Type AR and ARS
High Speed Auxiliary Relays

Application
AR
The AR relay is a four-pole auxiliary type relay designed for ultra high speed circuit breaker tripping duty in protective relaying systems. It is well suited for bus arrangements where more than one breaker must be tripped. The relay may also be applied to provide isolation of primary and back-up relaying, and provide high speed tripping for zone 1 faults.

It is normally furnished with four “make” contacts and will operate in 2 ms. with 10 watts of input power. The contacts will make and carry 30 amperes long enough to trip a breaker.

AR (High Threshold)
The high threshold AR relay is a sensitive high speed auxiliary relay with 4 normally open contacts designed to be secure against misoperation due to inadvertent grounding of a station battery or the trip lead. With the battery balanced with respect to ground, the maximum momentary voltage that can be applied to an auxiliary relay for either of these grounds is half battery voltage. The operating level of the high threshold AR exceeds these levels.

The relay operates in 4 milliseconds for an energy input of 10 watts.

The AR relays are available as an open unit mounted in a small molded case or in a type FT-11 FlexiTest case. They can also be supplied as a double unit in a type FT-22 FlexiTest case.

ARS
The ARS relay provides a high speed contact output with a 15 to 20 volt low energy level signal input. The relay may be used as an auxiliary when high speed contact output is required in response to solid state circuitry output or as an oscillograph interface.

The driving device must be capable of providing an input to the ARS relay of 6 milliamperes at a level of 15 to 20 volts.

The type ARS relay is composed of 1 or 2 AR units mounted in a FT-11 or FT-22 FlexiTest case.

Construction and Operation
AR
The basic relay unit consists of four stationary contacts, four leaf-spring moving contacts, a moving armature and card assembly which operates the moving contacts.

The moving and stationary contacts are mounted on a molded insulation block. The molded block, coil and lamination assembly is mounted to the frame.

All contacts are fine silver.

High speed operation is obtained by the low inertia of the moving parts, a sensitive electromagnet, and the proper L/R ratio of the operating circuit.

ARS
The type ARS relay is composed of 1 or 2 AR units (described at left) with series resistors, a printed circuit module, and indicating contractor switches (ICS) when required.

With the rated supply voltage applied to the relay, the proper signal voltage applied to an input terminal will cause the related AR unit to pick up. The AR unit will then energize the ICS (if used), which will seal around the AR unit contacts.
Characteristics
The AR unit without a series resistor has a sensitivity of 500 milli-amps. By properly combining the AR unit and a series resistor, an optimum speed of 2 milliseconds can be obtained for an energy input of 10 watts.

All AR units are capable of being energized continuously. All high speed relays will pick up at 80% of rated voltage or less; and drop out at 10% of rated voltage or higher.

AR (High Threshold)
The relay is adjusted to have a pickup value less than 80% of rating, but not less than 50% of the typical battery equalizing charge voltage, i.e. minimum pickup is greater than:

- 28 volts for 48 volt rating
- 70 volts for 125 volt rating
- 140 volts for 250 volt rating

The relay will drop out at 10% of rated voltage or higher. The relay is only available in a 4 wing configuration. Typical effective contact bounce is outlined below:

AR Only
The operate time of the relay with delayed dropout is about 6 ms, at rated voltage for a normally open contact. The relay will have a 0.1 second dropout time after being energized at least 0.015 seconds.

AR Unit Contact Rating

<table>
<thead>
<tr>
<th>Contact Circuit Volts DC</th>
<th>Interlocking Rating (Amps)</th>
<th>Carry Rating (Amps)</th>
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<tr>
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<td>Resistive</td>
<td>Inductive L/R – .005</td>
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<tr>
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<td>Single</td>
<td>Double</td>
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<td>1.0</td>
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AR Unit Contact Bounce

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<th>Contact Loading</th>
<th>Effective Bounce Time in Milliseconds</th>
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<tr>
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<td>Normally Open</td>
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<tr>
<td>Dry Circuit</td>
<td>2</td>
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<tr>
<td>10 Watt (one AR)</td>
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<td>Breaker Trip Coil</td>
<td>.2</td>
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ARS Maximum Circuit Delay Time

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<th>Input (Dc Volts)</th>
<th>Voltage Applied</th>
<th>Delay Time in Microsecond</th>
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<td>20</td>
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<td>105</td>
<td>300</td>
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Further Information
List Prices: PL 41-020
Technical Data: TD 41-025
Instructions:
Type AR, IL 41-759
Type ARS, IL 41-759.2
Type AR (High Threshold), IL 41-759.3
Renewal Parts:
Type AR, RPD 41-901
Type ARS, RPD 41-902
Flexiteast Case Dimensions: DB 41-076
Contactor Switches: DB 41-981
Other Protective Relays:
Application Selection Guide, TD 41-016

Carton Dimensions and Weights

<table>
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<tr>
<th>Case Type</th>
<th>No of Units</th>
<th>Net Weight Lbs. (KG)</th>
<th>Shipping Wt. Lbs. (KG)</th>
<th>Domestic Carton Inches (cm)</th>
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<td>Small Glass</td>
<td>1</td>
<td>(91)</td>
<td>4 (1.8)</td>
<td>4.75(12) x 9(22.8) x 8.5(21.6)</td>
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<tr>
<td>Flexiteast FT-11</td>
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<td>10 (4.5)</td>
<td>9(22.8) x 12(30.5) x 13(33)</td>
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<tr>
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<td>(5.0)</td>
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### Auxiliary, Non-Adjustable Pickup, 2 Milliseconds Operating Time

#### Molded Base Type (Device Number: 94X, Y, Z)

<table>
<thead>
<tr>
<th>Type</th>
<th>Contacts</th>
<th>Dc Rating</th>
<th>Watts</th>
<th>Relay Data</th>
<th>Projection Rear Connected Glass Window Cover®</th>
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<td>Volts</td>
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#### Flexitest Case Type

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#### Double Unit

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**Notes:**
- Denotes item available from stock
- Denotes item is "Quick Ship" style. "Quick Ship" is being phased in during 1990/1991 - check for availability.
- ICS: Indicating Contactor Switch (dc current operated) having seal-in contacts and indicating lags which are actuated when the ICS coil is energized at or above pickup current setting. Suitable for dc control voltages up to and including 250 volts dc. Two current ranges available:
  1. 0.2/2.0 amps dc, with tapped coils.
  2. 1.0 amp dc, without taps.
- Rating of ICS unit used in specific types of relays is shown in price tables. All other ratings must be negotiated.
- Maximum of 2 break contacts.
- Ten terminal case; available with 4 electrically independent contacts.
- Eight terminal case; not available with 4 electrically independent contacts.
Auxiliary, High Threshold, 70 Volt Pickup, 4 Milliseconds Operating Time

### Molded Base Type (Device Number: 94X, Y, Z)

<table>
<thead>
<tr>
<th>Type</th>
<th>Contacts</th>
<th>DC Rating</th>
<th>Watts</th>
<th>Relay Data</th>
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<tbody>
<tr>
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<td>Volts</td>
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<td>Watts</td>
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<td>Rear Connected Projection Mounted – Solid Cover</td>
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<td>Internal Schematic</td>
<td>Style Number</td>
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**Notes:**
- Denotes item available from stock.
- Denotes item is “Qwik Ship” style. Qwik Ship is being phased in during 1990/1991 – check for availability.
- Not available with break contacts.
- ICs: Indicating Contactor Switch (dc current operated) having seal-in contacts and indicating target which are actuated when the ICs coil is energized at or above pickup current setting. Suitable for dc control voltages up to and including 250 volts dc. Two current ranges available:
  1. 0.2/2.0 amps dc, with tapped coil.
  2. 1.0 amp dc, without taps.
- Rating of ICs unit used in specific types of relays is shown in price tables. All other ratings must be negotiated.
- When ac current is necessary in a control trip circuit, the ICs unit can be replaced by an ACS unit.
- The ACS unit may be supplied in place of an ICs unit at no additional cost. Specify system voltage rating on order.

### Non-Adjustable Pickup, 2 Millisecond Operating Time (Device Number: 94X, Y, Z)

<table>
<thead>
<tr>
<th>Type</th>
<th>Input Voltage – dc</th>
<th>Supply Voltage – dc</th>
<th>Watts</th>
<th>Contact Arrangement</th>
<th>ICS Unit</th>
<th>Internal Schematic</th>
<th>Style Number</th>
<th>Case Size</th>
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ABB Power T&D Company Inc.  
Relay Division  
4300 Coral Ridge Drive  
Coral Springs, FL 33065  
954-752-6700

ABB Power T&D Company Inc.  
Relay Division  
7036 Snowdrift Road, Suite 2  
Allentown, PA 18106  
610-395-7333

December, 1990