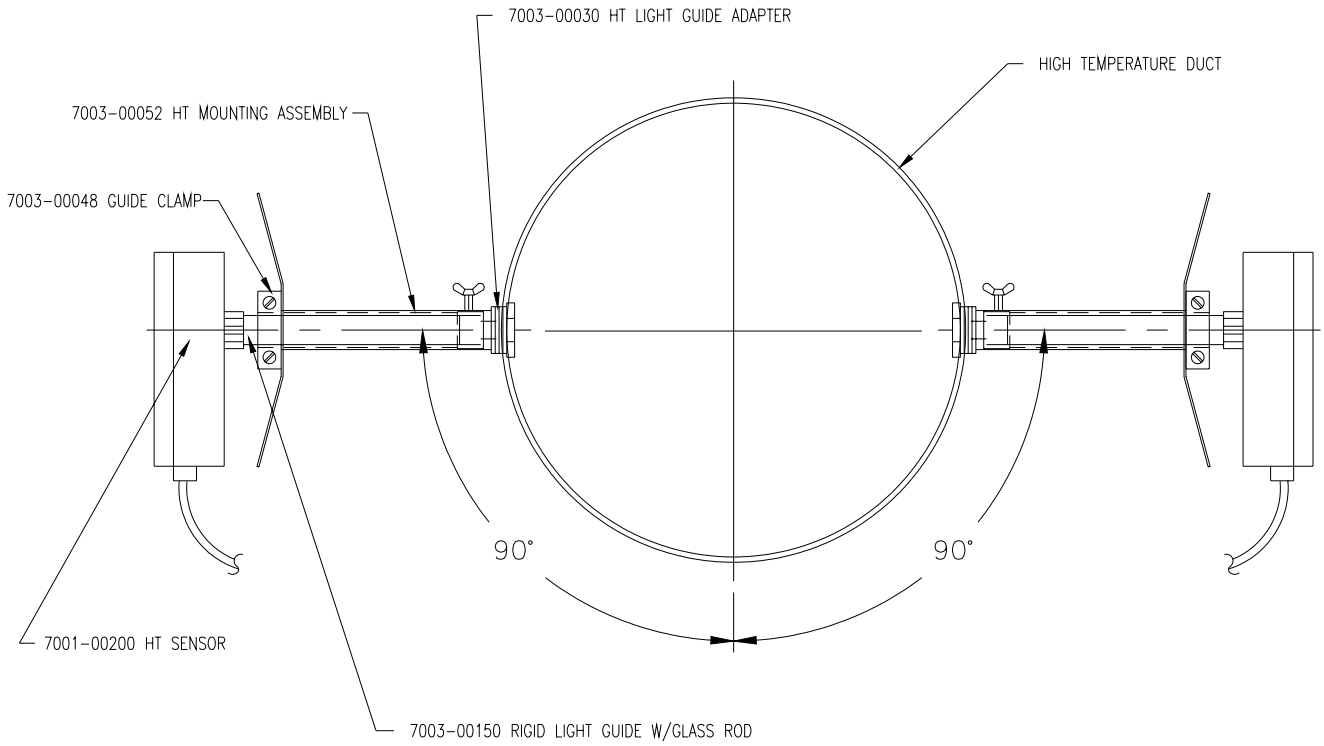
REFER TO PARTS LOCATION DRAWING #26-702



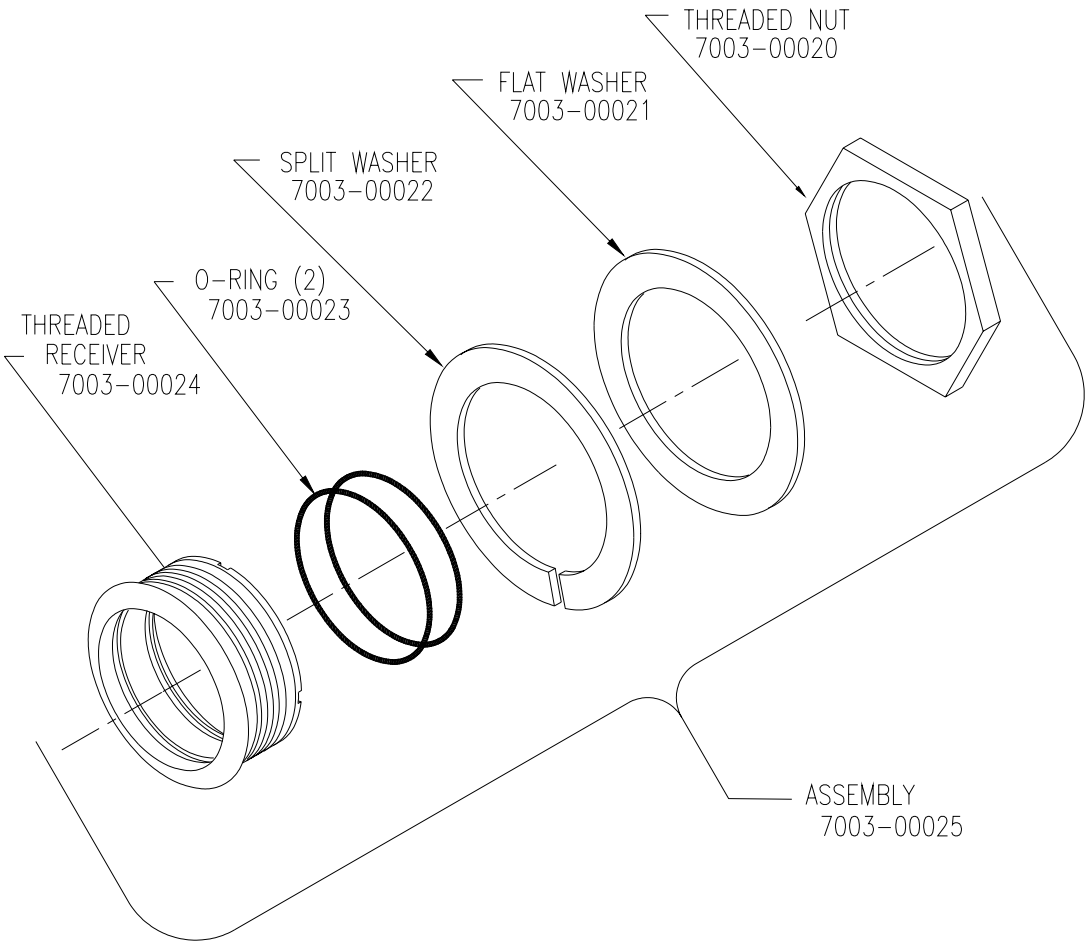
PIPE DIA. UNDER 10"ø
USE SENSOR MOUNTING BANDS
REF: DWG. NOS. 26-31 & 26-32

PIPE DIA. 10"ø AND ABOVE USE
SENSOR MOUNTING ADAPTER (SMA)
REF: DWG. 26-236 P/N 7003-00025

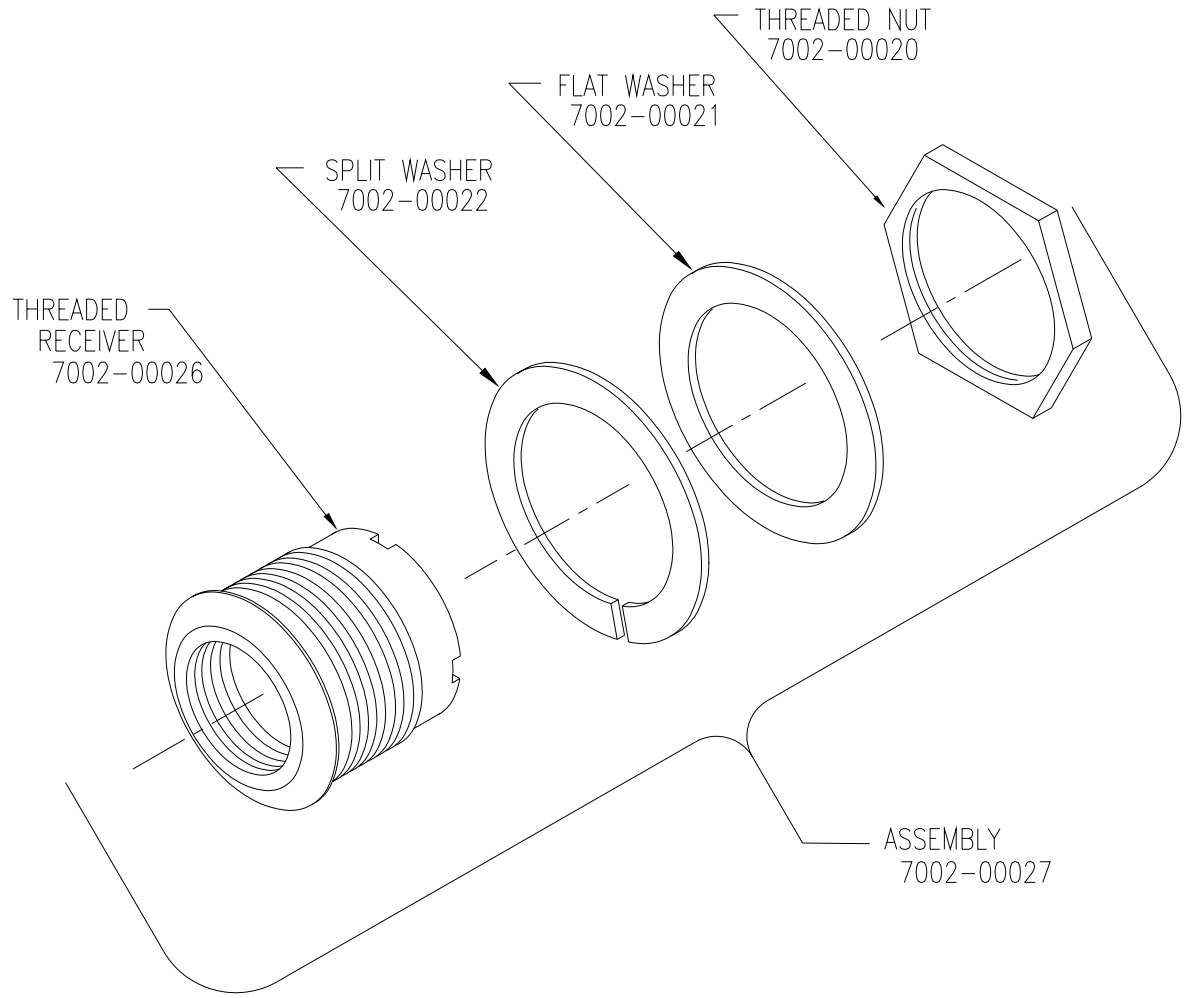
DWG 26-247 Light Guide Mounting High Temp. On Horizontal Pipe



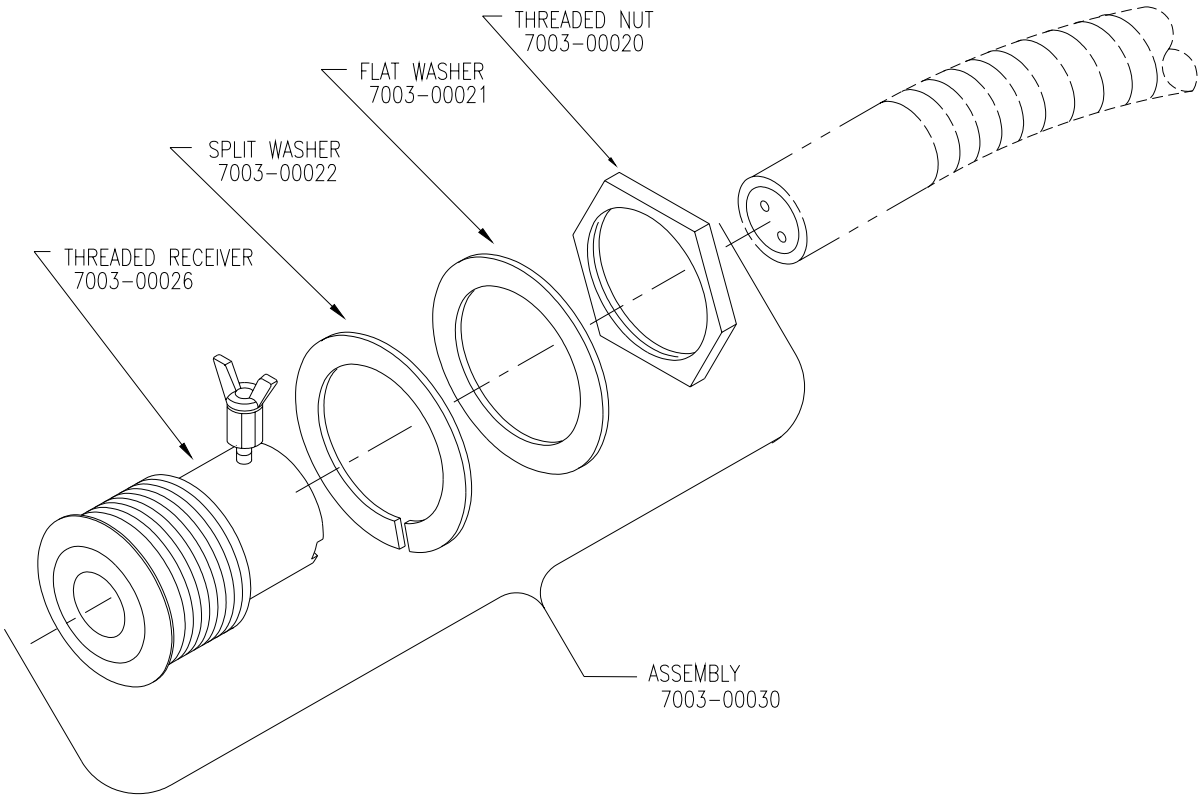
DWG 26-236 Sensor Mounting Adapter (SMA) Assembly



DWG 26-237 Nozzle Mounting Adapter (NMA) Assembly

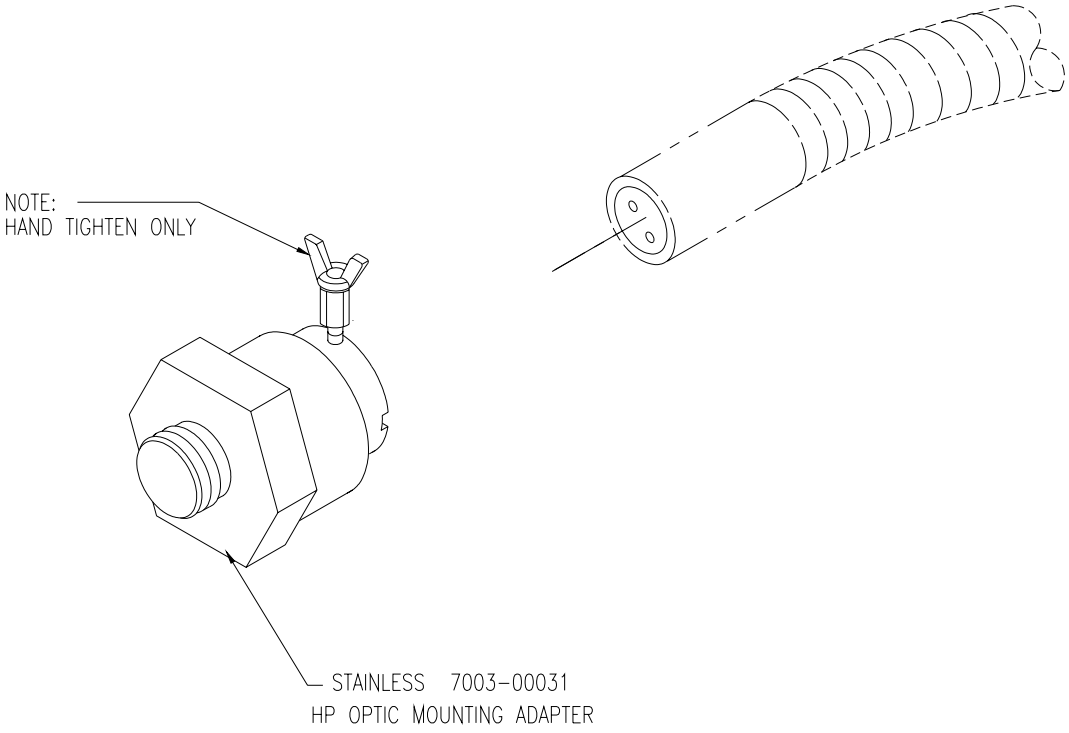


DWG 26-238 Polyp Mounting Adapter High Temperature Application

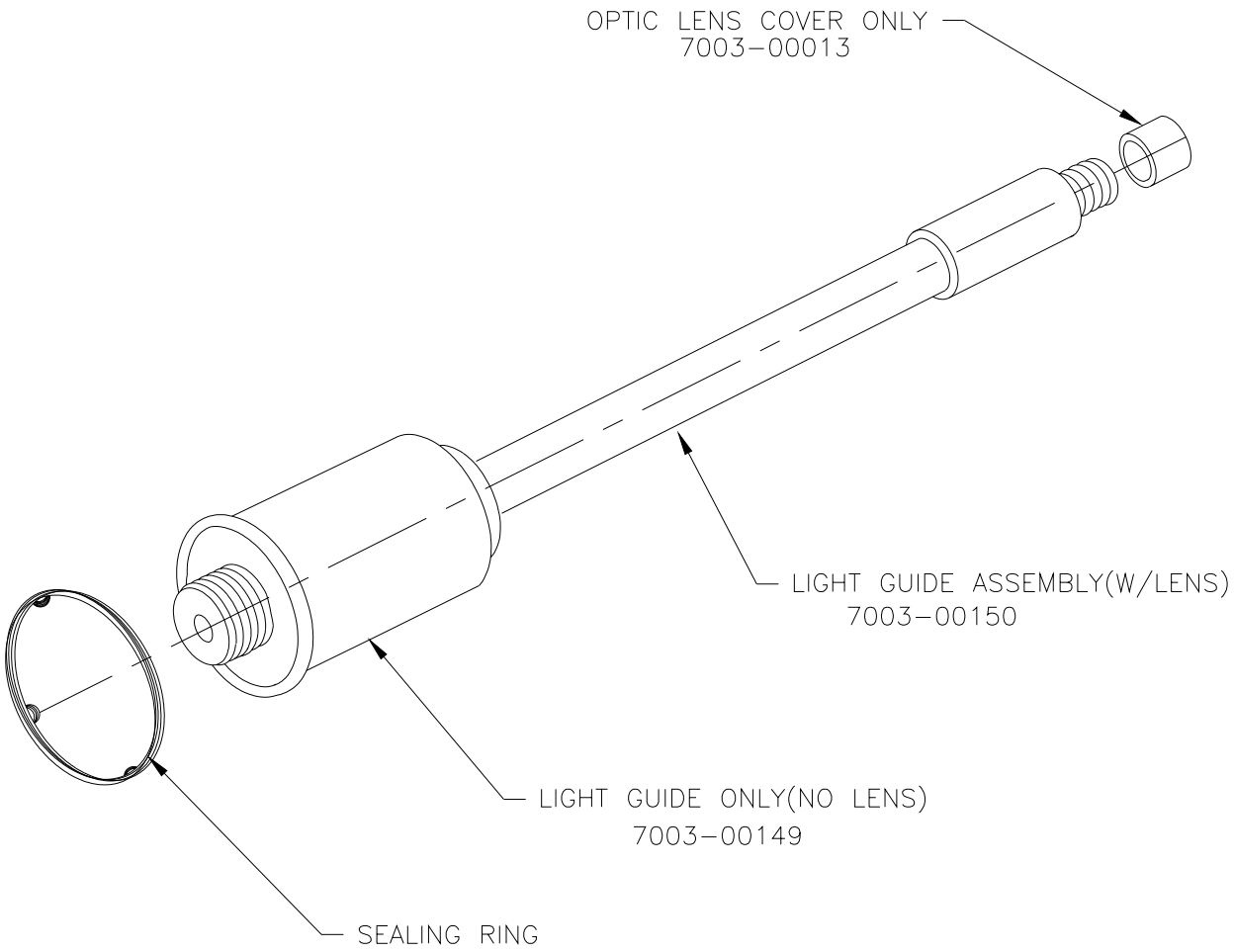


NOTE:
HAND TIGHTEN WING NUT BY HAND

DWG. 26-239 Polyp Mounting Adapter High Pressure Applications (PMA-HP)



DWG. 26-724 PyroGuard LIGHT GUIDE ASSEMBLY



Appendix

C-System EPROM Upgrade Procedure

1. Turn power off (switch located at left corner of inside lower panel.)

2. Disconnect AC power.

3. Locate the 28-pin IC chip in the center of the board. The chip will have either a sticker or a circular glass window on top.

4. Remove the chip by gently rocking it back and forth, taking care not to bend the pins. Exchange the old chip with your new chip, and place it in the supplied shipping container.

5. Install the new chip, making certain that the notched side of the chip is toward the top of the enclosure.

6. Reconnect AC power.

7. Turn power on.

8. Verify that system is functional.

9. Return old EPROM to Clarke's PyroGuard.

C-System Printer Installation and Maintenance

1. There are four terminals located behind the bottom access panel on the printer's enclosure. Two of these terminals are the 120V AC power wires labeled L1 and N.

2. The other two wires are the communication wire that must connect to the C-System. These wires are labeled 38 and 39 and connect to the C-System's terminals also labeled 38 and 39 respectively. Twisted pair wire is preferred if the printer is more than 50 ft. from the C-System. (*Note: Maximum distance is 3000 ft. from the C-System.)* **Do not run AC wire with communication wire in the same conduit.**

3. It is recommended to turn the C-System **ON** first before turning power **ON** at the printer.

4. The paper from the printer feeds into the open slot below the printer. It is recommended that the user check the printer every day and not to allow too much paper to accumulate into the slot behind the faceplate.

C-System Printer Operation

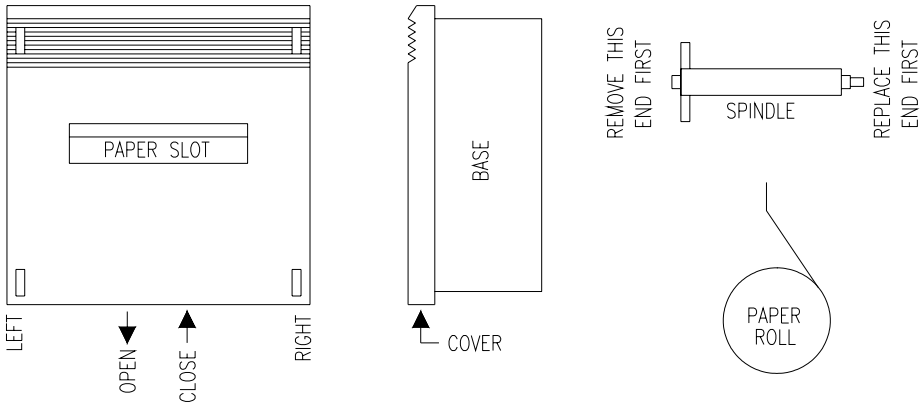
General Information:

The power switch turns the printer ON and OFF.
The paper feed button advances the printer paper.
The main fuse holder houses a 1A AGC fast fuse.

Printer Output:

AC POWER LOSS	(C-System has an AC power failure)
AC POWER REGAINED	(C-System has regained its AC power)
BATTERY TROUBLE	(C-System's on board batteries are low)
SENSOR # TROUBLE	(This particular sensor is open or shorted)
SENSOR # ALARM	(This particular sensor has seen sparks)
COUNTER OUTPUT	(Sensor has seen its set spark threshold)
VALVE # TROUBLE	(Valve circuit is open, shorted, or the valve is unexpectedly flowing water)
SENSOR # TESTED BAD	(This particular sensor has failed a manual test)
SENSOR # ALARM SENSOR # TESTED OK	(This particular sensor is able to see alarms and tested OK)

All printed events are followed by a Military Time and Date printout after the events have occurred. *(Note: this time and date must be programmed into the C-System.)*

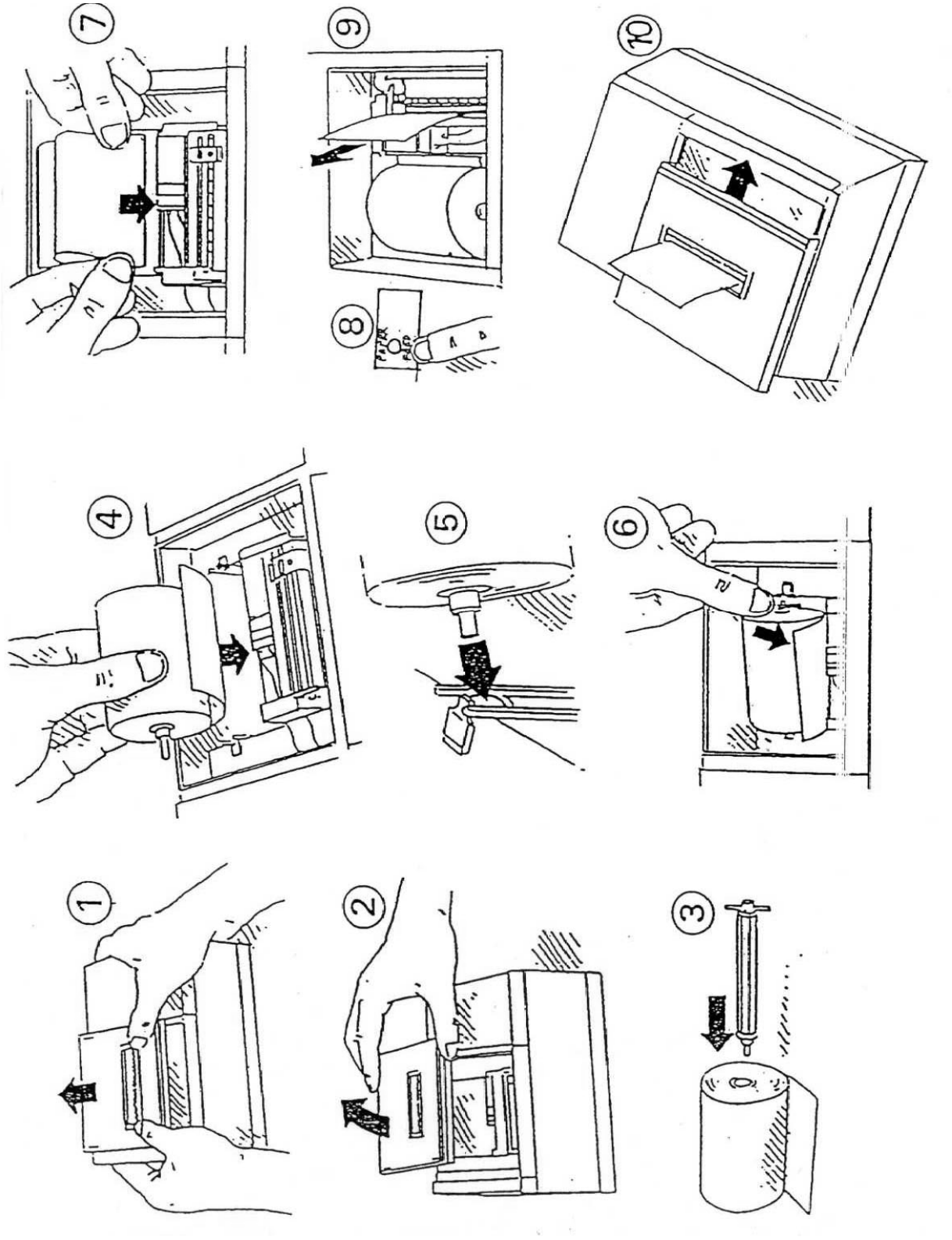


To Change The Paper Roll

1. Slide the cover in the direction marked ‘OPEN’ (it will only move a half inch)
2. Lift the cover off of the base.
3. Lift (rotational motion) the LEFT end of the paper spindle first then remove the spindle.
4. Insert the end of the new roll of paper into the paper slot of the printer mechanism with the paper coming off the roll at the bottom as shown.
5. Use the ‘PAPER FEED’ switch to advance paper(at least three inches should extend above the printer).
6. Place the spindle in the new paper roll with the two round shafts on the left end.
7. Insert the RIGHT end of the spindle in its holder first.
8. Snap the LEFT end of the spindle into position.
9. Feed the loose end of the paper through the paper slot and locate the cover flush with the base at the position one half inch from the top(see Step 1)
10. Slide the cover in the direction marked ‘CLOSE’ and snap into position.

To Change The Ribbon Cartridge

1. Remove the cover as described in steps 1 and 2 above.
2. Use the ‘PAPER FEED’ switch to advance paper (at least three inches should extend above the printer).
3. Press down on the left end of the ribbon (ribbon is marked ‘PUSH’).
4. Lift both ends to remove the old ribbon.
5. Turn the knob on the right end of the ribbon as needed to keep the ribbon tight while placing the new ribbon over the extended paper and snapping it down firmly into place.
6. Replace the cover as described in steps 9 and 10 above.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SETTING NEW STANDARDS OF EXCELLENCE IN SPARK DETECTION & SUPPRESSION

PyroGuard™

PLEASE NOTE THAT THESE INSTRUCTIONS ARE INTENDED FOR USE BY PERSONNEL HANDLING AND OPERATING THE EQUIPMENT.

IF ADDITIONAL COPIES OF THESE INSTRUCTIONS SHOULD BE REQUIRED, THEY MAY BE PURCHASED UPON REQUEST.

Clarke's® Sheet Metal, Inc.
660 Conger Street * P.O. BOX 2428
Eugene, Oregon USA 97402-0139
541-343-3395 * FAX 541-345-1447

WEBSITE: http://www.pyroguard.com
E-MAIL: quality@pyroguard.com

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660 Conger Street * P.O. BOX 2428
Eugene, Oregon USA 97402-0139
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10355 Linwood Avenue
Shreveport, Louisiana USA 71106-7911
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DETECTION & SUPPRESION SYSTEMS

Clarke's Sheet Metal, Inc. is here to help
You and offer technical assistance .