

# Clark·Reliance®

## Electro Eye-Hye System Installation and Maintenance Instructions

**NOTE:** This manual is intended for CE model systems **ONLY**.

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#### CAUTION !

*The Electro Eye-Hye System has mains voltages present when the source power is connected. Take care at all times when the enclosure is open and power is applied.*

*Potentially dangerous pressures and temperatures are present when the Electrolev unit is in service. Insure isolation valves are closed and all pressure containing parts are vented to safe levels prior to beginning work.*

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

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#### A.) Principle Of Operation

The Electro-Eye-Hye System utilizes the distinct electrical differences between water and steam to detect water presence. This is done by attaching a water chamber to a vessel (as a boiler steam drum) in which the water level is to be measured. The chamber will fill to the same level as the fluid in the main vessel.

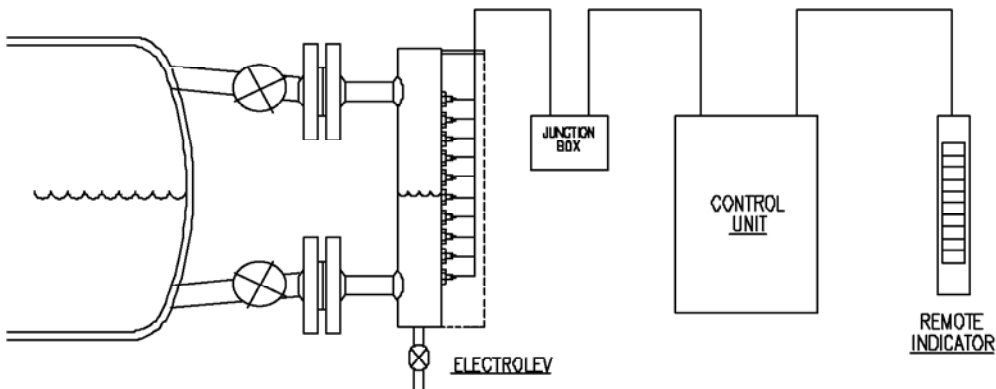
This water chamber, called the **Electrolev** column, is fitted with a series of conductivity probes along its vertical length. Each conductivity probe is electrically connected to a detection circuit housed within the control unit. As the water level immerses the conductivity probes a circuit path is formed through the water and sensed by the detection circuits. Conversely, conductivity probes above the water

level fail to provide an electrical circuit due to the relatively non-conductive properties of steam as compared to water.

The **Control Unit** contains the detection circuitry. As the detection circuits sense water presence, they operate control contacts within detector modules which provide indication and control functions.

The Eye-Hye System utilizes unique 'Multi-path' circuitry in which each conductivity probe is connected to its own dedicated detection circuit, control contacts and display drivers. Each circuit is enclosed in its own detector module housing. The power source for each detector module is individually fused to prevent the failure of any individual circuit from affecting other channels of the system. In addition to operational security, this provides for ease of maintenance, whereby a single channel can be repaired or replaced without needing to remove power from the entire system. A variety of supply power circuit arrangements are available to support the type and number of power sources the user requires.

Indication of the sensed water level is provided by lighted **Remote Indicators**. Two types are typically used: a single color vertical bank of lamps where a lighted red lamp indicates water and an unlit lamp indicates steam, or a bicolor display where a green lamp indicates water and a red lamp indicates steam. These indicators are typically placed at the control unit, feedwater or blowdown stations and in the control room.



**Fig. 1 EYE-HYE COMPONENTS & TYPICAL INSTALLATION**

#### B.) Components:

The Electro Eye-Hye System consists of three primary items, which are:

- 1.) The Electrolev water column and Conductivity Probes.
- 2.) The Control Unit containing the Electro Eye-Hye electronic circuits.
- 3.) The local and remote Indicator(s) (type and number may vary based on system requirements).

#### C.) Unpacking and Inspection:

Upon receipt of the Eye-Hye System examine the containers for damage. Report any suspicious conditions as soon as possible to your carrier to avoid acceptance of damaged goods. Clark-Reliance will not be responsible for goods damaged in shipping or storage, or subsequent loss or damage due to improper storage or exposure as a result of damage to shipping containers.

Verify all materials are present as recorded on the Packing List provided with each shipment. Report any discrepancies to Clark-Reliance immediately. Have the Clark-Reliance order number and shipping waybill available at time of calling.

#### D.) Installation

1. The **Electrolev** should be installed on the boiler drum or vessel, as shown in Fig. 1. The distance between the Electrolev and the boiler drum should be kept to a minimum. A slope in the steam leg running from the drum or vessel towards the Electrolev of not less than 1 inch of fall for each 50 inches of linear

length is recommended. The water leg should be installed with a downward slope running from the Electrolev to the drum or vessel. Care should be taken to insure no restriction or 'trap' occurs in the pipework which may lead to an accumulation of sediment, resulting in a restriction of flow to or from the Electrolev column. Isolation (Shut-off) valves should be installed to permit maintenance of the Electrolev while the vessel is pressurized. The standard vessel connections are 1" male pipe projections. Flanged or female socket weld connections are available options. A drain valve should be installed at the bottom of the Electrolev, as shown in Fig. 1. The standard drain connection on the Electrolev is 1/2" female socket-weld.

If the steam leg piping should be left exposed to encourage the formation of condensate flow to the Electrolev column (to promote heat transfer to minimize density related errors), it is recommended that shields or guards be fitted to reduce the risk of contact with hot surfaces. It is recommended that the water leg piping between the boiler drum and the Electrolev be insulated. Insulation will reduce the effects of cooling and will provide added personnel protection from hot piping. The Electrolev column may be insulated by field personnel, or with a Flexpak insulation jacket available from Clark-Reliance.

2. The **Control Unit** is provided in a variety of enclosures. Standard ECIL-\*\*R model Control Units may be mounted up to 1000 feet away from the electrolev. The Control Unit should be mounted in an area that is accessible for inspection and below 125° F. Refer to the dimensional drawings specific to the materials ordered for mounting dimensions. Refer to Fig. 2 for the recommended conduit knock-outs for wire entry / exit.

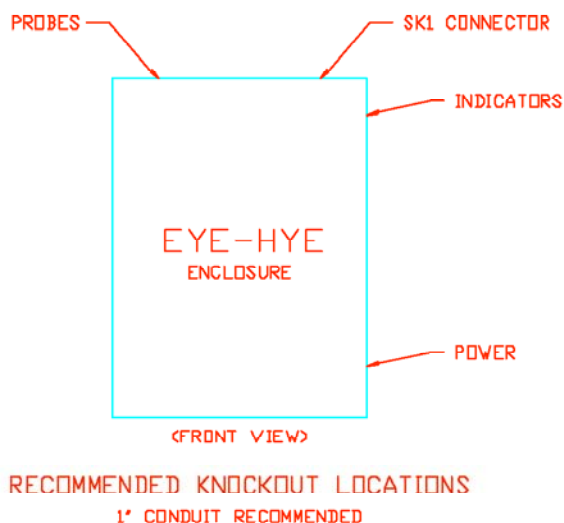


Fig. 2

3. The **Remote Indicator(s)** should be mounted for ease of viewing by the operator in accordance with operational considerations and applicable codes. There is no practical distance limitation between the Control Unit and the Remote Indicator. All Remote Indicators are designed for panel mounting. Weatherproof enclosures are available for outdoor installations. Wall mounting brackets are also available from Clark-Reliance. Refer to dimensional drawings of specific products for panel cutouts and mounting dimensions.

#### E.) Interconnecting wiring:

1. Field Wiring from the Electrolev is terminated in the Control Unit at connector SK3. Connections should be made as illustrated on the field wiring diagrams provided for the specific equipment ordered. The Electrolev is furnished with a 30" length of high temperature wire leads exiting from the conduit connection. Longer leads are available as an option and may have been furnished on request.

Model \_\_\_\_\_

Wire Specifications \_\_\_\_\_

EL450, EL1000	18 GA. Stranded Teflon insulated conductors rated at 300 VAC and 200°C / 392°F (Belden #83029, Alpha #5857, or equal)
EL1800, ELF3000	18 GA. Stranded Teflon-treated glass braided rated at 300 VAC and 400°C / 752°F Nickel coated copper conductor UL #5182 (Radix #MGT-4503, or equal)

**High temperature probe to junction box wire specification**

The high temperature probe wires should be routed to the Control Unit or a junction box (furnished by C-R, when specified).

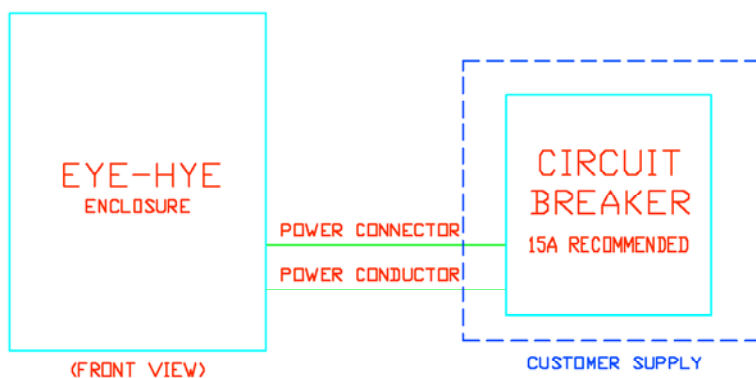
Low temperature Multi-conductor cable may be routed from the junction box to the Control Unit. The number of required conductors is equal to the number of conductivity probes, plus one for the common connection. For example a twelve probe Electrolev would require 13 conductors. (note: for increased reliability a termination for a redundant common wire to the Electrolev is provided at the Control Unit. An additional conductor would be needed if this feature is employed.)

<u>Model</u>	<u>Wire Specifications</u>
EL450, EL1000, EL1800, ELF3000	18 GA. Stranded (Tinned Copper) PVC insulated, rated at 300 VAC and 60°C / 140° F (Belden #8468 or equal).

**Junction box to control unit wire specification**

2. The power connection to the Control Unit is suitable for 12 to 20 GA. wire. The power terminals provide for single or dual power source connections. For single power source, connect AC power to the terminal block denoted P1 and C1 (Power 1 and Common 1). For split power source operation where one of two sources supply power to the odd or even channels, remove on board jumpers J1 & J2 and connect source #1 to the terminal block P1 and C1 and connect source #2 to the terminal block P2 and C2 (Power 2 and Common 2).

Whether the input power in a single or dual source, it should be routed through an external disconnecting device. The disconnecting device is usually a circuit breaker. The recommended limit of the circuit breaker should be 15 A. Refer to Fig. 3 for a wiring block diagram.



**RECOMMENDED POWER DISCONNECT WIRING**

Fig. 3

3. Between the Control Unit and the Remote Indicator(s) the number of conductors required for a Remote Indicator equal the total number lamps plus one for a common conductor. For example, an MTI-12B Remote Bicolor Indicator has 12 red lamps, 12 green lamps, and one common. Therefore, 25 conductors are required. Connections for Remote Indicators are made at SK1 terminals 1 to 39. Refer to the Remote Indicator field wiring diagram furnished with the system for connections relating to the equipment supplied. Indicators may be wired in parallel, for multiple indicator installations. All Remote Indicators are powered with 24 VAC from the Control Unit

<u>Model</u>	<u>Wire Specifications</u>
All :STI, MTI & SMI models	18 GA. Stranded (Tinned Copper) PVC insulated, rated at 300 VAC and 60°C / 140° F (Belden #8468 or equal).

Remote Indicator wire specification

4. Alarm and trip wiring is provided at SK2 terminals 1 to 36. A single form "C" contact is provided for generation of control and alarm functions for each channel. Inter-connections between multiple channels can be made for various fail-safe or voting logic methods. Additional alarm and trip contacts can be obtained by using the contacts associated with the Remote Indicator circuits when no Remote Indicator is employed. *Insure that jumpers J4 through J15 are removed before using remote display driver circuits for alarm or trip functions.* Refer to the specific equipment assembly drawings provided with your system for further information on this feature. (Note: consult Clark-Reliance prior to using this feature).

F.) System Options

(Note: Refer to fig. 5 for location of system components.)

1. The **Flexpak Insulation** jacket provides a flexible insulation wrap for the Electrolev Column. This reduces heat loss and protects against accidental contact with hot surfaces on the Electrolev. The Flexpak can be specified with the original order, or ordered to retrofit an existing system. Flexpak jackets are designed for easy removal or installation with Velcro fasteners. When ordering for retrofit applications specify the serial number of the existing Electrolev. This information is located on the nameplate which is attached to the probe housing. The serial number will enable Clark-Reliance personnel to specify properly the Flexpack jacket for your application.

2. The **Fault Detector** board (part # ECID-69/70) provides self diagnostic functions for the Eye-Hye Control Unit. This board plugs in by use of a ribbon connector to PL 2 on the main board and is mounted on the system's option DIN rail. AC power is connected at TB1 and can be connected to main board power at SK 4 or an independent AC source circuit based on design considerations. The microprocessor based unit performs full time examination of the Eye-Hye system to identify and provide alarm outputs for failures in the probe detection or power system. This checking is done completely separate from measurement and control functions. Unlike systems that use the same circuitry for measurement and fault detection, the Eye-Hye system is secure from "common-mode" circuit failures. A circuit failure in the control portion or the fault detection portion of the Eye-Hye will not go undetected or cause additional failures in the opposite circuits.

The Fault Detector board provides an integral slidewire analog output which is automatically ranged to 100% of the level measured in the Electrolev. The slidewire output is provided at TB 2. Consult option schematics for connection details.

3. The **System Exerciser** Box (part # ECID-71) is a set of toggle switches which provides a simulated electrode input to the Control Unit. The box is plugged into mainboard connector PL 1. With the Electrolev column drained or electrically isolated by removing connector SK 3, the switches on the System Exerciser Box can be toggled to simulate steam or water states, facilitating system checkout or analog calibrations.

### G. Startup and Operational Checks:

**CAUTION !** *The Electro Eye-Hye System has mains voltages present when the source power is connected. Take care at all times when the enclosure is open and power is applied.*

### H. Maintenance

#### 1. **Cleaning:**

Blow down of the Electrolev column should be performed as needed to clear any accumulations of debris in the column and pipework. Blow down should be conducted weekly or less frequently, based upon water quality. Blow down is performed correctly by closing the water valve and slowly opening the drain valve for approximately 15-30 seconds. A brief blow down is sufficient. Excessive blow down may shorten the life of the probes.

#### 2. **Probe Replacements:**

When replacing conductivity probes, coat threads lightly and uniformly with a high temperature anti seize type compound such as 'Never-Seize', MolyCote G, or Fel-Pro C.

Torque T, V, & Z probes to 40 Ft - Lb. (54 Newton-Meters).

Torque F probes to 90 Ft - Lb. (122 Newton-Meters).

### I. Environment

The Eye Hye Control Unit does not exhibit any environmental hazards. On initial warm-up, the Electrolev may leak at the conductivity probes. Any leakage may be in the form of water, steam, rust, and or any additive the customer may condition the boiler water in the tank.

Always install a new sealing gasket when replacing probes as follows:

(Each replacement probe is supplied with 4 gaskets)

<u>Probe</u>	<u>Gasket Part No.</u>
T	WCM-13
V	X175500 (Formerly E10-10)
Z	E10-10S
F	E10-10S

#### Replacement Gasket Reference Chart

Control Units require no maintenance. Test switches may be activated at any time.

The standard type (STI Series) Indicators utilize 30 volt incandescent lamps, C-R part no. LI2-5B. Indicators that are of the sub-miniature or miniature models employ LED's and contain no replacement parts.

**Electrolev Commissioning:** Initial warm-up of the Electrolev column should be done gradually. To do this, keep the water valve closed, open the drain valve widely, and crack open the steam valve for a few minutes. Then, close the drain valve, and slowly open the steam and water valves fully. Check for any leakage at the conductivity probes.

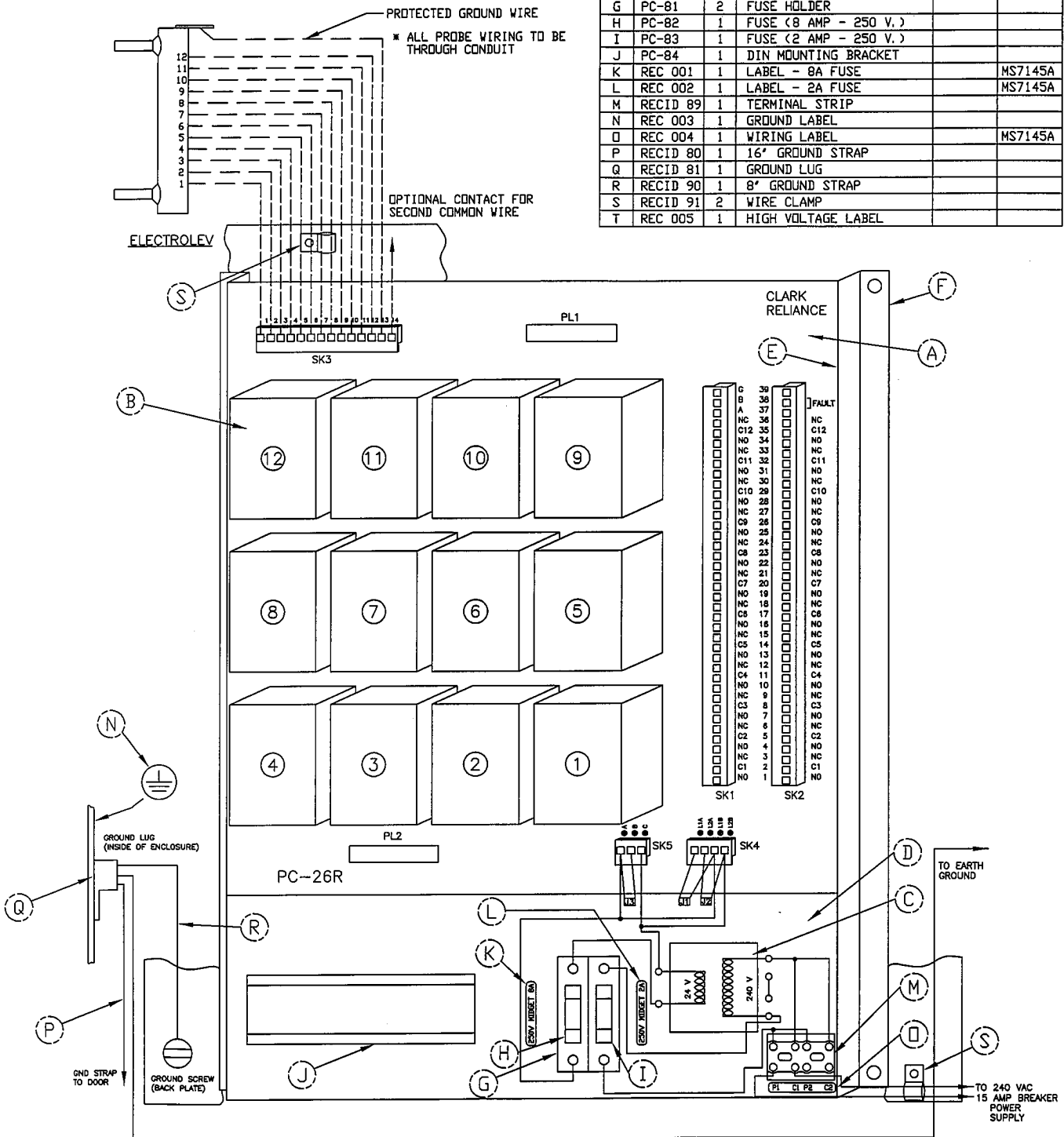
Hot-torquing is recommended on all installations. After initial warm-up, the Electrolev column should be isolated and the drain valve opened. After insuring the column is drained and pressure relieved, re-torque T, V, or Z probes to 40 Ft Lb., (54 Newton-Meters) and F probes to 90 Ft Lb. (122 Newton-Meters) After torquing is complete, close the drain valve and return the Electrolev to service. Hot-torquing of the conductivity probes insures proper sealing and extends the sealing gasket life.

**Control Unit and Remote Indicators:** Verify all wiring is in accordance with drawings for the specific model Electro Eye-Hye and any installed options purchased. Remove the two tubular glass fuses at the power transformer and apply source power to the system. Verify AC source power is within specifications. Verify transformer output between source side of 8 amp fuse and SK 5 terminal "C" is between 24 and 32 VAC. Remove source power and install fuses. Re-apply power and observe the system is energized at the Local (if supplied) and Remote Indicators. Isolate the Control Unit from the Electrolev by removing SK 3 from the main board mating plug. By using the optional System Exerciser Box (see instructions provided with unit) or individually shorting between SK 3 terminal 13 and each of the terminals 1 through 12 in sequence verify a change of the detector status from steam to water by the illumination of the internal red LED within each of the detector modules and an indication of water on any Local and Remote Indicators. Remove all jumpers or System Exerciser Box and re-connect SK 3. Verify all indications agree with water level in the Electrolev.

**CONTROL UNIT ASSEMBLY**

NOTE: ENCLOSURE NOT SHOWN  
 FOR NEMA 1 USE PART NO. ECIE-1 DWG NO EC7149-A  
 FOR NEMA 4 USE PART NO. ECIE-4 DWG NO EC7150-A  
 FOR NEMA 4X USE PART NO. RA24H1608SSLP


BILL OF MATERIAL				
ITEM	PART NO.	QTY.	DESCRIPTION	MATERIAL DWG. NO.
A	PC-26R	1	PRINTED CIRCUIT BOARD	EC7399-B
B	ECID-29R	12	RELAY	
C	PH75PG	1	TRANSFORMER	
D	PC-91	1	TRANSFORMER PANEL	18 GA. S.S. EC7684-A
E	PC-33L	1	SUPPORT BRACKET	18 GA. S.S. EC7155-A
F	PC-33R	1	SUPPORT BRACKET	18 GA. S.S. EC7155-A
G	PC-81	2	FUSE HOLDER	
H	PC-82	1	FUSE (8 AMP - 250 V.)	
I	PC-83	1	FUSE (2 AMP - 250 V.)	
J	PC-84	1	DIN MOUNTING BRACKET	
K	REC 001	1	LABEL - 8A FUSE	MS7145A
L	REC 002	1	LABEL - 2A FUSE	MS7145A
M	RECID 89	1	TERMINAL STRIP	
N	REC 003	1	GROUND LABEL	
O	REC 004	1	WIRING LABEL	MS7145A
P	RECID 80	1	16' GROUND STRAP	
Q	RECID 81	1	GROUND LUG	
R	RECID 90	1	8' GROUND STRAP	
S	RECID 91	2	WIRE CLAMP	
T	REC 005	1	HIGH VOLTAGE LABEL	



NOTE: PLACE ITEM ① ON OUTSIDE OF ENCLOSURE DOOR.

2	7/14/10	REDRAWN ON NEW FORMAT	ST
REV	DATE	CHANGE	BY

MANUFACTURED BY



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 STRONGSVILLE, OH 44149 USA  
 PH: 440-572-1500  
 WEB: www.clarkreliance.com

**CLARK-RELIANCE®**

ECIL-12R-24V  
 CONTROL UNIT (CE)

DRAWN: ST

CHECKED:

DATE: 7/14/10

REVISION:

DRAWING NO.: EC1974-A

REV.: 2



<u>Symptom</u>	<u>Probable Cause</u>	<u>Corrective Action</u>
1. Indicator Lamp illuminated above level, or remains on during blow-down	1 A) Failed/Short-circuited probe	1 A) Remove probe and clean if contaminated, or replace if leakage is detected.
	1 B) Shorted/Open circuit in field wiring	2 B) Check all wires and connections for short circuits and proper connections
2. Indicator lamp out at any level	2. A) Single Lamp failure on STI Series indicator	2 A) Replace lamp P/N: LI2-5B
	2 B) All Indicators not illuminated due to power out or loss of signal or ground wire.	2 B) check 8 amp fuse on power panel in control unit. Verify all wiring and terminations.
	2 C) Single LED not illuminated on models with LED indicators, problem is either failed LED, faulty detector module or wiring problem.	2 C) Replace detector module. Verify all wiring and terminations. Replace remote display (unit is not field repairable)
3. Control circuits inoperative	3 A) faulty detector module or open wiring circuit	3 A) Replace detector module. Verify all wiring connections.

**NOTICE:** If this equipment is used in a matter not specified by the manufacturer, the protection provided by the equipment may be impaired.

#### K. Electrical Specifications

**Enclosure Design:** NEMA 1 (standard)  
NEMA 4, 4X & 7 (optional)

**Temperature Rating:** -40 to +125°F / -40 to 52°C

**Supply Voltage:** 240 VAC 50/60 HZ 60 W

**Contact Design:** DPDT (2 form C)

**Contact Voltage Ratings:** 30 VAC, 42.4 VDC

**Contact Current Ratings:** 8 A at 150 VA

**Contact Life:** Mechanical - 5 million operation Electrical - 100,000 operations min. at full load.

**Probe Circuit Current:** 1.5 mA @ 12 VAC per probe.

**Sensitivity:** 50,000 Ohms

**Listing:** Factory Mutual #2N2A4.AF, CSA # LR14001, and UL listed Detector Modules

**L. System Component Supply Current:**

<u>Part #</u>	<u>Component</u>	Current @ 120 VAC	Current @ 240 VAC
ECIL-10R	Control Unit	.37 A	.19 A
ECIL-12R	Control Unit	.44 A	.22 A
ECIL-20R	Control Unit	.74 A	.37 A
SMI-10BR	Sub-Miniature Indicator	.04 A	.02 A
SMI-12BR	Sub-Miniature Indicator	.04 A	.02 A
SMI-20BR	Sub-Miniature Indicator	.06 A	.03 A
MTI-10	Miniature Indicator	.09 A	.05 A
MTI-12	Miniature Indicator	.10 A	.05 A
MTI-20	Miniature Indicator	.18 A	.09 A
MTI-10B	Miniature Indicator	.09 A	.05 A
MTI-12B	Miniature Indicator	.10 A	.05 A
MTI-20B	Miniature Indicator	.18 A	.09 A
STI-10	Standard Indicator	.38 A	.19 A
STI-12	Standard Indicator	.45 A	.23 A
STI-20	Standard Indicator	.76 A	.38 A

Consult the factory or your local Clark-Reliance Representative with any questions. Technical questions can be promptly answered, if the caller provides the system serial number (Example EE - \_ \_ \_ \_ \_ ) or the drawing numbers.

**Clark-Reliance Corp.**  
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