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REPORT

on

TRIP DEVICES FOR USE IN LOW VOLTAGE AC POWER CIRCUIT BREAKERS

Under The Classification Program

Utility Relay Company, Ltd.  
**\*Chagrin Falls, OH**

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## DESCRIPTION

## PRODUCT COVERED:

\* USC, CNC - Trip Device, AC-PRO, AC-PRO-II, AC-PRO-MP and AC-PRO-MP-II Trip Units.

## GENERAL:

The AC-PRO trip unit is a solid state micro-controller based trip device, intended only for use on the AC low-voltage circuit breakers listed below.

Manufacturer	Breaker Cat. No.	Breaker Rating
Westinghouse	DB-50	1600 A
General Electric	AK-2-50	1600 A
General Electric	AK-2-75	3000 A
ITE	KB Steel Back	600 A
Schneider Electric	Series H-3	800A to 4000A
ITE	K-1600	1600 A
Westinghouse	DS-206	800 A
Westinghouse	DS-416	1600 A
ITE	K-600	600 A
ITE	K800	800A
Westinghouse	DS-632	3200A

The AC-PRO-II unit is a solid state micro-controller based trip device, intended only for use on the AC low-voltage circuit breakers listed below.

Manufacturer	Breaker Cat. No.	Breaker Rating
ITE	K-3000	3000 A
Allis-Chalmers	LA-1600A	1600 A
Westinghouse	DS-416	1600 A
Westinghouse	DS-206	800 A
ITE	K-600	600 A
ITE	K800	800A
Westinghouse	DS-632	3200A
General Electric	AKR-75	3200A
<b>Westinghouse</b>	<b>DB-50</b>	<b>1600 A</b>
<b>General Electric</b>	<b>AK-2-50</b>	<b>1600 A</b>
<b>General Electric</b>	<b>AK-2-75</b>	<b>3000 A</b>
<b>ITE</b>	<b>K-1600</b>	<b>1600 A</b>
<b>ITE</b>	<b>KB Steel Back</b>	<b>600 A</b>
<b>Schneider Electric</b>	<b>Series H-3</b>	<b>800A to 4000A</b>

\*The AC-PRO-MP and AC-PRO-MP-II units are solid state micro-controller based trip **devices**, intended only for use on the AC low-voltage circuit breakers listed below.

Manufacturer	Breaker Cat. No.	*Breaker Rating
Merlin Gerin, Masterpact	16MP H1	1600 A

The trip unit provides 3-phase over-current and fault protection. Ground over-current protection is also available on some models.

The trip unit is "direct acting", since it does not rely on an external power source to perform its protection function. Power is taken directly from the current the trip unit is monitoring by way of a set of current transformers (CTs). See ILLS. 1 and 2 for manufacturer's trip curves (for engineering consideration only).

Trip unit includes instruction manual, including wiring diagrams and trip setting instructions.

#### CURRENT TRANSFORMERS:

The AC-PRO unit is designed for use with CTs made specifically for the AC-PRO device.

**ENGINEERING CONSIDERATIONS (NOT FOR FIELD REPRESENTATIVE'S USE):**

USC - Indicates investigation to United States Standard UL 1066 and the IEEE Standard Requirements for Conversion of Power Switchgear Equipment, IEEE C37.59-1991, to determine compliance with appropriate sections of the Standard for Trip Devices for AC and General Purposes DC Low-Voltage Power Circuit Breakers, ANSI C37.17-1979 and the Standard For Low-voltage AC Power Circuit Breakers used in Enclosures-Test Procedures, ANSI C37.50-1989.

CNC - Indicates investigation to Canadian Standard C22.2, No. 31, Switchgear Assemblies.

1. These devices have been investigated and found suitable for use in place of the original trip device of each specific low voltage alternating-current power circuit breaker as identified above. These devices are intended for field or factory assembly.

2. The Classification covers only the trip device in its ability to sense and respond to overcurrent and fault current conditions. This Classification does not cover the circuit breaker on which the trip device is mounted.

3 All servicing of the units to be conducted by the manufacturer or a service person designated by the manufacturer to insure proper replacement parts. An instruction manual is to be provided with each unit to insure proper installation and optimum operation.

4. This product is Classified with respect to the risk of electric shock, fire and mechanical injury only.

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## CONSTRUCTION DETAILS

## Markings -

Each unit shall be provided with the following markings:

1. Classified company name, date of manufacture, model and serial number.
2. Long time, short time, instantaneous and ground fault settings are set by switch settings as described in the manual.
3. Each unit shall be marked with a compatibility list of suitable power circuit breaker model numbers, and frame sizes. Example  
"For this unit, the suitable low voltage power circuit breaker is  
\*Westinghouse Type DB-50, 1600A frame size.

Corrosion Protection - All ferrous metal parts are protected from corrosion by plating, galvanizing or enameling. This does not apply to minor parts such as screws, washers and the like.

## AC-PRO TRIP UNIT - FIG. 1 (N98-20434)

GENERAL - For interior view, See Fig. 2.

- \* 1. Enclosure - **Iridite coated** aluminum alloy 3/32 in. thick, 6-3/4 by 2-1/4 by 3-26/32 in. overall.
- \* Alternate - End Panels, **Iridite coated aluminum alloy 1/16 in. thick.**
- 2. Window - Clear Mylar plastic .007 in. thick with adhesive laminated backing, Cat. No. 3M 467MP, manufactured by 3M.
- 3. Terminal Blocks - R/C (XCFR2), Type MSTB 2.5, manufactured by Phoenix contact.

## AC-PRO TRIP UNIT INTERIOR - FIG. 2 (N98-20522)

GENERAL - Components on printed circuit board are not itemized. Illustrates general layout of components.

1. Printed Wiring Boards - Any R/C (ZPMV2) printed wiring board, 105°C temperature rating, 94V-2 minimum flammability. Solder temperature and solder times as specified by the printed wiring board manufacturer.

2. Coating - R/C (QMJU2), coatings for use on Recognized printed wiring boards, designated Grade 1A33, manufactured by HumiSeal.

## AC-PRO OFF-BOARD FRAM P.C.B. - FIG. 3

General - Components on printed circuit board are not itemized.  
Illustrates general layout of components.

1. Printed Wiring Boards - Any R/C (ZPMV2) printed wiring board, 105°C temperature rating, 94V-2 minimum flammability. Solder temperature and solder times as specified by the printed wiring board manufacturer.
2. Battery - 9 Volt battery for back-up power. Attached through 2 leads.
3. **Coating - R/C (QMJU2), coatings for use on Recognized printed wiring boards, designated Grade 1A33, manufactured by HumiSeal.**



Fig. 3, 4

## AC-PRO-II TRIP UNIT - (PCB-51.0-P1)

GENERAL - Components on printed circuit board are not itemized. Illustrates general layout of components. See Illustration 4 and Ill. 13.

1. Enclosure - **Die Cast** aluminum, approximately 0.080 in. thick, 5 by 1 9/16 by 3 1/2 in. overall. (Encloses PCB-51.0-P1 and PCB-53.0-P3). See Illustration 12.
2. Window - Clear Mylar plastic .007 in. thick with adhesive laminated backing, Cat. No. 3M 467MP, manufactured by 3M.
3. Printed Wiring Boards - Any R/C (ZPMV2) printed wiring board 4 layer, FR-4, min. 105°C temperature rating, 94V-2 minimum flammability. Solder temperature and solder times as specified by the printed wiring board manufacturer.
4. Coating - R/C (QMJU2), coatings for use on Recognized printed wiring boards, designated Grade 1A33, manufactured by HumiSeal.
5. Q2 - MOSFET N-CH, rated 60V, 300 mA.
6. Ribbon Cable - (ZPXK2), manufactured by ZHUHAI SOFTWIN ELECTRONICS LTD, rated V-0.
7. Battery - 9 Volt battery for back-up power.
8. Terminal Blocks (J1)- R/C (XCFR2), Connector Type MSTB 2.5, manufactured by Phoenix contact.
9. Terminal Blocks (J3)- R/C (XCFR2), Connector Type MSTB 2.5, manufactured by Phoenix contact.

Fig. 5, 6

## AC-PRO-II TRIP UNIT- (PCB-53.0-P3)

GENERAL - Components on printed circuit board are not itemized. Illustrates general layout of components, see illustration 5.

1. Printed Wiring Boards - Any R/C (ZPMV2) printed wiring board, 6 layer, FR-4, min. 105°C temperature rating, 94V-2 minimum flammability. Solder temperature and solder times as specified by the printed wiring board manufacturer.
2. Coating - R/C (QMJU2), coatings for use on Recognized printed wiring boards, designated Grade 1A33, manufactured by HumiSeal.
3. Connectors (J6) - (ECBT2), manufactured by Samtec, type S2M-110-02-F-D-LC.
4. Connectors (J2)-(ECBT2), manufactured by Molex, type 5566, rated 600V, 13 Amps, or equivalent.
5. (Q12) - MOSFET N-CH, rated 60V, 50 A, type BSC110N06NS3.
6. (U37) - R/C (NLDX2)- Magnetically Operated Relay, manufactured by Panasonic, type DSP1-L2-DC24V, rated 24V, 5A.
7. (Q33) - rated 500V, 8 A rms.

**\*AC-PRO-MP TRIP UNIT - F7-13**

GENERAL - Components on printed circuit board are not itemized. Illustrates general layout of components. Consist of four multi-layer PWB's. See Illustrations 6-9 for each pwb layout. See Ill. 11 for components.

1. Enclosure - Stainless Steel 14 Gauge(.075) in. thick, estimated 10-1/2 by 4-3/4 by 2-1/4 in. overall. See Illustration 10.
2. Window - Clear Mylar plastic .007 in. thick with adhesive laminated backing, Cat. No. 3M 467MP, manufactured by 3M.
3. Printed Wiring Boards - Any R/C (ZPMV2) printed wiring board, FR-4, min. 105°C temperature rating, 94V-2 minimum flammability. Solder temperature and solder times as specified by the printed wiring board manufacturer.
4. Coating - R/C (QMJU2), coatings for use on Recognized printed wiring boards, designated Grade 1A33, manufactured by HumiSeal.

## AC-PRO-MP-II TRIP UNIT - F14-21

GENERAL - Components on printed circuit board are not itemized. Illustrates general layout of components. Consist of five single and multi-layer PWB's. See Illustrations 14-18 for each pwb layout. See Ill. 19 for components.

1. Enclosure - Stainless Steel 14 Gauge(.075) in. thick, estimated 10-1/2 by 4-3/4 by 2-1/4 in. overall.
2. Window - Clear Mylar plastic .007 in. thick with adhesive laminated backing, Cat. No. 3M 467MP, manufactured by 3M.
3. Printed Wiring Boards - Any R/C (ZPMV2) printed wiring board, FR-4, min. 105°C temperature rating, 94V-2 minimum flammability. Solder temperature and solder times as specified by the printed wiring board manufacturer.
4. Coating - R/C (QMJU2), coatings for use on Recognized printed wiring boards, designated Grade 1A33, manufactured by HumiSeal.