

Reclosers

**Form 4C Microprocessor-Based Recloser Control
KME4-88-1 (120V) and KME4-88-2 (240V)
Analog Current Metering Accessory—Design II**

Service Information

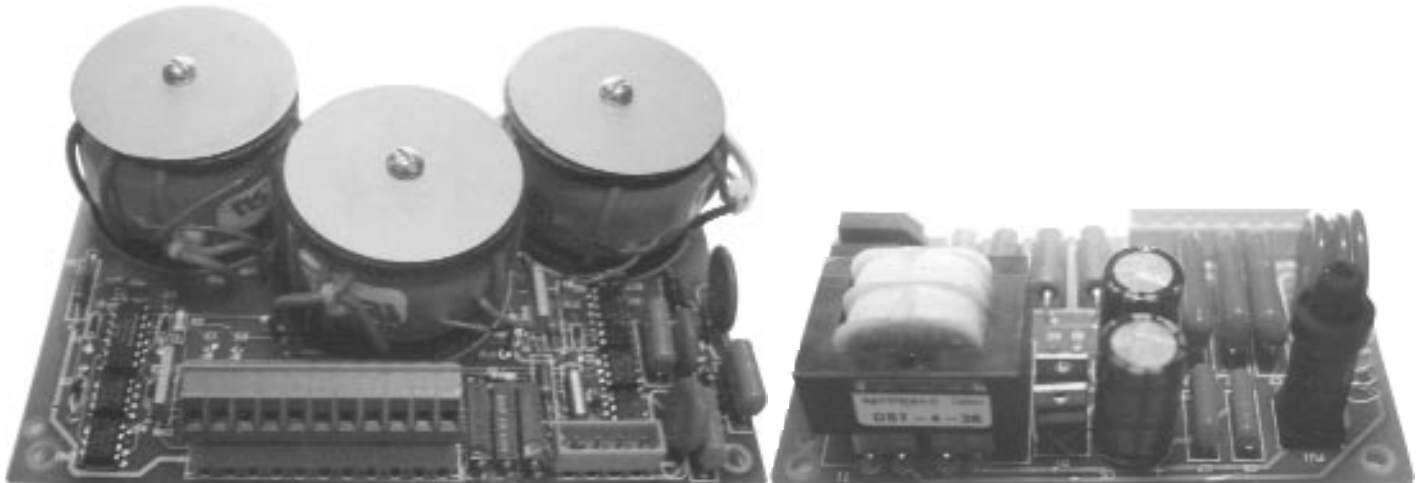
S280-77-6

Figure 1.
Kyle® KME4-88 Analog Current Metering Accessory—Design II, consisting of the main circuit board (left) and power supply board (right).

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SAFETY FOR LIFE



Kyle Distribution Switchgear products meet or exceed all applicable industry standards relating to product safety. We actively promote safe practices in the use and maintenance of our products through our service literature, instructional training programs, and the continuous efforts of all Kyle employees involved in product design, manufacture, marketing, and service.


We strongly urge that you always follow all locally approved safety procedures and safety instructions when working around high voltage lines and equipment and support our “Safety For Life” mission.


SAFETY INFORMATION

Following is important safety information. For safe installation and operation of this equipment, be sure to read and understand all cautions and warnings.

Hazard Statement Definitions


This manual contains two types of hazard statements:


 **WARNING:** Refers to hazards or unsafe practices which can result in death, severe personal injury, and equipment damage.


 **CAUTION:** Refers to hazards or unsafe practices which can result in damage to equipment or in personal injury.

Safety Instructions

Following are general caution and warning statements that apply to this equipment. Additional statements, related to specific tasks and procedures, are located throughout the manual.

 **WARNING:** Before installing, operating, maintaining, or testing this equipment, carefully read and understand the contents of this manual. Improper operation, handling or maintenance can result in death, severe personal injury, and equipment damage. G101.0

 **WARNING:** This equipment is not intended to protect human life. Follow all locally approved procedures and safety practices when installing or operating this equipment. Failure to comply can result in death, severe personal injury and equipment damage. G102.1

 **WARNING:** Hazardous voltage. Contact with high voltage will cause death or severe personal injury. Follow all locally approved safety procedures when working around high voltage lines and equipment. G103.2



PRODUCT INFORMATION

Introduction

Service Information S280-77-6 provides operating instructions for, and information about, the Kyle® KME4-88-1 and KME4-88-2 Analog Current Metering Accessory—Design II option. KME4-88-1 is wired for 120V applications (jumpers J1 and J2, Figure 6, are present; jumper J3 will NOT be present), and KME4-88-2 is wired for 240V use (jumper J3, Figure 6, is present; jumpers J1 and J2 will NOT be present). The accessory is shipped factory-installed in a double-size cabinet housing the Form 4C microprocessor-based recloser control (see Figure 2).

The information contained in this manual is organized into the following major categories: *Safety Information, Product Information, General Description, and Operation*. Refer to the table of contents for page numbers.

Read This Manual First

Read and understand the contents of this manual and follow all locally approved procedures and safety practices before operating this equipment.

Additional Information

These instructions cannot cover all details or variations in the equipment, procedures, or process described, or provide directions for meeting every possible contingency during installation, operation, or maintenance. When additional information is desired to satisfy a problem not covered sufficiently for the user's purpose, please contact your Cooper Power Systems representative.

Maintenance Information

This accessory is designed to be maintenance-free. If the accessory fails to perform satisfactorily, consult your Cooper Power Systems representative.

Acceptance and Initial Inspection

Each accessory is completely assembled, inspected, tested and adjusted at the factory when installed in the Form 4C control. It is installed, ready to use, and in good condition when accepted by the carrier for shipment. Upon receipt of the control, follow these steps:

1. Inspect the Form 4C control thoroughly for damage or loss of parts incurred during shipment. If damage or loss is discovered, file a claim with the carrier immediately.
2. Check for hardware and tighten all fasteners that may have loosened during shipment.

ANSI Standards

Kyle Distribution Switchgear products are designed and tested in accordance with ANSI standards C37.60 and C37.85, and meet the requirements of C37.61 *Application, Operation, and Maintenance of Automatic Circuit Reclosers Guide*.

ISO Standards

The Quality System at the Cooper Power Systems Kyle Distribution Switchgear plant is ISO 9001 certified.

Application

The accessory is pre-configured at the factory within the Form 4C control for external power of 120Vac or 240Vac, as required. KME4-88-1 is wired for 120V applications (jumpers J1 and J2, Figure 6, are present; jumper J3 will NOT be present), and KME4-88-2 is wired for 240V use (jumper J3, Figure 6, is present; jumpers J1 and J2 will NOT be present).

The accessory has the ability to derive a signal representative of recloser (line) current by interfacing with the existing control circuitry, thereby eliminating the need for bushing-mounted current-sensing transformers (CT's). The circuitry involved has negligible effect on the minimum pick-up circuits of the controls. The key features of this derived signal are accuracy, isolation and minimal effect on minimum trip level. The accessory provides a universal dc output of either 0-1mA (current) or 0-10Vdc (voltage) for customer monitoring purposes. The output is an analog signal of 0–10Vdc or 0–1mA for primary currents of 0–1000 amperes using 1000:1 current-sensing transformers. Other CT ratios are compatible, but the output will be scaled appropriately.

TABLE 1

CT Ratio	Primary Amps	Output
500:1	0–500A	0–1mA / 0–10Vdc
1000:1	0–1000A	0–1mA / 0–10Vdc
2000:1	0–2000A	0–1mA / 0–10Vdc

GENERAL DESCRIPTION

The Analog Current Metering Accessory consists of two circuit boards: the current resolution amplifier board (see Figure 3) and a regulated power supply board. The current resolution amplifier circuitry is comprised of recloser CT interface and buffering amplifiers, full-wave amplifiers, and a final filtering amplifier. There are three such sections, one for each phase.

The power supply board has a fused, surge-protected input to a transformer primary. The isolated secondary of the transformer is rectified, filtered, and regulated to provide power to the current resolution amplifier board.

Features

Key features of the Analog Current Metering Accessory–Design II include:

- **Continuous Overload Without Damage:** Inputs of 1.5A continuous, 20A for 1.0 seconds, 40A for 0.25 seconds.
- **Accuracy:** $\pm 5\%$ of reading or ± 5 amps primary line current, whichever is greater.
- **Power Factor Range:** All.
- **Temperature Range:** -40°C to $+60^{\circ}\text{C}$.
- **Frequency Range:** 50/60Hz.
- **Effect on Minimum Trip and TCC's:** Less than 1%.
- **Analog Outputs of 0–1mAdc or 0–10Vdc** at 1000A primary current
- **Monitoring of phase A, B, and C line currents**
- **No extra CT's or cables for transducers required.**

Description of Operation

The established normal operating range on the input is zero-to-one amps ac RMS, based on a 1000:1 CT ratio.

The Analog Current Metering Accessory is capable of a continuous overload of 50% and is capable of sustaining the expected overloads during momentary fault conditions.

Input Power Requirements

The Analog Current Metering Accessory requires four watts of ac power and ships from the factory with either of the following options:

- 120Vac $\pm 10\%$ @ 50/60Hz
- 240Vac $\pm 10\%$ @ 50/60Hz

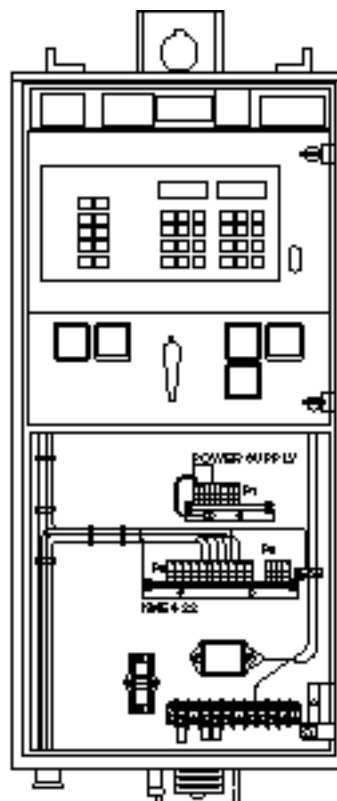


Figure 2. A double-size Form 4C Recloser Control cabinet is required for the KME4-88-1 or KME4-88-2 Analog Current Metering Accessory–Design II.

Customer Connections

CAUTION: Equipment damage; misoperation. External leads must be shielded and the shield must be grounded at both ends. Terminate the shield and each lead with a GE V150LA20A metal oxide varistor (MOV), or equivalent, at the remote end. Attach MOV's between the leads and ground. Failure to properly shield and protect leads can result in equipment damage and/or unintentional operation.

G117.1

The customer connections (Figure 4) are located on the accessory amplifier circuit board and are identified as the P3-1 through P3-4 terminals. Always use shielded cable for wires entering or exiting from the control cabinet.

OPERATION

The Analog Current Metering Accessory monitors instantaneous load current with 0–1mA_{dc} current output or 0–10V_{dc} voltage output at 1000A primary current, 1000:1 sensing CT's.

The Analog Current Metering Accessory consists of three isolated phase circuits. Each circuit places only a small burden (0.2VA) on the recloser current transformer secondary, and has negligible effect on the control current-sensing and fault-timing functions.

The input current is fed through another current transformer with its secondary connected across a resistance to establish an ac voltage proportional to line current. This voltage is then full-wave rectified, filtered and scaled. The signal is then fed into a buffering amplifier which delivers a current or voltage output through surge-protected contacts.

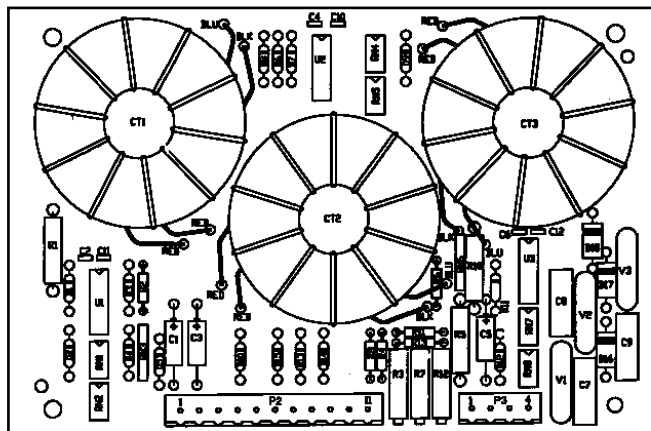


Figure 3.
KME4-88-1 or KME4-88-2 Analog Current Metering Accessory–Design II amplifier circuit board layout.

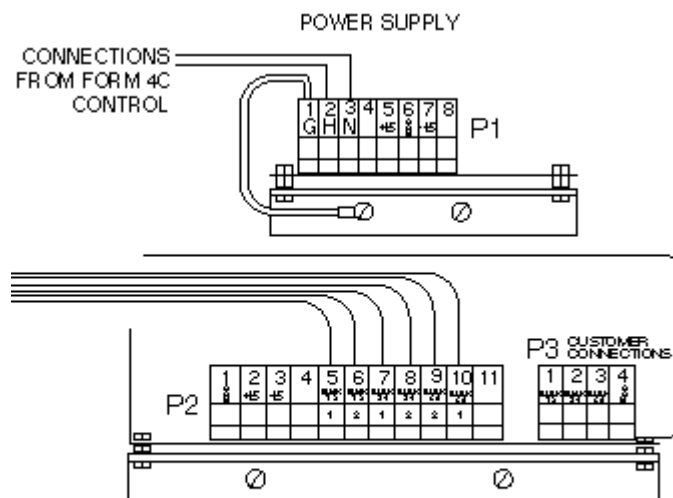


Figure 4.
KME4-88-1 and KME4-88-2 Analog Current Metering Accessory–Design II customer connections are made at terminal strip P3, with common located at P3-4.

Verification of Operation

CAUTION: Recloser misoperation. The control must be removed from service prior to performing any maintenance, testing, or programming changes. Failure to comply can result in mis-operation (unintentional operation) of the recloser.

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If the unit is in service, by-pass and trip the recloser. For by-pass procedure, refer to *Service Information S280-77-1 Form 4C Microprocessor-Based Recloser Control Installation and Operation Instructions*. Use the following procedures to confirm the operation of the accessory. Refer to Figures 4, 5 and 6.

Equipment required: A recloser tester, or a control tester (such as the Kyle Type MET Tester or equivalent) and a multimeter.

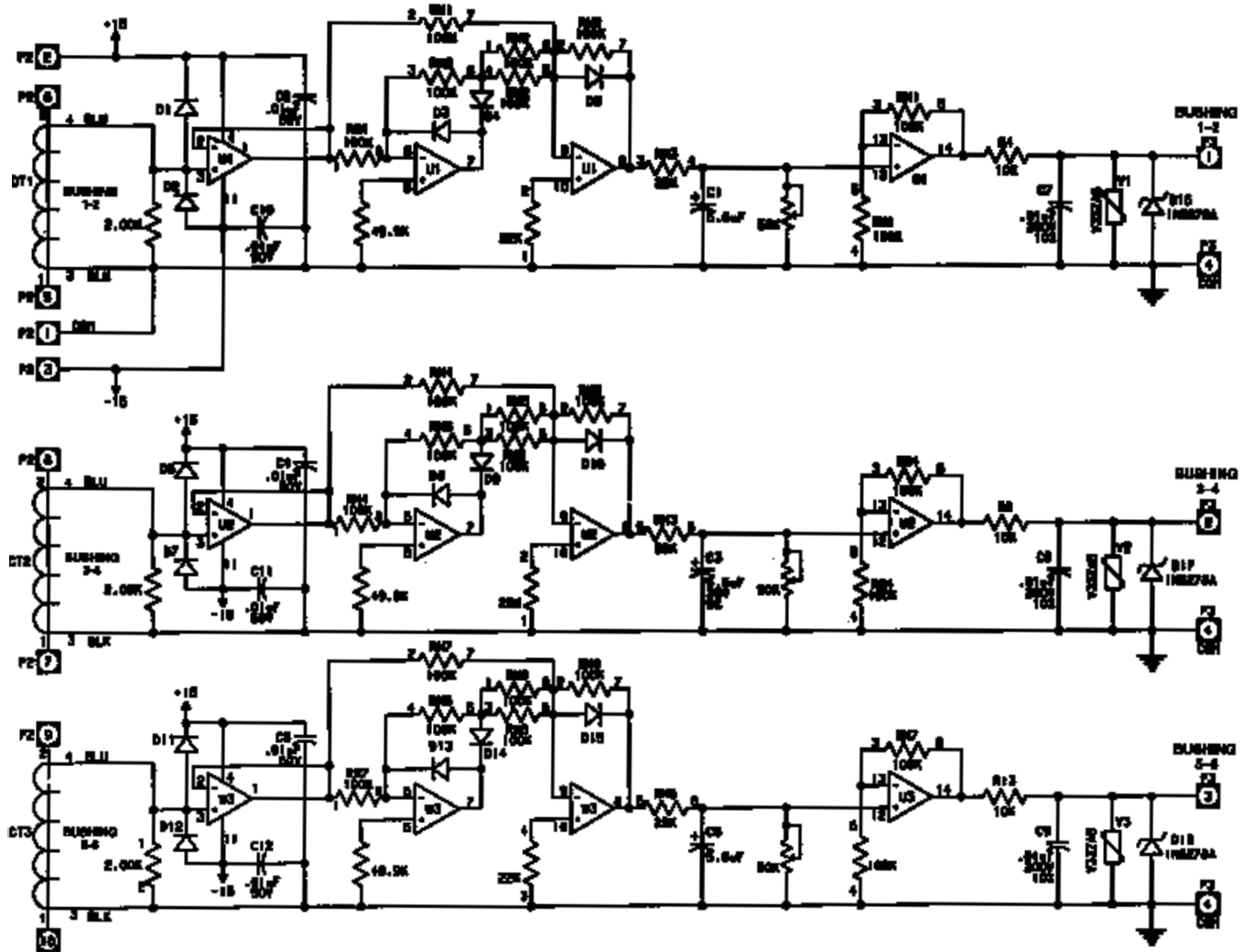


Figure 5. The KME4-88-1 and KME4-88-2 Analog Current Metering Accessory–Design II amplifier circuit board schematic.

Test Procedure

The accessory can be tested to verify proper operation. Testing will require either a high-current test source, or a control tester (such as the Kyle KMET tester).

The full scale test with 1000A primary gives 10Vdc or 1mA; this test may be proportionally scaled for any other desired input test point so that other values may be chosen.

1. Verify that power is present at the power supply board (see Figures 4 and 6). Check voltage across terminals P1-2 and P1-3. Voltage should be either 120Vac or 240Vac, depending on configuration of accessory.
2. Verify that the output of the power supply board is $\pm 15\text{Vdc} \pm 0.3\text{Vdc}$ on both supplies (P1-5 is +15; P1-7 is -15 with respect to common P1-6).
3. Apply test current and measure output at terminals P3-1, 2, 3, and 4 (see Figure 4). For example:

- A. Apply a simulated load current of 100A to the A phase of the control.
- B. Verify that the output of the accessory on terminal P3-1 is 1.0Vdc, or 0.1mA.
- C. Repeat the procedure for both the B and C phases of the control.
- D. Repeat test steps A, B, and C for other current values as desired.

This concludes verification of operation for the accessory. In the event the above test indicates the accessory is malfunctioning, contact your Cooper Power Systems representative.

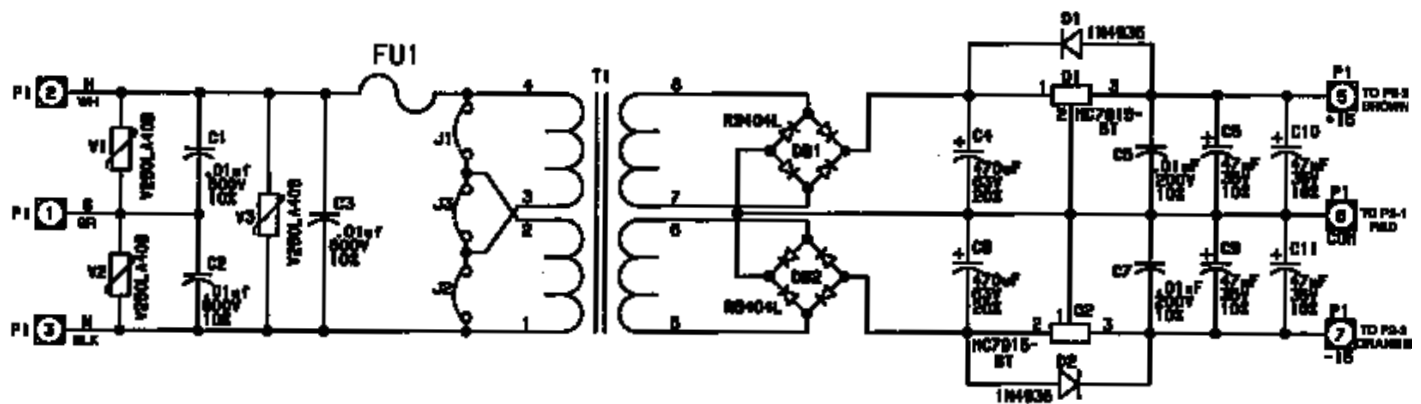


Figure 6.
The KME4-88-1 and KME4-88-2 Analog Current Metering Accessory–Design II power supply board schematic. KME4-88-1 is wired for 120V applications (jumpers J1 and J2 will be present, jumper J3 will NOT be present), and KME4-88-2 is wired for 240V applications (jumper J3 will be present, jumpers J1 and J2 will NOT be present).



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