Clark·Reliance®
Electro Eye-Hye System
Installation and Maintenance Instructions

Table of Contents

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.

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Form 539CR1 Rev 10/98

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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.

Optional circuits for fault detection, analog outputs, fail safe, or redundant power distribution and latching pump control are also available.

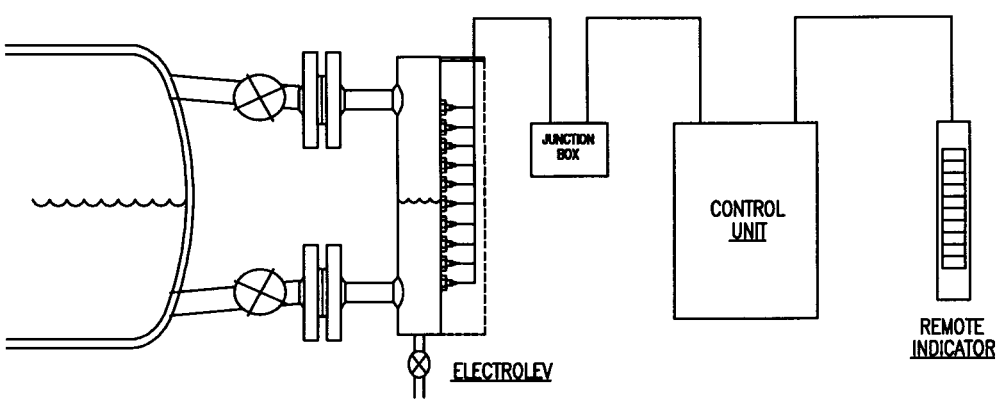

Fig. 1 EYE-HYE COMPONENTS & TYPICAL INSTALLATION

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. If a slope in the steam leg is run from the drum or vessel towards the Electrolev, there should be 1 inch of fall for each 50 inches of linear length. The water leg should be installed with a downward slope running from the Electrolev to the drum or vessel. A slope in the steam piping is recommended for systems operating above 1800 PSI. 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 enhance heat transfer and 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 steam and 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 150° F. Refer to the dimensional drawings specific to the materials ordered for mounting dimensions.

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.)

Model	Wire Specifications
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. Connect AC power source to SK4 L1A & L2A for single power source operation or when using the Power Source Diverter option. 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 SK4 L1A & L2A and source #2 to SK4 L1B & L2B.

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.

Model	Wire Specifications
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 Contacts are rated at 5 Amp @ 120/240 VAC or 1 Amp @ 120 VDC., 5 Amp @ 30 VDC. 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. **Test Switch Circuits** are provided to enable operators / users to test indicator lamps and all relay circuits On ECIL-**R models the test function is performed with an accessory printed circuit board attached to the PL 1 connector on the main control board. This board is field wired to a momentary normally open push button. The push button is furnished in a weather resistant enclosure for convenient mounting. 18 Ga. wire is sufficient for Test Switch interwiring. Refer to actual wiring diagrams for more details.

3. Models PSD-120 (for 120 VAC models) and PSD-240 (for 240 VAC models) **Power Supply Diverters** are designed to provide for continued operation of the Electro Eye-Hye with no loss of performance even in the event of the loss of a main power source. The primary source (A) will power the entire system under normal operating conditions. In the event of a power failure, the PSD diverts the power to the secondary source (B), and continues to power the system. When source (A) is restored, the PSD automatically switches back to source (A). A typical installation is illustrated in Fig. 2 below.

NOTE: Drawing shown is for 120 VAC models. For 240 VAC models consult factory provided drawings.

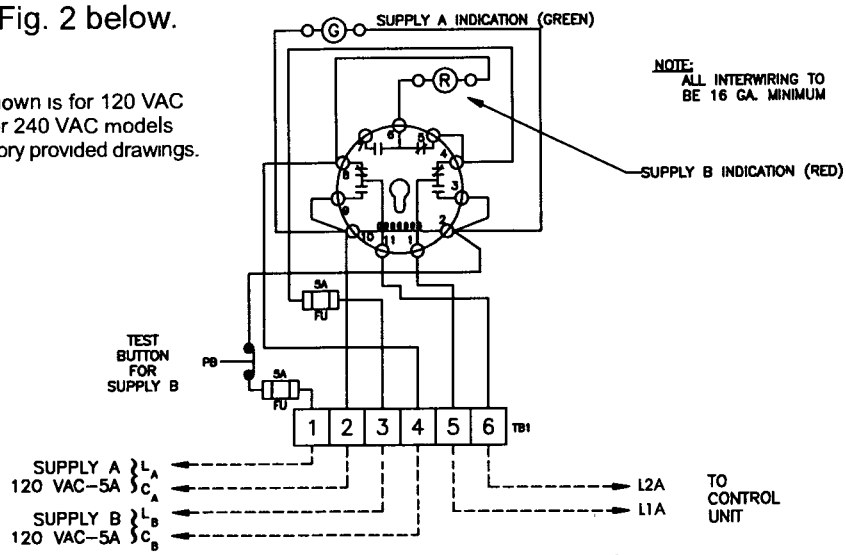

Fig. 2 Power Supply Diverter Wiring

4. 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.

5. 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.

6. The purpose of **Dead Band Relays** is to allow the user to enable an alarm or control function to be "turned on" at one level and to be "turned off" at another level. When dead band relays are specified, the Control Unit will be furnished with two additional relays, and all auxiliary contacts wired to terminal blocks. The Dead Band Relays will be identified on the Control Unit diagram as D.L. (Dead Low) and D.H. (Dead High). They will be as illustrated below in Fig. 3.

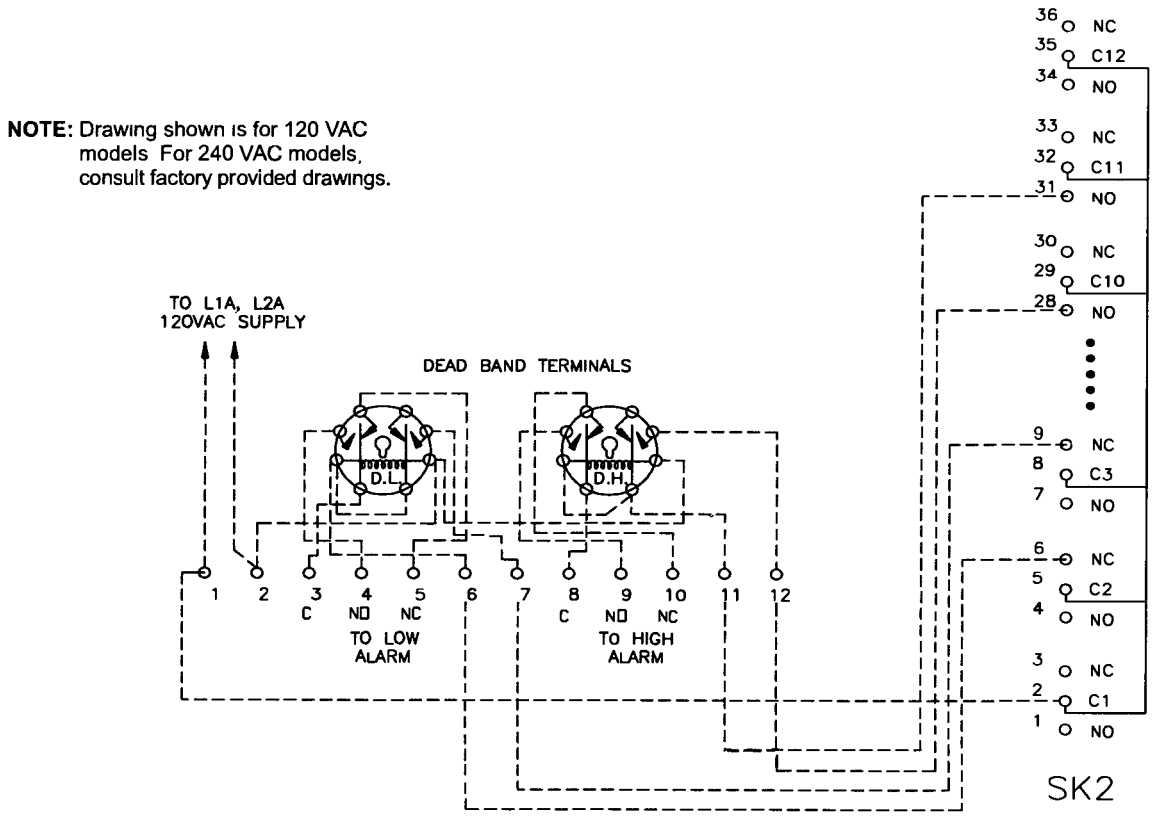

Fig. 3 Dead Band Wiring

The above example is wired to illustrate a high alarm when the water reaches the 11th probe, and will de-energize the alarm when the water drops below the 10th probe. The low alarm will be energized when the water drops below probe #2 and will remain energized until the level rises to the probe #3. The user may select a broader range between actuation levels to suit the operation.

7. The **4-20 mA Output Transmitter** (part # RPC-27) has been pre-wired at the factory to provide a digital signal output. This signal corresponds to the level in the Electrolev column. The output has been adjusted to provide equal increments of change between input levels

The transmitter PC board has been designed with 21 field adjustable potentiometers (see Fig. 4). One potentiometer has been provided to fine tune the 4-mA output with no level in the electrolev (1). The remaining 20 potentiometers are numbered from 1 to 20. They correspond to the conductivity probes in sequence

from the lowest to the uppermost (2). For example , if a 10 probe system is employed, then potentiometers #1 through #10 will be used.

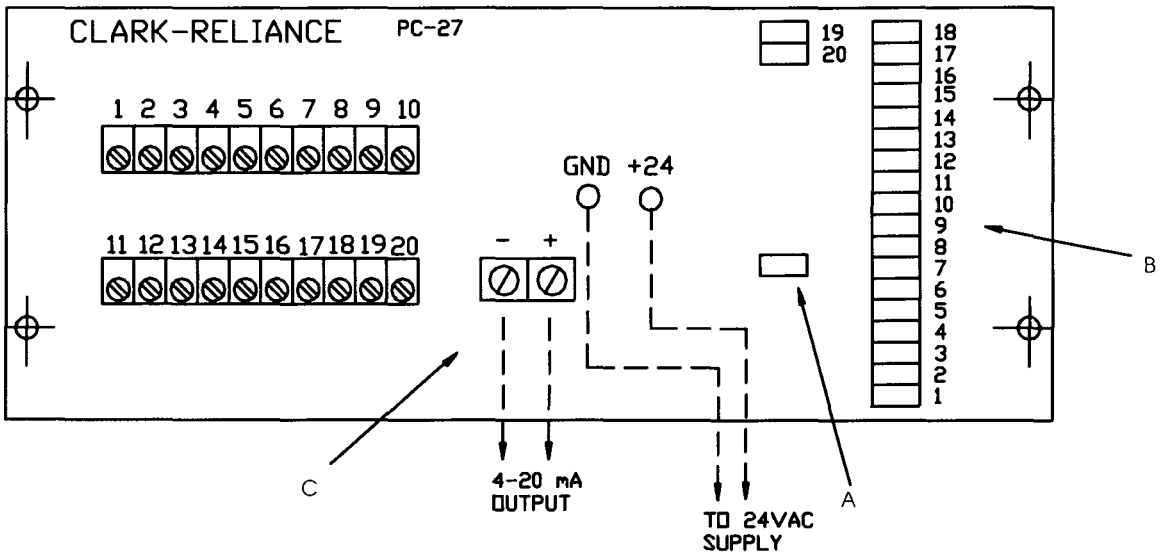

Fig. 4 4-20mA Output P-C Board

The adjustment procedure is as follows:

1. Isolate the power supply from the control unit.
2. Valve out and drain the Electrolev.
3. Verify all the Probe leads from the Control Unit to the Electrolev.
4. Attach an ammeter to the signal output terminals (C) in proper polarity.
5. Return the power supply to the control unit. At this time, no relays will be energized.
6. Adjust the potentiometer in the center (A) to obtain 4 mA on the meter.
7. Turn off power supply.
8. Add a jumper wire from Electrolev probe #1 terminal to the Electrolev common This will cause relay #1 to energize.
9. Restore power and adjust #1 potentiometer to desired output level.
10. Remove power and add next jumper from Electrolev Probe #1 to Probe #2.
11. Restore power and adjust #2 potentiometer to desired level.
12. Repeat the procedure used on probes #1 and #2 for each remaining probe, and adjust output levels until complete.
13. With power off remove all jumpers.
14. Return unit to service.

G. Startup and Operational Checks:

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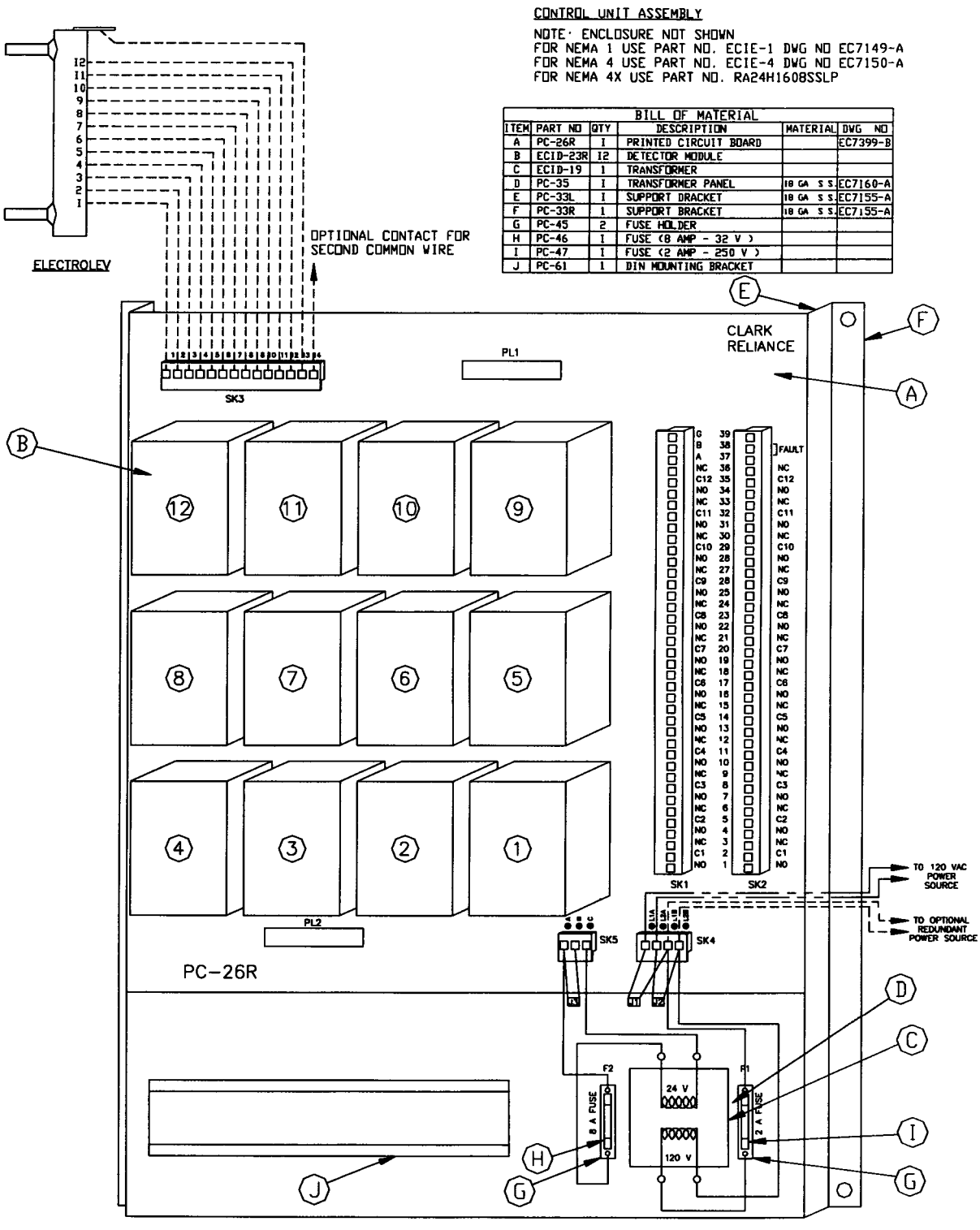

Fig. 5 Typical Control unit component arrangement (ECIL12R shown)

NOTE: Drawing shown is for 120 VAC models. For 240 VAC models, consult factory provided drawings

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.

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).

Always install a new sealing gasket when replacing probes as follows:
(Each replacement probe is supplied with 4 gaskets)

Probe	Gasket Part No.
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 models employ integral LED's and contain no replacement parts. Miniature models are designed with red only LED's (Part No. MI-52), or Red/Green LED's (Part No. MI-51).

I. Trouble - Shooting Guide

Symptom	Probable Cause	Corrective Action
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.

J. Electrical Specifications

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

Temperature Rating: -40 to +150°F / -40 to 65°C

Supply Voltage: 120 VAC 50/60 HZ (standard) 240 VAC 50/60 HZ (option)

Supply Current: 4.4 VA

Contact Design: DPDT (2 form C)

Contact Ratings: 5A @ 120, 240 VAC, 5A. @ 30 VDC., and 1A. @ 120 VDC.

Contact Life: Mechanical - 5 million operations 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

K. System Component Supply Current:

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

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.

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Clark·Reliance®

Notice to Plant Operators

The use of non-Original Equipment Manufacturer parts (such as glass, gaskets, probes, modules, etc.) will void the Agency Approval (FM, UL, CSA, CRN, ABS, etc.), pressure/temperature rating, and warranty of this equipment. Clark-Reliance requires the use of OEM parts for all repairs on this product in order to maintain plant and personnel safety, and reliable operation.

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Critical spare parts for overnight delivery, direct from the manufacturer.

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Steel Valve Repair Kit

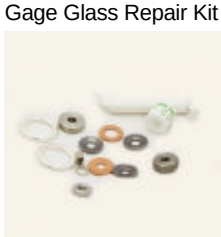

Replacement Probes


Gage Glass Repair Kit


Simpliport Module


Simpliport Packing Nut


Replacement Relays


Probe Repair Kit


Replacement EA100 Ass'y


Replacement Micro-switch


Bronze Valve Repair Kit


Valve Packing


Replacement Floats

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