RC8

RELAY CARD

E10-0069

Installation and Operation Instructions

EPACO

Fike® CORPORATION

Manual P/N E06-054
Rev. No: 1, 07/04

Introduction

Fike is pleased to present a new Installation, Operation and Maintenance Manual for our Explosion Protection System. This document has been created to incorporate the most up-to-date information available for this Fike product and to make it easy to use.

Who should read this manual?

This manual is intended for those individuals who are custodians of the Fike EPACO™ System. Others such as architects, engineers, sales and marketing personnel, etc. will find the information useful as well.

Warranty Information

Fike provides a one-year limited manufacturer's warranty on the product identified in this manual. Copies of the warranty can be obtained from an authorized Fike sales outlet. An authorized Fike sales outlet, using the MRA procedure, must return warranty items. See Section 11 of this manual for details of returning product to Fike.

Limitation of Liability

Fike Corporation cannot be held liable for any damages resulting from the use or misuse of this product.

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Disclaimer

The information contained in this manual is as accurate as possible. This manual is intended to be an aid to Fike authorized sales outlets or engineers charged with the installation and maintenance of the Fike Explosion Protection System. Fike does not warrant that this manual is technically correct, complete or the product referenced herein is free from minor flaws. Fike reserves the right to change the information contained in this manual without notice.

Quality Notice

Fike Corporation has maintained ISO 9001 certification since 1996. Prior to shipment, we thoroughly test our products and review our documentation to assure the highest quality in all respects. In a spirit of continuous improvement, Fike welcomes your suggestions. Please direct all suggestions or comments to

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List of Exhibits

1.0 TERMS AND SYMBOLS USED IN THIS MANUAL

Term/Symbol	Description
	**Fuse** symbol. This designation represents a circuit protection fuse. The fuse is rated at the amperage noted next to this marking.
 **DB9**	**Computer Connection** symbol. This designation represents the location for the computer connection. Using a straight-through serial cable, the RC8 can be connected from this DB9 connection to a computer serial port. The EP Works software can be installed on the computer and provide operational information.
	**Status Bus** symbol. The Status Bus circuit is a low speed network connection that sends and receives status information to Annunciator Module.
	**DC Power** symbol. This symbol is located on the RC8 P3 terminal. It designates the 24VDC input terminals and the 24VDC output terminals to the next RC8 in the system.
 **NO NC C**	**Relay** symbol. This symbol located on the top and bottom of the RC8 P2 and P3 terminal outputs. It designates the relay output wiring connections.

2.0 EPACO SYSTEM OVERVIEW

The EPACO™ System is a modular detection and control system combining the latest in addressable technology with simplicity of installation and maintenance. All system modules are DIN rail mounted to allow for a variety of installation options. Three (3) bus type communication circuits tie the various system modules into one easy to operate protection system. A non-volatile history buffer allows for enhanced diagnostic ability to troubleshoot process situations. With the optional Annunciator Module (AM), the customer has the ability to step through a menu format to retrieve process history without having to wait for a service agency to arrive on site.

This manual will provide the necessary information to properly install and monitor the Relay Card (RC8) for the EPACO™ System. The commissioning and service should be performed by certified service engineers and outlets specifically trained on this system.

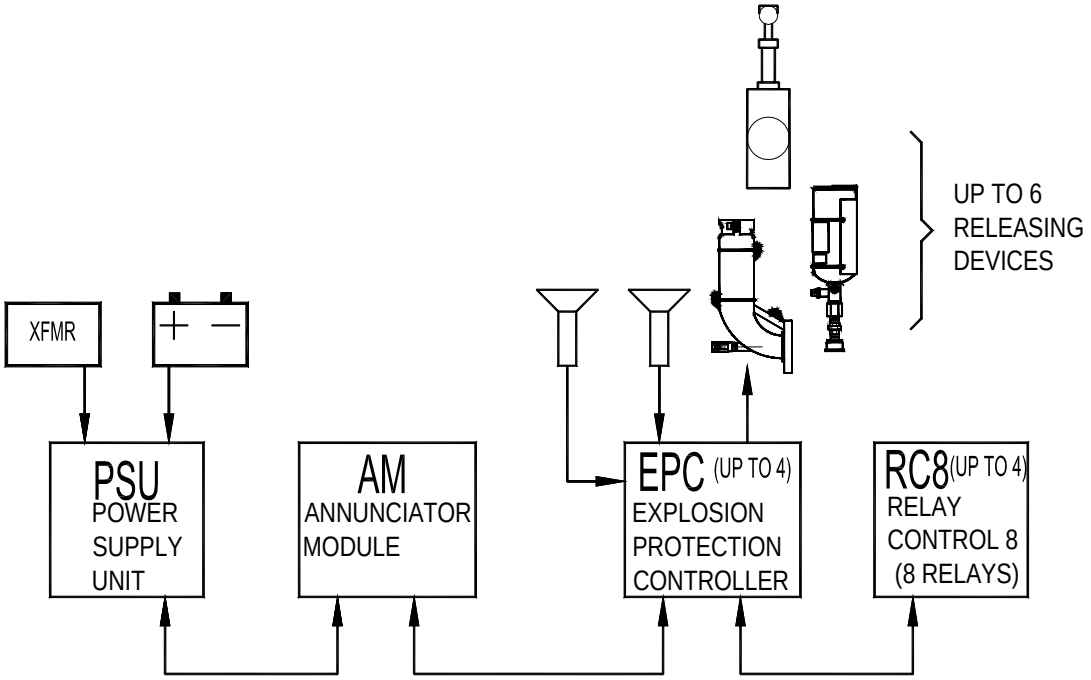

Exhibit 2-1 EPACO System Block Diagram

3.0 SYSTEM COMPONENTS

The cornerstone of the system is the Explosion Protection Controller (**EPC**). Three colored LEDs provide instant visual indication of system status. The DIN rail mounting allows for flexibility when choosing an enclosure. The EPC is an addressable panel that has the ability to retain an event history for enhanced system diagnostics. The EPC is a component that allows mounting in close proximity to the protected environment, thereby minimizing field wiring. Shorter wire runs greatly reduce the interference from electrical and radio frequency sources, allowing for a much more reliable protection system. The EPC's detection inputs can be programmed for pressure warning, threshold detection, and rate of rise detection. It also has a contact closure detection circuit to support thermal, infrared, or other switch-closure type detection devices[1]. A supervisory input circuit is provided to monitor suppression container pressure or other similar system status safeguards. The EPC has a remote disable input contact to allow for disabling the EPC from a customer PLC or other remote device during product loading, cleaning, or maintenance. DIP switches allow for basic system programming. An RS232 connection is available at each module for connection to a PC. Using the EP Works™ software, an authorized user can access system diagnostics and more complex programming by PC.

The EPC is powered by the other key component in the EPACO™ system, the Power Supply Unit (**PSU**). The PSU has six separate 24 VDC, 1 amp power output circuits capable of powering up to four EPCs in addition to other components of the EPACO™ system. The PSU has the flexibility of containing its own battery backup supply or the customer has the option of supplying a backup power source. The PSU has an imbedded power shutdown procedure in the event of AC power failure, which prevents the backup batteries from being completely depleted. In addition to powering EPCs, the PSU can power an Annunciator Module (AM) and Relay Card Modules (RC8). The power circuit dedicated for the Annunciator Module can not be shut off. All other power output circuits can be shut off for service on the various system components. The PSU may be eliminated if battery backed, uninterrupted 24VDC, 0.500 Amps power per module can be provided by others. For an FM approved installation without the PSU, the uninterruptible power must be U.L. 1778 "Uninterruptible Power Systems" listed, and conform to NFPA 72 "National Fire Alarm Code", NFPA 70 "National Electrical Code" (Articles 700 and 701), NFPA 110 "Standard for Emergency and Standby Power Systems", and NFPA 111 "Standard on Stored Electrical Energy Emergency and Standby Power Systems".

The Annunciator Module (**AM**) provides a central communication point for diagnostics. This module will typically be installed in an area removed from the process environment such as a control room. The AM has two push buttons to access the various menus and three numbered LEDs for identification of the system statuses within the menus.

The Relay Card Module (**RC8**) provides the user with a block of eight Form "C" relays for equipment shutdowns and remote notification of system trouble and alarm conditions. On-board LEDs display status for instant visual verification of each relay. DIP switches are provided for configuring the relay's operation.

Exhibit 3-1 RC8 Photo

[1] FM Approved switch closure for use with Fike threshold detector (E61-042-x) and Rate of Rise detector (E61-056-x). Other switch closure, thermal, or infrared devices are not approved by FM.

4.0 INSTALLATION

4.1 INSTALLATION OVERVIEW

The effectiveness of active explosion protection systems, such as explosion suppression and explosion isolation, depends upon the instantaneous reaction of the protection system and is a direct function of its speed of response.

It is therefore, critical that all possible measures are taken to reduce the individual system components' response times to an absolute minimum.

An active explosion protection system basically consists of three components: One or more explosion detectors, an electronic system controller, and one or more protective devices such as explosion suppressors or isolation valves. Instrumentation wiring interconnects these components.

The system controller is microprocessor-based and shall be installed in a location that maintains the EPC's temperature rating of -18°C to 43°C (0°F to 110°F) when it is installed in an auxiliary housing. For FM Approved installations the housing shall be a lockable enclosure conforming to the installed area requirements as defined by NEMA 250 "Enclosures for Electrical Equipment (1000 Volts Maximum)."

Besides its function as a fire controller it also incorporates an event table and a self-checking feature to continuously monitor the complete system-loop for errors or system defects.

Electronic devices, microprocessors, pyrotechnic initiators, and field wiring are influenced by the electromagnetic "environment" surrounding these components. The use of cellular telephones, transmitters, induction motors, welding equipment or the presence of power cables and transformers can create environments with high levels of electromagnetic radiation, resulting in induced electrical "noise" or voltage peaks.

Such effects are known to designers and manufacturers of instrumentation and control systems (PLC's), used in industrial environments and are handled through the use of specially designed electronic filters. These filters neutralize the unwanted noise and offer a "clean" signal for further processing. The filters, however, result in a delay in the processing of signals, and can therefore only be applied with great care in explosion protection systems where the effectiveness depends on the overall response time.

In active explosion protection systems, a balance must be maintained: The system must be extremely fast to achieve the required effectiveness, but at the same time must be stable and insensitive to surrounding sources of noise.

The system controller will detect and report major system troubles (such as ground faults, wire disconnection, and unstable input or output signals) and indicates the need for appropriate action.

The system controller will also detect unacceptable levels of electromagnetically induced noise. If the magnitude of the noise is such that this may result in a risk for spontaneous system activation or affect the system's performance, the controller will revert to its default error-mode.

It is essential to practice extreme caution when selecting component location, cable specifications, cable routes, and the "cleanliness" of the offered power source. In order to reduce the electromagnetic induced noise to a level that will not affect the required performance of the explosion protection system, verify all earth connections. It is preferred to have the enclosure and conduits connected to Protective Earth (similar with other building grounds) while the drain wires from the field wiring and each module ground connected to a separate Instrument Earth. This Instrument Earth connection shall not have inductive or capacitive loading such as motors, welders, or other industrial equipment. Where a separate earth connection is not available, the drain wires and module ground connections should be made to battery common. Complying with the following recommendations will help minimize the induced noise to acceptable levels.

4.2 POWER SPECIFICATIONS

The AC supply (commonly supplied to the EPACO Power Supply Unit, PSU) shall be wired through a dedicated circuit to a 100[2]/120/240VAC 15 or 16 Amp circuit breaker. High voltage circuits may NOT be run in the same conduit as low voltage circuits.

Cabling from transformer to PSU shall be 1.3 mm^2 (16AWG) minimum not to exceed 3 meters (10 feet).

[2] Not FM Approved for 100 VAC.

Cabling from PSU to RC8 shall be 0.8 mm^2 (18AWG) minimum not to exceed 10 Ω resistance.

A keyed selector switch is recommended in the PSU to RC8 power supply cabling to facilitate reset of the RC8. This shall have a 30V, 1A rating.

4.3 RELAY CARD (RC8)

The Relay Card (RC8) is a DIN rail mounted, fully programmable module containing eight (8) Form "C" relays. Each relay is equipped with a green LED to provide a visual indication of the relay state. These relays facilitate process shutdowns or other actions in response to conditions recognized by the EPACO™ system.

The RC8 is powered with 24VDC from the PSU. Up to four (4) RC8s can be connected in parallel to the power supply. The RC8 is capable of communicating on the Status Bus for exchanging status information and remote control of the outputs. A history of the relay states is captured in the Annunciator Module.

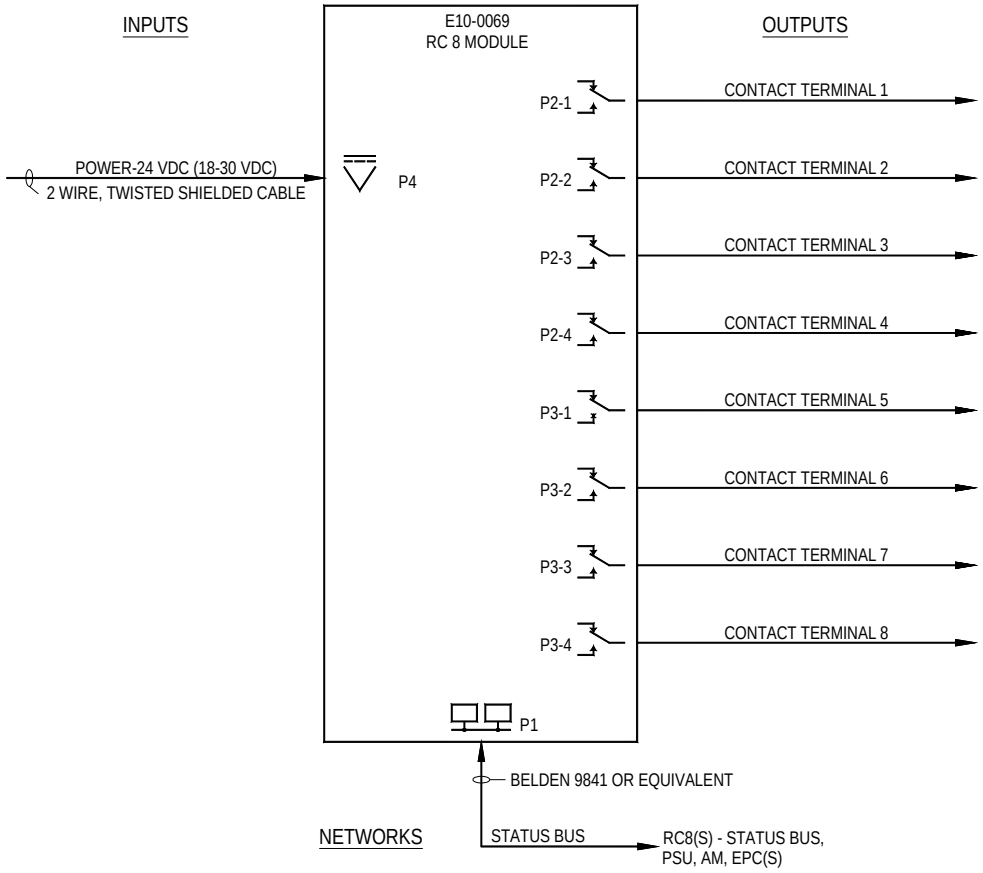

Exhibit 4-1 RC8 Block Diagram

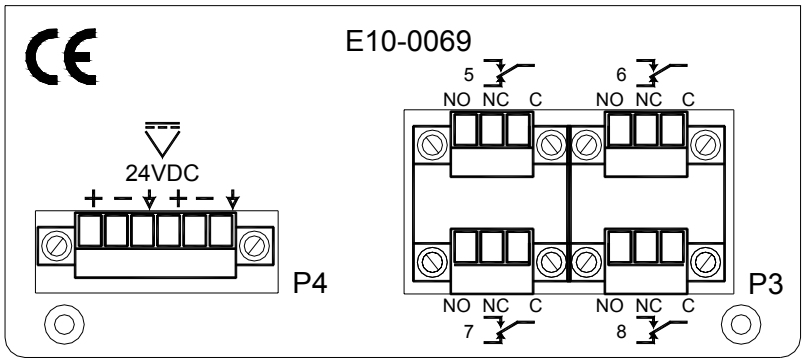

Exhibit 4-2 RC8 Bottom View – P3-P4 Wiring Connections

4.4 CIRCUIT CONNECTIONS

4.4.1 24VDC Power (P4)

Power Input requires between 18 to 30 Vdc, at 500mA. For the Relay Card, power needs to be from the EPACO PSU or an approved power source for proper operation of the status bus.

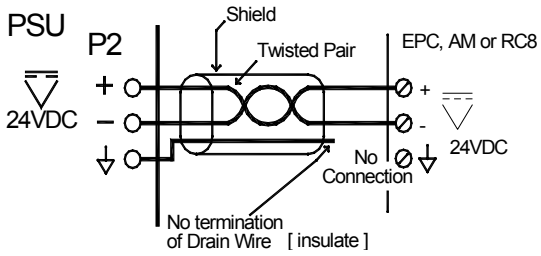

Exhibit 4-3 RC8 Power Input Wiring

4.4.2 Relay (P2 & P3)

Relays 1 through 8 are available to provide EPACO system status to monitoring equipment. The relays are a "fail-safe" relay that will transfer upon any system upon the programmed condition. This can be used for equipment shutdown, visual, audible, or other type annunciation. Trouble conditions may or may not affect the protection system's ability to respond to a deflagration, but must be acknowledged and identified prior to continuing to run the process.

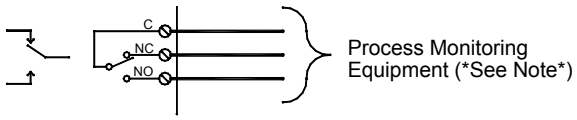

Exhibit 4-4 RC8 Relay Wiring

Note: The relay designations (NO, NC, and C) are shown in the de-energized state with no power applied. When the RC8 is powered and the system is in the NORMAL state, the relay is energized. (The relay marking is opposite of what is expected).

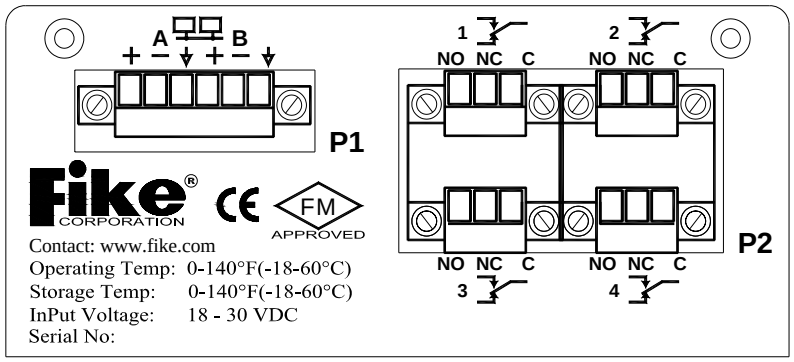

Exhibit 4-5 RC8 Top View – P1-P2 Wiring Connections

4.4.3 Status Bus (P1)

The Status Bus is a low speed communication bus that transmits control information between the EPC, Power Supply, Annunciator Module and Relay Modules. Belden 9841 or RE-Y2Y cabling is recommended for this circuit. Maximum resistance R=50 Ω, inductance L=100uH, and capacitance C=0.02uF with a maximum length of 300m (1,000 ft).

Note: The B+ connects to the A+ on the next device; similarly the B– connects to the A– of the next device. Install the 140 Ω, 1/2 watt resistor at each end as shown.

Note: The drain wire should only be connected on one end of each wire run. Make sure that the drain wire, which is not connected to a terminal, is cut and insulated from making contact to metal or other wiring connections.

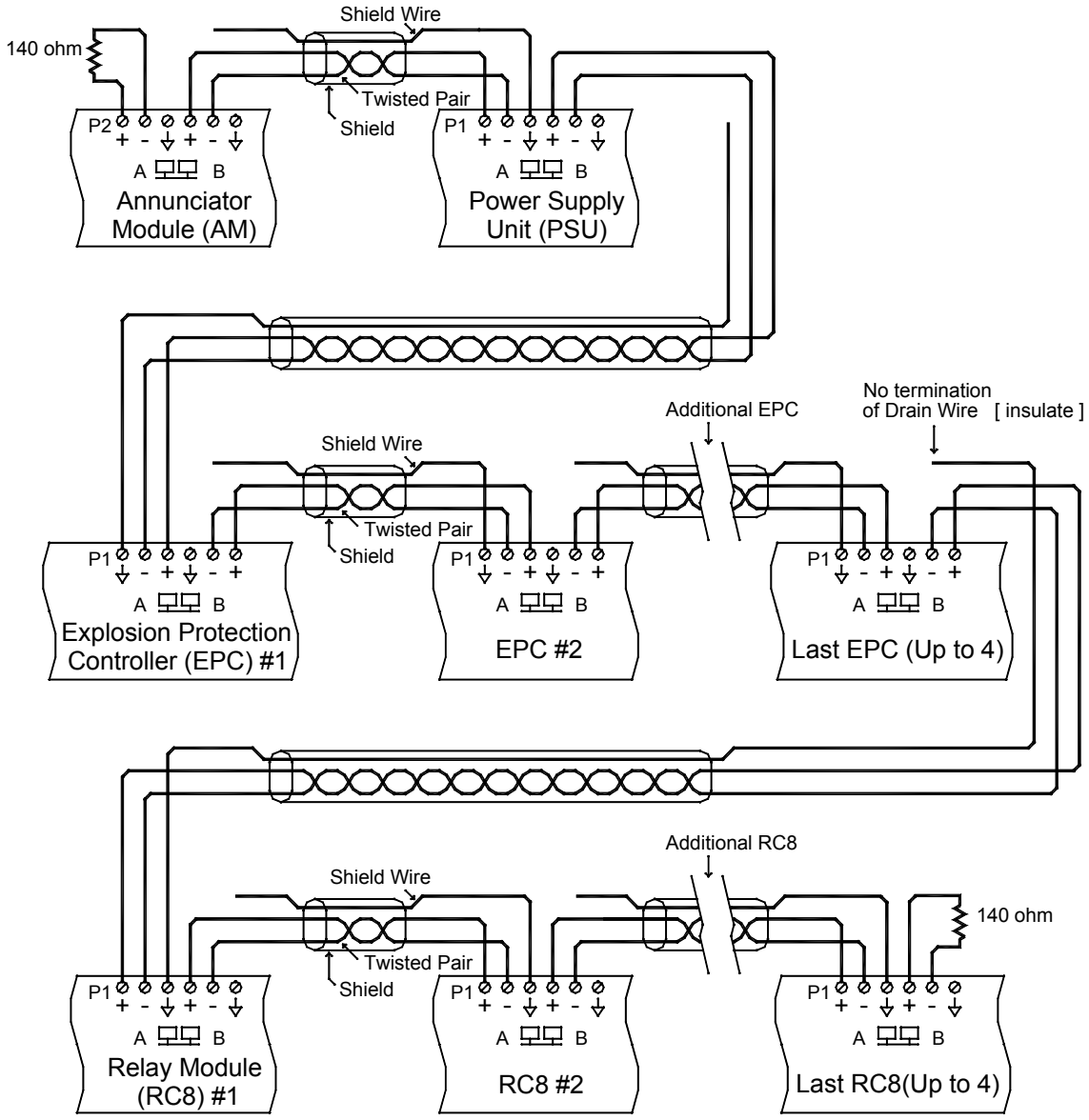

Exhibit 4-6 Status Bus Wiring

5.0 OPERATION

5.1 CONFIGURATION

The RC8 is a fully programmable module. System configuration can be performed with DIPswitches on these modules or by way of a DB9 serial port connection to a PC using EPWorks™ Software. RC8 addressing is done using the two ADD (address) DIPswitches. The four MODE DIP switches are used for programming specific relay configurations. Expanded programming may be created via PC with Fike's EPWorks™ Software.

NOTE: Address and configuration changes are to be made by Fike authorized engineers or technicians only.

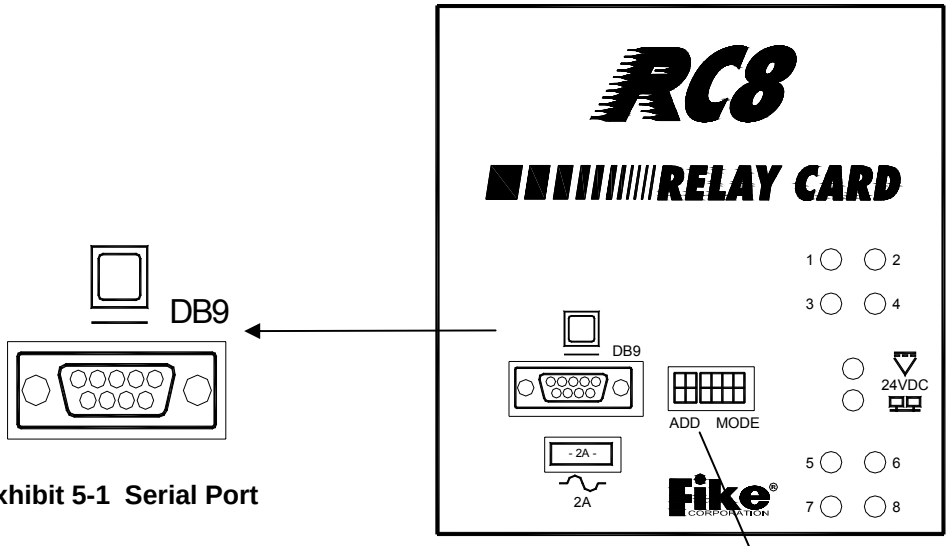

Exhibit 5-1 Serial Port

5.1.1 Dip Switch Configuration

The EPACO system can have multiple RC8's connected to a single system. The ADD switches enable the system to distinguish between multiple RC8's. The RC8 is configured to one of six (6) configurations using the MODE DIP switches on the face of the unit. The configuration of the DIP switches set the relay operation parameters of the RC8. The DIP switches incorporate a safety feature that prevents a programming change should one of the DIP switches inadvertently get changed.

5.1.2 PC Configurations

There are twelve (12) relay configurations that can be selected using a PC with EPWorks™ software. These relay configurations are more elaborate than are available with the DIP switch configurations.

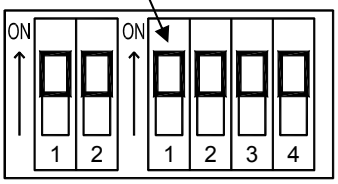

Exhibit 5-2 DIP Switches

5.2 RC8 STATUS

The RC8 is a process interface for the EPACO system. The following tasks are accomplished by the RC8:

- Communicates system status via relays for user interface
- Direct shut downs, slow downs, and remote notifications of system trouble and alarm conditions
- Remote location of interface, separate from the hazard zone

The RC8 operation can be classified into two main states of operation: Normal and Trouble / Alarm. Each of these states is described in sections 5.2.1 and 5.2.2. Exhibit 5-6 further describes other conditions within these states in a handy spreadsheet for quick reference.

5.2.1 RC8 Normal State

When power is applied to the RC8, it performs a 15 second initialization. At the end of the initialization, the Status Bus LED will turn on and the appropriate relays and relay LEDs will be energized to indicate the current status of the EPACO system.

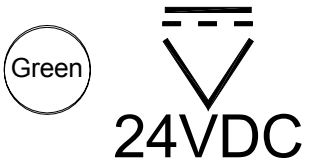

Exhibit 5-3 Power LED

5.2.2 RC8 Trouble or Alarm State

A trouble or alarm occurs on the EPACO system if any one of the supervised circuits experiences a wiring fault open or short condition, if a configuration is invalid, if the system is disabled, if a process pressure warning level is exceeded, if the input voltage drops below 18VDC or the activation criteria on the detector inputs have been met. In the Trouble or Alarm State the green LED programmed to respond to the fault or alarm condition will turn off, and the corresponding relay is de-energized. Depending on the cause of the trouble, the system may or may NOT be completely functional. Each trouble should be investigated to determine the cause and promptly fixed. Each trouble, except for remote disable, will latch at the EPC. If the trouble is resolved, the EPC trouble can be cleared by disabling and re-enabling via the remote disable input, by cycling of the power input to the EPC, or by disabling and re-enabling the EPC via the Annunciator Module (see Annunciator Module Installation and Operation Instructions E06-053). If the remote disable is active, the EPC will enter the trouble state. When the remote disable is returned to normal, the EPC will automatically clear to the normal state, if no other troubles are present, without cycling the power.

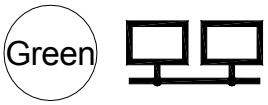

Exhibit 5-4 Status Bus LED

Exhibit 5-5 Trouble LED

Note: The alarm state will activate the system. If the system is reset after an alarm, it is typical to have an open wiring fault on the Series Firing circuit, since the actuator(s) have activated.

5.3 RELAY EVENTS

The RC8 relays can be configured for 55 different EPACO system events as shown in the table below. The relay functionality can be selected through one of the six DIP switch configurations listed below in Exhibit 5-7 or one of the twelve EPWorks™ configurations shown in Exhibit 5-8 or 5-9.

Module	Description	Module	Description
EPC *x*	No EPC or EPC Shutdown	PSU	No PSU/External Power Supply used or No Communications
EPC *x*	Normal Operation Mode	PSU	Normal Operation Mode
EPC *x*	Trouble on one of the Input Circuits	PSU	Fan Trouble
EPC *x*	Pressure Warning Level Exceeded	PSU	Ground Fault Trouble
EPC *x*	Trouble on one of the Output Circuits	PSU	Battery or Charge Trouble
EPC *x*	Trouble on the Fire Bus	PSU	AC Trouble
EPC *x*	PreDischarge Condition Satisfied	PSU	Battery Backup being Utilized
EPC *x*	Supervisory Input Active	PSU	Output Trouble
EPC *x*	EPC has Activated Releasing Outputs	PSU	Outputs Disabled
EPC *x*	EPC has been Disabled	PSU	Auto Shutdown Mode
EPC *x*	Failure during Arming	System	Status Bus Communication Failure

"*x*" = EPC 1 through 4

Exhibit 5-6 Relay Events Table

Config #	Mode Switch Position				Relay Number							
	1	2	3	4	1	2	3	4	5	6	7	8
PC Config	Off	Off	Off	Off	---- User Selectable with Software ----							
1	On	Off	Off	Off	EPC 1 Trouble	EPC 1 Alarm	EPC 2 Trouble	EPC 2 Alarm	EPC 3 Trouble	EPC 3 Alarm	EPC 4 Trouble	EPC 4 Alarm
2	Off	On	Off	Off	EPC 1 Trouble	EPC 1 Alarm	EPC 1 Pres. Warning	EPC 1 Disable	EPC 1 Shutdown	EPC 1 PreDischarge	EPC 1 Supervisory	EPC 1 Arming Trouble
3	On	On	Off	Off	EPC 2 Pres. Warning	EPC 2 Disable	EPC 2 Trouble	EPC 2 Alarm	EPC 2 Shutdown	EPC 2 PreDischarge	EPC 2 Supervisory	EPC 2 Arming Trouble
4	Off	Off	On	Off	EPC 3 Shutdown	EPC 3 PreDischarge	EPC 3 Pres. Warning	EPC 3 Disable	EPC 3 Trouble	EPC 3 Alarm	EPC 3 Supervisory	EPC 3 Arming Trouble
5	On	Off	On	Off	EPC 4 Supervisory	EPC 4 Arming Trouble	EPC 4 Pres. Warning	EPC 4 Disable	EPC 4 Shutdown	EPC 4 PreDischarge	EPC 4 Trouble	EPC 4 Alarm
6	Off	On	On	Off	PSU Trouble	AC Power Failure	Batt. Power Failure	Ground Fault	PSU Fan Failure	PSU Output Failure	N/A	RC8 Bus Failure
Config Clear	On	On	On	On	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

EPC Trouble = No EPC or EPC Shutdown, Trouble on Input Circuit, Pressure Warning, Trouble on Output Circuit, Trouble on Fire Bus, PreDischarge, Supervisory Input Active, EPC Disabled, or Failure During Arming.

EPC Alarm = Releasing Outputs Activated, or No EPC or EPC Shutdown.

Definitions		
	Config Clear	Configure Clear - Used to change the configuration settings in the Relay Card.
	PC Config	PC Configure - Used to provide expanded programming options.

Exhibit 5-7 DIP Switch Configuration Table for RC8

	Configuration 1	Configuration 2	Configuration 3	Configuration 4	Configuration 5	Configuration 6
Relay 1	EPC 1 – Pressure Warning EPC 1 - PreDischarge EPC 1 - Supervisory EPC 1 - Arming Trouble	EPC 3 - Pressure Warning EPC 3 - PreDischarge EPC 3 - Supervisory EPC 3 - Arming Trouble	EPC 1 - Shutdown EPC 1 - Input Trouble EPC 1 - Pressure Warning EPC 1 - Output Trouble EPC 1 - Fire Bus Trouble EPC 1 - PreDischarge EPC 1 - Supervisory EPC 1 - Disabled	EPC 2 - Shutdown EPC 2 - Input Trouble EPC 2 - Pressure Warning EPC 2 - Output Trouble EPC 2 - Fire Bus Trouble EPC 2 - PreDischarge EPC 2 - Supervisory EPC 2 - Disabled	EPC 3 - Shutdown EPC 3 - Input Trouble EPC 3 - Pressure Warning EPC 3 - Output Trouble EPC 3 - Fire Bus Trouble EPC 3 - PreDischarge EPC 3 - Supervisory EPC 3 - Disabled	EPC 4 - Shutdown EPC 4 - Input Trouble EPC 4 - Pressure Warning EPC 4 - Output Trouble EPC 4 - Fire Bus Trouble EPC 4 - PreDischarge EPC 4 - Supervisory EPC 4 - Disabled
Relay 2	EPC 1 - Shutdown EPC 1 - Input Trouble EPC 1 - Output Trouble EPC 1 - Fire Bus Trouble EPC 1 - Disabled	EPC 3 - Shutdown EPC 3 - Input Trouble EPC 3 - Output Trouble EPC 3 - Fire Bus Trouble EPC 3 - Disabled	EPC 1 - Activation	EPC 2 - Activation	EPC 3 - Activation	EPC 4 - Activation
Relay 3	EPC 1 - Activation EPC 1 - Shutdown EPC 1 - Disabled	EPC 3 - Activation EPC 3 - Shutdown EPC 3 - Disabled	EPC 1 - Pressure Warning	EPC 2 - Pressure Warning	EPC 3 - Pressure Warning	EPC 4 - Pressure Warning
Relay 4	EPC 2 - Pressure Warning EPC 2 - PreDischarge EPC 2 - Supervisory EPC 2 - Arming Trouble	EPC 4 - Pressure Warning EPC 4 - PreDischarge EPC 4 - Supervisory EPC 4 - Arming Trouble	EPC 1 - Disabled	EPC 2 - Disabled	EPC 3 - Disabled	EPC 4 - Disabled
Relay 5	EPC 2 - Shutdown EPC 2 - Input Trouble EPC 2 - Output Trouble EPC 2 - Fire Bus Trouble EPC 2 - Disabled	EPC 4 - Shutdown EPC 4 - Input Trouble EPC 4 - Output Trouble EPC 4 - Fire Bus Trouble EPC 4 - Disabled	EPC 1 - Shutdown	EPC 2 - Shutdown	EPC 3 - Shutdown	EPC 4 - Shutdown
Relay 6	EPC 2 - Activation EPC 2 - Shutdown EPC 2 - Disabled	EPC 4 - Activation EPC 4 - Shutdown EPC 4 - Disabled	EPC 1 - Pressure Warning EPC 1 - PreDischarge	EPC 2 - Pressure Warning EPC 2 - PreDischarge	EPC 3 - Pressure Warning EPC 3 - PreDischarge	EPC 4 - Pressure Warning EPC 4 - PreDischarge
Relay 7	PSU - Fan Trouble PSU - Ground Fault Trouble PSU - Batt./Charge Trouble PSU - AC Trouble PSU - Battery Backup	PSU - Battery Trouble	EPC 1 - Supervisory	EPC 2 - Supervisory	EPC 3 - Supervisory	EPC 4 - Supervisory
Relay 8	RC8 - Status Bus Failure	PSU - AC Trouble	RC8 - Status Bus Failure	RC8 - Status Bus Failure	RC8 - Status Bus Failure	RC8 - Status Bus Failure

Exhibit 5-8 EPWorks™ Configurations 1 - 6

	Configuration 7	Configuration 8	Configuration 9	Configuration 10	Configuration 11	Configuration 12
Relay 1	EPC 1 - Supervisory	EPC 1 - Pressure Warning	EPC 1 - Supervisory	EPC 1 - Disabled	EPC 1 - Supervisory	PSU - AC Trouble
Relay 2	EPC 1 - Shutdown EPC 1 - Input Trouble EPC 1 - Output Trouble EPC 1 - Fire Bus Trouble EPC 1 - Disabled	EPC 1 - Disabled	EPC 1 - Pressure Warning EPC 1 - PreDischarge	EPC 1 - Shutdown	EPC 2 - Supervisory	PSU – Batt./Charge Trouble
Relay 3	EPC 2 - Supervisory	EPC 2 - Pressure Warning	EPC 2 - Supervisory	EPC 2 - Disabled	EPC 3 - Supervisory	PSU - Fan Trouble
Relay 4	EPC 2 - Shutdown EPC 2 - Input Trouble EPC 2 - Output Trouble EPC 2 - Fire Bus Trouble EPC 2 - Disabled	EPC 2 - Disabled	EPC 2 - Pressure Warning EPC 2 - PreDischarge	EPC 2 - Shutdown	EPC 4 - Supervisory	PSU - Ground Fault Trouble
Relay 5	EPC 3 - Supervisory	EPC 3 - Pressure Warning	EPC 3 - Supervisory	EPC 3 - Disabled	RC8 - Status Bus Failure	PSU - Battery Backup
Relay 6	EPC 3 - Shutdown EPC 3 - Input Trouble EPC 3 - Output Trouble EPC 3 - Fire Bus Trouble EPC 3 - Disabled	EPC 3 - Disabled	EPC 3 - Pressure Warning EPC 3 - PreDischarge	EPC 3 - Shutdown	PSU - Fan Trouble PSU - Ground Fault Trouble PSU - Batt./Charge Trouble PSU - AC Trouble PSU - Battery Backup	PSU - Output Trouble
Relay 7	EPC 4 - Supervisory	EPC 4 - Pressure Warning	EPC 4 - Supervisory	EPC 4 - Disabled	EPC 1-4 - Shutdown EPC 1-4 - Input Trouble EPC 1-4 - Pressure Warning EPC 1-4 - Output Trouble EPC 1-4 - Fire Bus Trouble EPC 1-4 - PreDischarge EPC 1-4 - Supervisory EPC 1-4 - Disabled	PSU - Output Disabled
Relay 8	EPC 4 - Shutdown EPC 4 - Input Trouble EPC 4 - Output Trouble EPC 4 - Fire Bus Trouble EPC 4 - Disabled	EPC 4 - Disabled	EPC 4 - Pressure Warning EPC 4 - PreDischarge	EPC 4 - Shutdown	EPC 1-4 - Activation	PSU - Shutdown

Exhibit 5-9 EPWorks™ Configurations 7 - 12

6.0 PERIODIC MAINTENANCE

CAUTION: If assistance is needed before performing any maintenance or service work on the Fike Explosion Protection equipment and/or systems, contact Fike for instructions. See section 11.0 Repair and Return Authorization for contact information.

6.1 GENERAL

Routine system inspections shall be conducted in accordance with the requirements of the appropriate local authority having jurisdiction and National Fire Protection Association Standard Number 69, Explosion Prevention System, current edition.

The inspection schedule and procedure set forth below are provided as a minimum requirement for Fike Explosion Protection System Controllers, which operate in moderate environments. These control panel instructions are to be implemented in conjunction with complete system inspection instructions.

During initial system checkout or start-up, the Fike Factory Field Personnel, due to process operational characteristics and/or historical inspection data on the specific process, may determine that an additional inspection is required. If this occurs, it will be in addition to the following maintenance schedule.

It is extremely important to closely monitor the operational characteristics of your system during the first few days and weeks after the initial start-up.

6.2 INSPECTION PROCEDURE

The following is the recommended procedure to follow when conducting an inspection.

Step 1: Disable the Control Panel

Step 2: Shunt the GCA's and install jumpers

Step 3: Re-Arm the Control Panel and Disable

Step 4: Calibrate the pressure detectors

Step 5: Cycle the Explosion Isolation Valves – if present

Step 6: Checkout the panel

Step 7: Reconnect the GCA's and log the container pressures and serial numbers

Step 8: Re-arm the system

6.3 ROUTINE INSPECTIONS

These inspections are to be performed by Fike Field Personnel or personnel trained and certified by Fike.

To perform an inspection, it is important to first obtain all pertinent data that relates to the specific system being inspected. The required information includes:

- System Engineered Drawings

  Component Location Drawing No._____

  Field Wiring Drawing No._____
- Copy of Manuals, Specifications or Documents Referenced on Fike System Engineered Drawings
- Inspection Equipment
- Operating Specifications on Each Component Being Inspected

6.4 THREE-YEAR REPLACEMENT

Replace all system batteries.

6.5 TEN-YEAR REPLACEMENT

Replace all GCA actuators, following all safe handling practices and recommendations.

Note: The ten-year replacement is based upon a 70°F to 80°F (20°C to 30°C) actuator temperature. The replacement frequency may be more frequent when exposure to higher temperature or harsh environments is experienced.

7.0 DECOMMISSIONING PROCEDURE / CHECK-LIST

The following procedure must only be performed by a Fike qualified Service Engineer, who has been assigned to prepare and complete the decommissioning of the above referenced Explosion Protection System.

Each step in the listed procedure must be adhered to and completion/acceptance of this form is mandatory. The Service Engineer must check off each of the following steps. In the case of non-compliance, the observed discrepancy must be corrected before completion of the system decommissioning.

STEPS / DESCRIPTION			
1. Use Fike system/project component location diagram to record and verify the locations of all Fike system components for each zone and system.	□ pass	□ fail	□ Remark/ Note No.
2. Control panel to be disarmed/shutdown.	□ pass	□ fail	□ Remark/ Note No.
3. All suppressor/valve actuators to be shunted.	□ pass	□ fail	□ Remark/ Note No.
4. Each suppressor/valve container to be depressurized. Note: Do not ventilate nitrogen in a confined space.	□ pass	□ fail	□ Remark/ Note No.
5. Power supply to the control panel to be isolated by the customer and disconnected to prevent accidental reconnection. Fike to verify.	□ pass	□ fail	□ Remark/ Note No.
6. Control panel battery to be disconnected and removed for proper disposal.	□ pass	□ fail	□ Remark/ Note No.
7. Each actuator is to be removed and placed in a storage housing, to be either stored on site or removed for proper disposal.	□ pass	□ fail	□ Remark/ Note No.
8. Verify that all suppressor/valve gauges are reading zero, replace fill valve cap loosely.	□ pass	□ fail	□ Remark/ Note No.
ATTENTION: SYSTEM IS NOW DECOMMISSIONED AND READY FOR DISMOUNTING BY THE CUSTOMER.			

Exhibit 7-1 Decommissioning Steps

8.0 RC8 SPARE PARTS

Part Number	Description
E10-0069	Relay Card (RC8)
02-4181	Fuse, 2A mini automotive blade type
02-10415	Six (6) Position Wire Terminal Block (P1 & P4)
02-10417	Three (3) Position Wire Terminal Block (P2 & P3)
02-10876	End of Line Resistor, 140 Ω, 0.5 Watt for P1 Status Bus

Exhibit 8-1 Spare Parts List

9.0 LED DIAGNOSTICS

Condition	Power LED	Status Bus LED	Relay LED(s) based on Configuration
Initial power up [first 15 seconds]	on	off	all off
Normal Sate (No troubles or alarms)	on	on	all on
Invalid configuration	on	fast pulse	all off
Trouble or Alarm	on	on	corresponding off (1)

(1) Relay follows LED condition.

Exhibit 9-1 LED Diagnostics

10.0 SPECIFICATIONS

Part Number:	E10-0069
Input Power:	18 to 30 VDC; 300mA
Max. Noise Ripple:	500mV peak at 24 VDC
Fuse:	2A Mini Automotive Type
Lower Limit for Input Power Shut-down:	16 VDC
Power Consumption:	300mA in Normal State
Terminal Block Capacity:	1.5 to 0.14 $mm^2$16 to 28 AWG (16 to 28 AWG)
Relay Output:	Eight SPDT Form C. Each rated DC operation: 2 amps @ 30VDC (pf=0.35) AC operation: 0.5 amps @ 250VAC (pf=0.35)
Status Bus:	Wire specification Alpha wire or RE-Y2Y or Belden 9841, maximum resistance of 50 Ω, inductance L=100uH, capacitance C=0.02uF, maximum length 300 m (1,000 ft) total.
Temperature Rating:	-18°C to 60°C (0°F to 140°F). If EPC is not located inside auxiliary housing, maximum temperature is 43.3°C 110°F (110°F).
Humidity:	80% relative, maximum (non-condensing).
Size:	120mm L x 125mm H x 54mm D (4.8″ L x 4.9″ H x 2.1″ D).
Weight:	0.5 kg (1 lb.).
Hazardous Area:	The RC8 is not rated for hazardous atmospheres. The RC8 must be located in an auxiliary housing that is rated for the hazardous atmosphere in which it is located. To maintain the systems FM Approval for hazardous locations, the housing shall be an FM approved housing from the following: - E10-0085, E10-0087 or Killark XB-10126 or larger XB series housing approved for Class I, Div. 1 & 2, Groups C,D Class I, Zones 1 & 2, Groups IIB, IIA Class II, Div. 1 & 2, Groups E,F,G Class III NEMA 7(C,D), 9(E,F,G) - E10-0080, E10-0086, or Killark DB-10106 or larger DB series housing approved for Class II, Div. 1 & 2, Groups E,F,G Class III NEMA 3R, 4, 4X, 9(E,F,G) For ATEX installations the RC8 must be located in a non-hazardous atmosphere.
Current Firmware Version:	Can be verified using EPWorks™ Software.

11.0 REPAIR AND RETURN AUTHORIZATION

Any component that is to be returned to Fike must be approved for return prior to shipment. In order for the returned component to receive the correct attention, credit, repair, or replacement either under warranty or at the owner's expense, an authorization number must be assigned by Fike. A pre-arranged return authorization will expedite the business and corrective action measures taken upon receipt of the part(s).

A reference to the return authorization number should be inserted to the packing slip. If a packing slip is not used, then reference to the return authorization number should be made through alternate means. When preparing the component for shipment, please include your original Purchase Order Number, Invoice Number, or Fike Production Order Number. Include with the package the address you want the part shipped back to, shipment method, contact name, and telephone number.

A specific statement as the perceived defect or component failure will assist in examining the part(s). This statement should also address symptoms and an operation history of the system in which the component was installed.

In the event the suspect part is found within a larger top assembly component, the party assigning the Material Return Authorization Number (MRA) should be able to assist you as to whether the entire assembly must be returned or only the component in question.

To start the MRA procedure, contact the nearest Fike Sales Outlet. The nearest Fike Sales Outlet may be found on the Internet at www.fike.com. The nearest Fike Sales Outlet may also be found by calling one of the following:

AMERICAS

FIKE CORPORATION
USA
Phone +1-816-229-3405
Email: fpssales@fike.com

FIKE CANADA
Phone +1-905-681-3100
Email: fikecanada@fike.com

FIKE LATINA LTDA
Brazil
Phone +55-11-4525-1277
Email: vendas@fike.com.br

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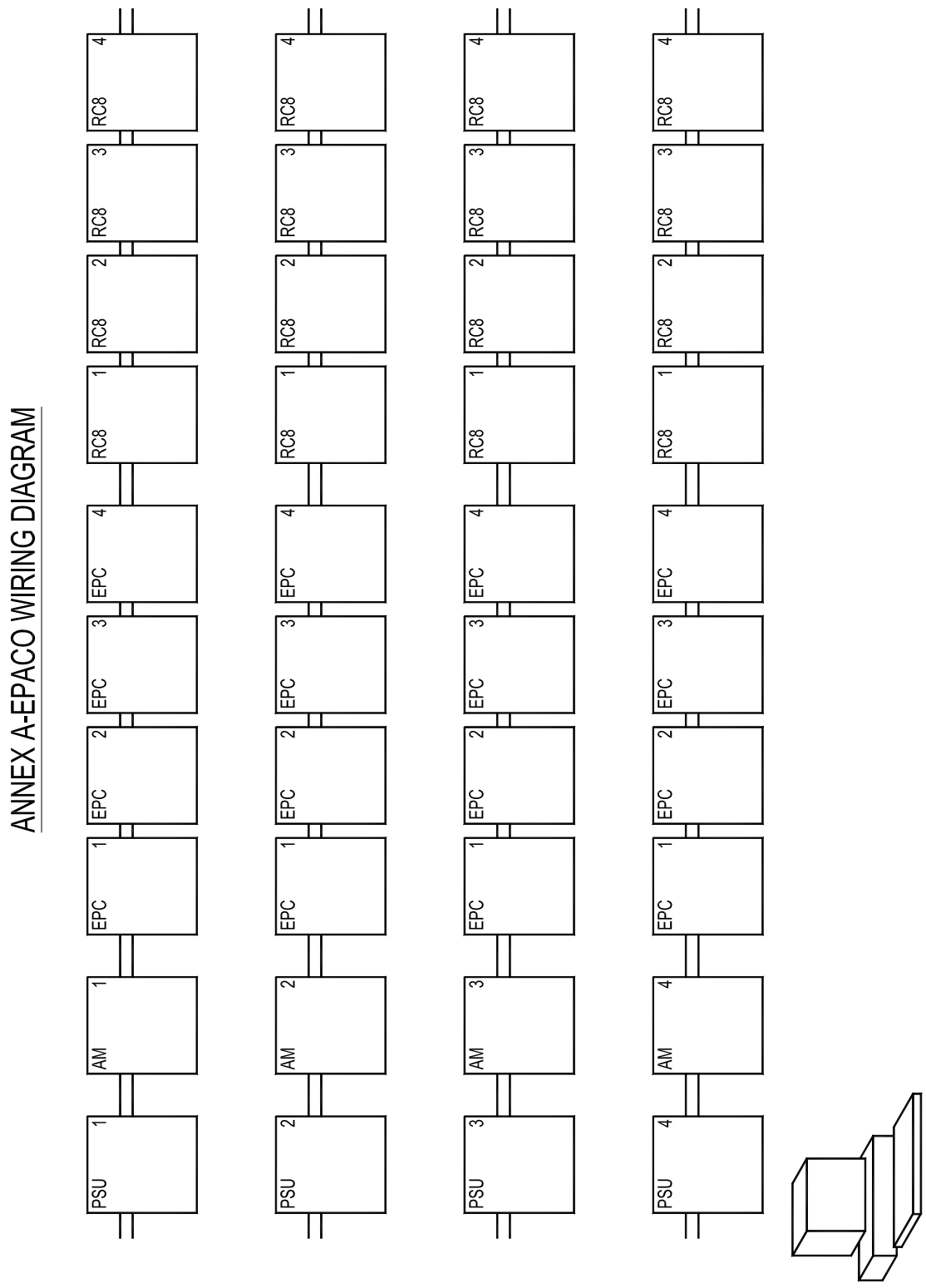

Annex A EPACO Wiring Diagram

This exhibit may be used to generate an overview of the EPACO system

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