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UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, D.C. 20555

October 7, 1992

NRC INFORMATION NOTICE 91-64, SUPPLEMENT 1: SITE AREA EMERGENCY RESULTING FROM A LOSS OF NON-CLASS 1E UNINTERRUPTIBLE POWER SUPPLIES

Addressees

All holders of operating licenses or construction permits for nuclear power reactors.

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this supplement to provide additional information on replacement intervals for the control logic back-up power battery packs associated with the Exide Electronics, Incorporated (Exide) 75 KVA uninterruptible power supply (UPS) model No. 575-60T3-120/208 and to provide additional simplified drawings of the Exide UPS control logic power supply modifications that were performed by Niagara Mohawk Corporation's Nine Mile Point, Unit 2, facility. It is expected that recipients will review the information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. However, suggestions contained in this information notice supplement are not NRC requirements, therefore, no specific action or written response is required.

Description of Circumstances

On August 13, 1991, the Nine Mile Point, Unit 2, facility was operating at full power when a phase to ground electrical fault occurred on phase B of the Unit 2 main power transformer. The fault resulted in trips of the main generator, main turbine, and reactor. The fault also caused the voltage on electrical distribution phase B buses to momentarily decrease to approximately 50 percent of its nominal value for approximately 200 milliseconds, after which the electrical distribution system voltage returned to the nominal value.

This momentary voltage degradation on the electrical distribution buses resulted in the simultaneous loss of power output from each of the five Non-Class 1E uninterruptible power supplies. Exide's UPS units have internal continuously charged back-up batteries to prevent a loss of control logic power. Exide's UPS control logic circuitry receives, processes, generates, and sends electrical signals essential for proper UPS operation. However, in this incident the back-up power battery packs were apparently past their useful life and were completely discharged.

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The loss of power from the UPS units caused a loss of the control room annunciators, the safety parameter display system computer, control rod position indication, the plant process computer, the core thermal limits computer, the feedwater control system, some of the lighting for the plant, the plant radio and paging systems, some instrumentation for balance-of-plant systems, and some instrument recorders. Loss of control room annunciators concurrent with the plant transient resulting from automatic tripping of the main generator, main turbine, and reactor caused the licensee to declare a site area emergency in accordance with the site emergency plan. The loss of control rod position indicators and other equipment losses burdened the operators in implementing the emergency procedures. However, the operators shut down the plant in accordance with emergency procedures. About 13 hours after the plant trip, the reactor was placed in a cold shutdown condition; and approximately 1 hour later, the licensee ended the site area emergency.

Discussion

At the time of the August 13, 1991, event involving UPS losses, the 120 volt (V) alternating current (ac) maintenance supply was the normal ac input power source to the UPS control logic dc power supply (Attachment 1). This power is derived from the phase B bus electrical distribution system and is provided through a regulating transformer. It is not considered as reliable or as high a quality of power as the power supplied from the inverter. The incident prompted the licensee to modify Exide's UPS internal wiring to give a normal source of ac power to the UPS control logic power supply from the inverter with the maintenance supply as the alternate source (Attachment 2). This modification makes the UPS less susceptible to plant electrical disturbances.

Exide used Gate's Energy Products (Gates) rechargeable batteries for its UPS control logic battery power application. Therefore, the NRC staff reviewed data sheets on the performance of Gates battery packs. The Gates data sheets contained battery characteristic curves and additional items regarding actual battery performance. NRC staff reviewed these data sheets and the associated current values required for the control logic system and determined that functional battery packs acting alone would support the amperage consumption necessary for the UPS control logic to operate for longer than 10 minutes. The performance data sheets show that battery life expectancy is a function of float voltage and temperature values with charge and discharge cycle life being a function of the depth of discharge. The data sheets also show that greater float voltage or higher operating temperature values decrease battery life. For example, the performance data sheets indicate that the battery could last slightly longer than 5 years with an operating temperature of 30° Celsius (C) and a float voltage of 2.3 Vdc. If the operating temperature value is increased to 40°C with a float voltage value of 2.3 Vdc, the battery life expectancy is indicated to be approximately 3 years. If the float voltage value is increased to 2.4 Vdc the life expectancy is indicated to be 2 years. Further, if the operating temperature value is increased to 50°C and the float voltage value is 2.4 Vdc, the

battery life expectancy decreases to approximately 1 year. Therefore, high float voltage values combined with excessively high operating temperature values substantially decrease battery life. Contributing factors to the event were that the UPS back-up internal battery packs were completely discharged, and the licensee had not performed adequate preventative maintenance for the battery packs based upon actual in-service conditions that could adversely affect battery life.

This information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact one of the technical contacts listed below or the appropriate Office of Nuclear Reactor Regulation (NRR) project manager.

Charles E. Rossi, Director
Division of Operational Events Assessment
Office of Nuclear Reactor Regulation

Technical contacts: Frank Ashe, NRR
(301) 504-2785

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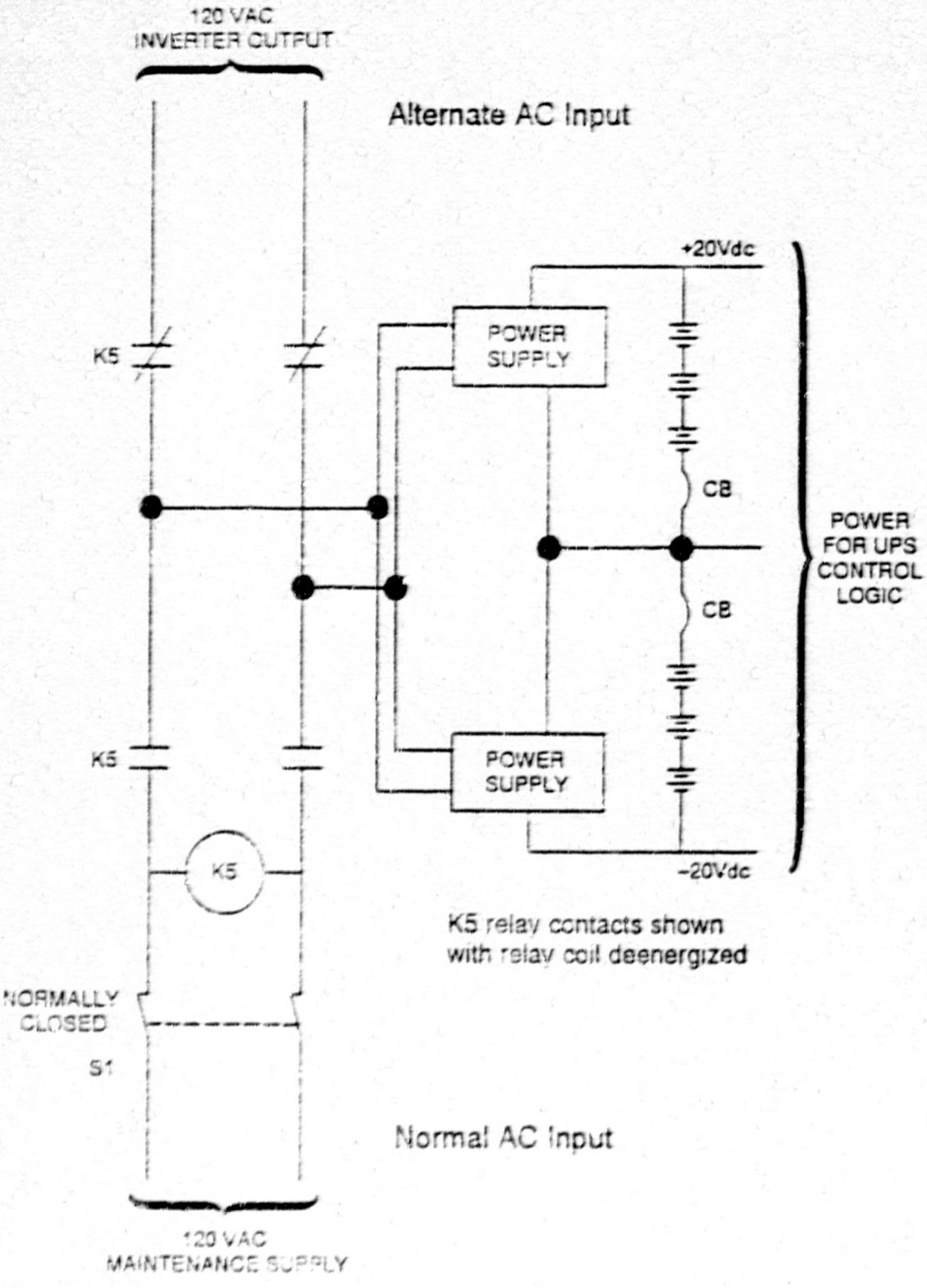
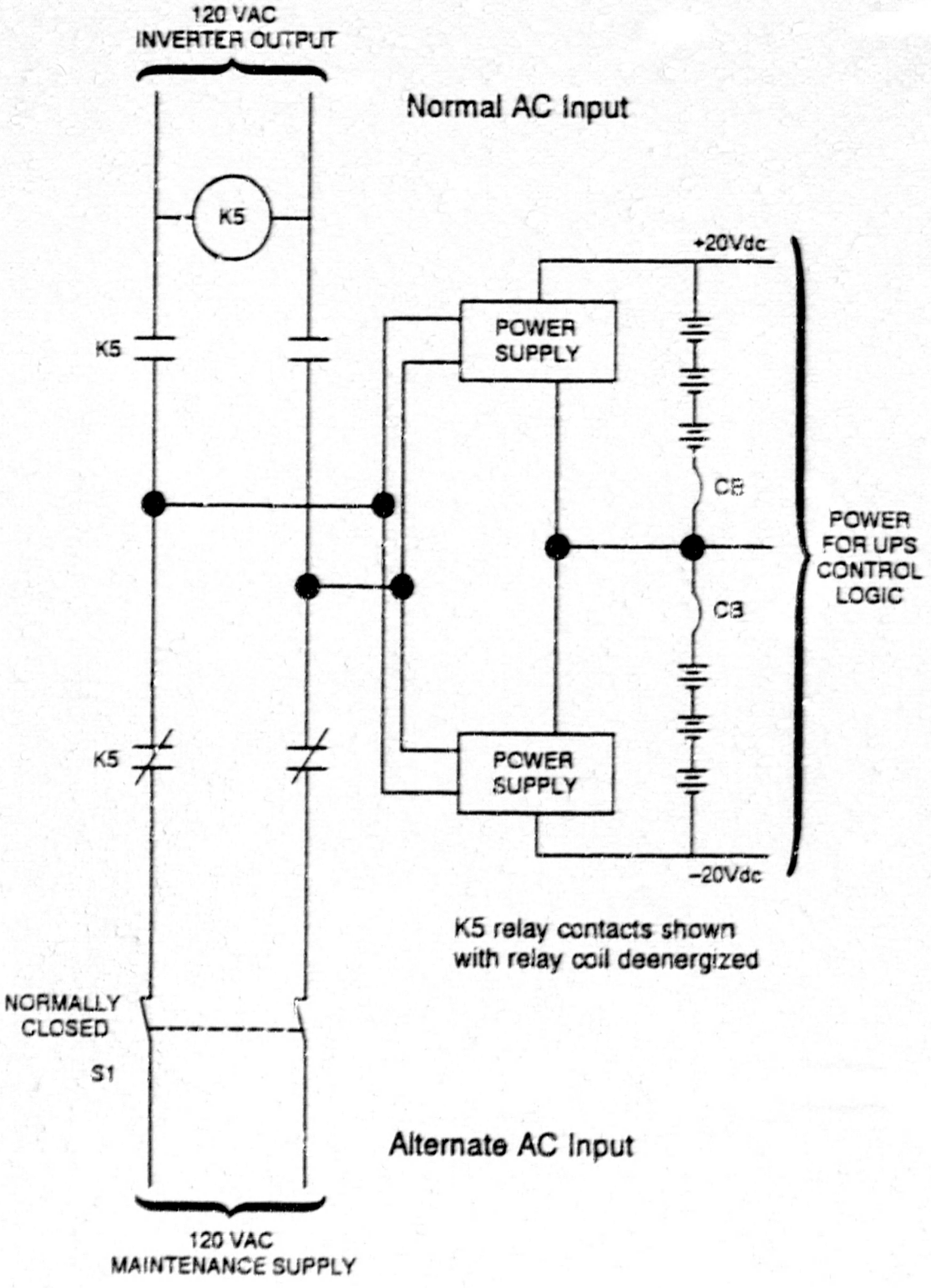
(301) 504-2979

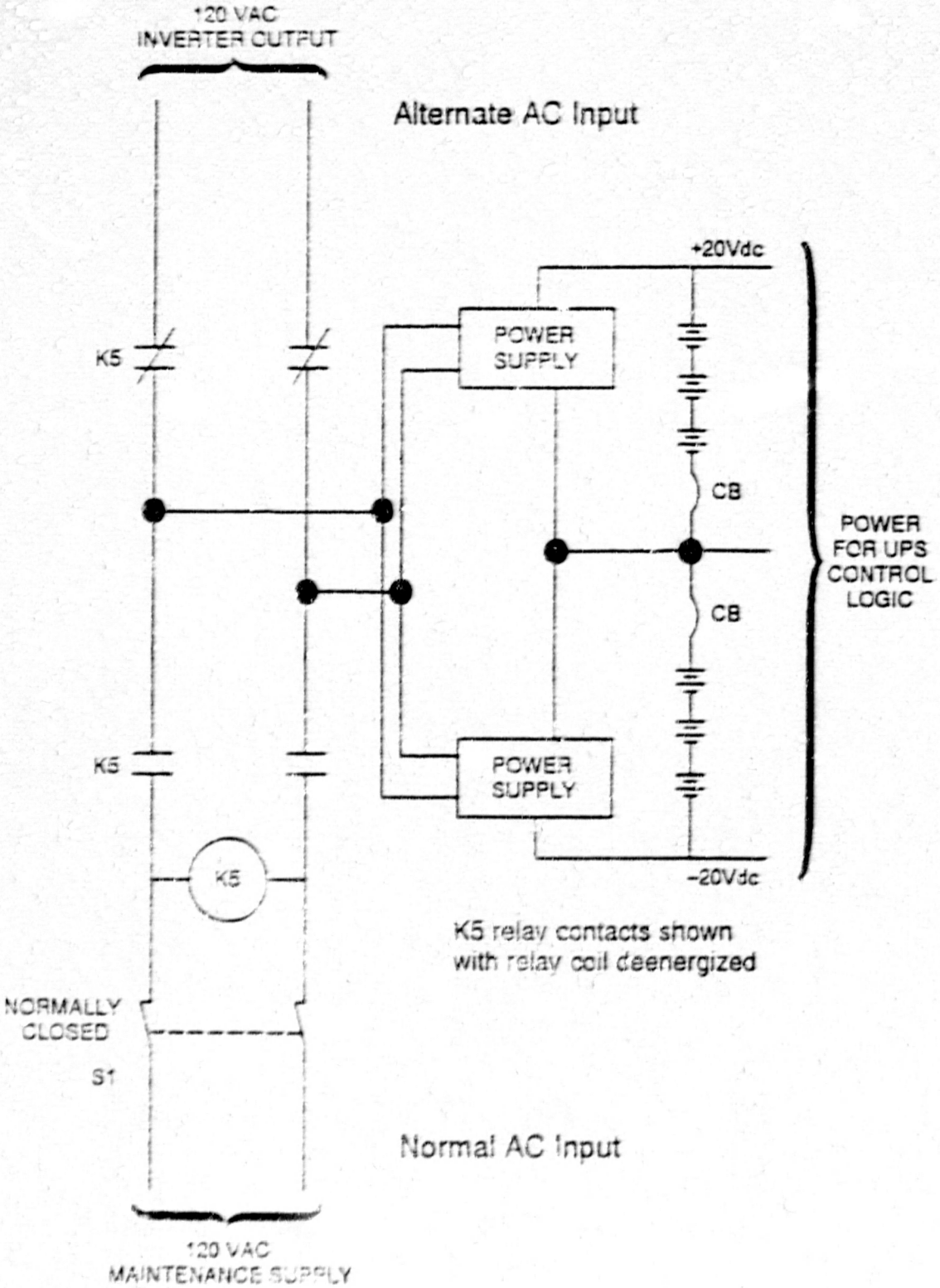
Attachments:
1. Simplified Diagram For UPS Control Logic Power Supply Design Prior To Modification
2. Simplified Diagram For Modified UPS Control Logic Power Supply Design
3. List of Recently Issued NRC Information Notices



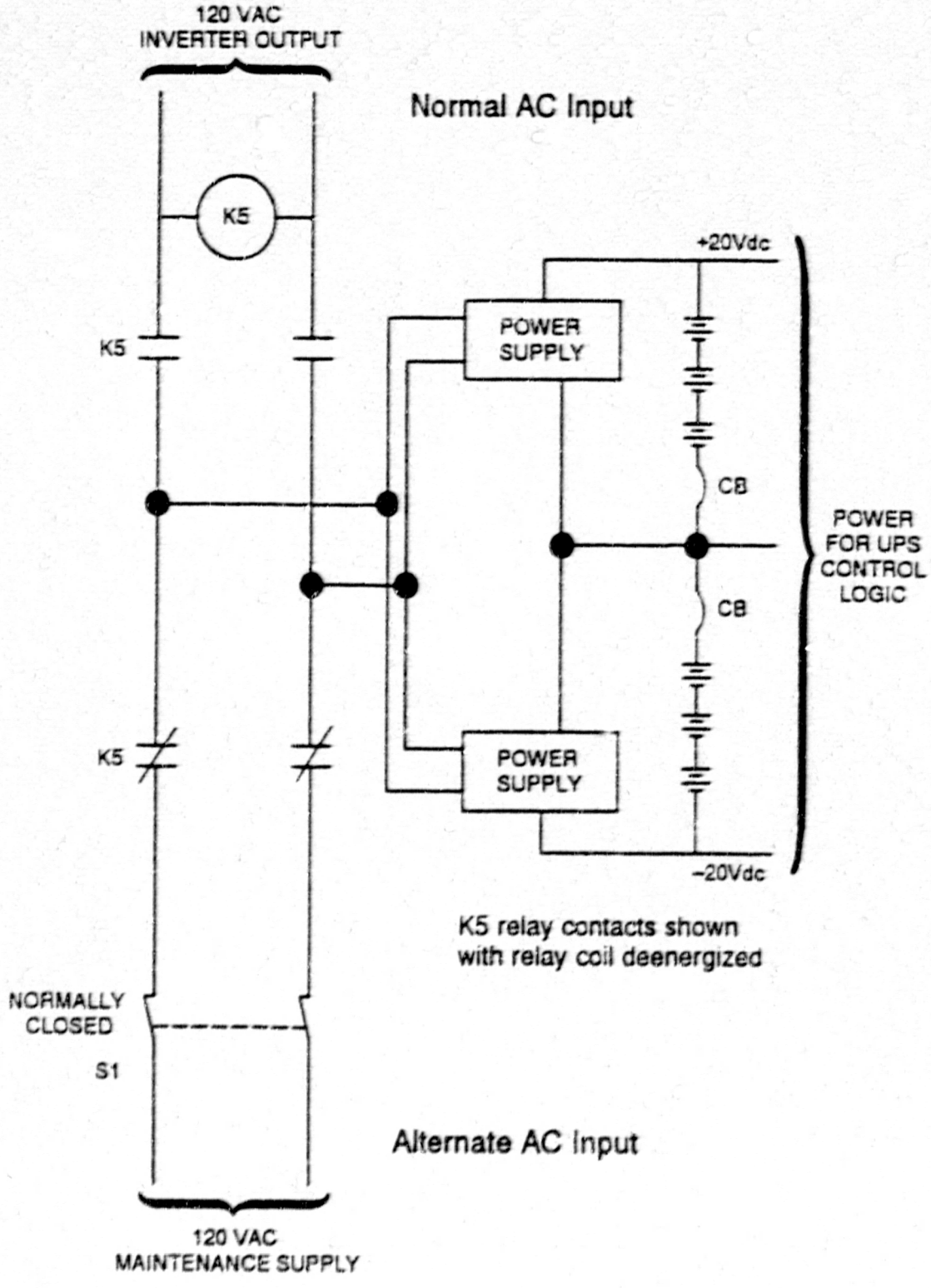
Simplified Diagram for UPS Control Logic Power Supply Design Prior to Modification



Simplified Diagram for Modified UPS Control Logic Power Supply Design



Simplified Diagram for UPS Control Logic Power Supply Design Prior to Modification



Simplified Diagram for Modified UPS Control Logic Power Supply Design

LIST OF RECENTLY ISSUED
NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
92-71	Partial Plugging of Suppression Pool Strainers At A Foreign BWR	09/30/92	All holders of OLs or CPs for nuclear power reactors.
92-70	Westinghouse Motor-Operated Valve Performance Data Supplied to Nuclear Power Plant Licensees	09/25/92	All holders of OLs or CPs for nuclear power reactors.
92-69	Water Leakage from Yard Area Through Conduits Into Buildings	09/22/92	All holders of OLs or CPs for nuclear power reactors.
91-29, Supp. 1	Deficiencies Identified During Electrical Distribution System Functional Inspections	09/14/92	All holders of OLs or CPs for nuclear power reactors.
92-68	Potentially Substandard Slip-On, Welding Neck, and Blind Flanges	09/10/92	All holders of OLs or CPs for nuclear power reactors.
92-67	Deficiency in Design Modifications to Address Failures of Hiller Actuators Upon A Gradual Loss of Air Pressure	09/10/92	All holders of OLs or CPs for nuclear power reactors.
92-66	Access Denied to NRC Inspectors at Five Star Products, Inc. and Construction Products Research, Fairfield, Connecticut	09/01/92	All holders of OLs or CPs for nuclear power reactors and all recipients of NUREG-0040, "Licensee, Contractor and Vendor Inspection Status Report" (White Book).
92-65	Safety System Problems Caused by Modifications That Were Not Adequately Reviewed and Tested	09/03/92	All holders of OLs or CPs for nuclear power reactors.

OL = Operating License
CP = Construction Permit

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