

## Remote Controlled Circuit Breaker (RCCB)



### Single Pole

- 28 VDC
- 115/200 VAC 400 Hz



### Three Phase

- 115/200 VAC 400 Hz
- Three Phase Only

### Qualified

Qualified to demanding performance parameters of MIL-PRF-83383 standard.

### Use as a Relay, Circuit Breaker, Or Both

RCCBs combine the best attributes of a circuit breaker and a relay. Automatically protects the wires and the load device during circuit/load breakdown, but allows the flight deck control of the load during normal operation.

### Weight and Cost Savings

In distributed-load applications, RCCBs are a more efficient power distribution solution promoting cost and weight savings through the elimination of long runs of heavy cables associated with the conventional relay - flight deck circuit protector method. Control of the RCCB requires only one #22 AWG control wire from the ICU on the flight deck to the RCCB.

### Cockpit Space Savings

An RCCB system removes the presence of large circuit breakers from the cockpit while permitting remote On/Off operation from the flight deck. Combine Eaton RCCB with Indicator Control Unit (ICU) model #1500-052-05.

## PERFORMANCE DATA

<b>Rupture Levels</b>	3600 A (115 VAC or 28VDC for 1Pole and 115VAC for 3 Pole)
<b>Endurance (Resistive &amp; Inductive(Motor))</b>	50,000 Cycles
<b>Endurance (Motor)</b>	5-50A: 50,000 cycles; 60-100A: 25,000 cycles
<b>Endurance (Lamp)</b>	5-25A: 50,000 cycles; 35-50A: 25,000 cycles; 60-100A: no rating
<b>Dielectric Strength</b>	1500V, 60Hz, MIL-STD-202, method 301, 0.5 MA max
<b>Insulation Resistance</b>	100 mega ohm min, MIL-STD-202, method 302
<b>Thermal Temperature Range</b>	-54°C to 71°C (-65°F to 160°F). MIL-STD-202, Method 107
<b>Vibration</b>	10G's to 2000 Hz. Exceeds MIL-STD-202, Method 204, Condition C, 10 microseconds max. chatter
<b>Shock</b>	25G's. MIL-STD-202, Method 213, 10 microseconds max. chatter
<b>Altitude</b>	50,000 ft.
<b>EMI Requirements</b>	MIL-STD-461, Requirements CS114 and RE102 over the frequency range of 14 KHz to 400 MHz and RE102 limits for Aircraft and Space Systems.
<b>EMI/RFI Susceptibility and Generation</b>	MIL-STD-461, Class 1D
<b>Moisture Resistance</b>	MIL-STD-202, method 106
<b>Salt Spray Resistance</b>	MIL-STD-202, method 101, Condition B
<b>Sand and Dust Resistance</b>	MIL-STD-202, method 110, Condition A
<b>Fungus Resistance</b>	MIL-HDBK-454, Guideline 4
<b>Explosion Proof</b>	MIL-STD-202, method 109
<b>Weight (Single Pole)</b>	5-25A: 318 grams (0.703 lbs.); 35-50A: 325 grams (0.719 lbs.); 60-100A: 332 grams (0.734 lbs.)
<b>Weight (w/ Auxiliary Contacts)</b>	5-25A: 332 grams (0.734 lbs.); 35-50A: 339 grams (0.750 lbs.); 60-100A: 346 grams (0.766 lbs.)
<b>Weight (Three Phase)</b>	2.0 lbs. max.

## OVERLOAD CALIBRATION DATA

Specification Table	@ 25°C		@ +71°C		@ -54°C		Test Time Parameters
	MIN	MAX	MIN	MAX	MIN	MAX	
Must Hold	115%		115%		115%		% for 1 Hour
Must Trip		138%		138%		150%	% Within 1 Hour

## Remote Controlled Circuit Breaker (RCCB)

### Engineering Data

#### Single Pole Single Throw (Double Break Contacts)

Catalog Number <sup>①</sup>	Rated Contact Load (Amperes)								MIL-PRF-83383 Part Number	Maximum Weight Oz/gm
	28 Vdc				115/200 V 400 Hz					
	Res.	Ind.	Motor	Lamp	Res.	Ind.	Motor	Lamp		
SM600BA5A1	5	5	5	5	5	5	5	5	M83383/02-01	11.75/332
SM600BA5N1									M83383/01-02	11.25/318
SM600BA10A1	10	10	10	10	10	10	10	10	M83383/02-03	11.75/332
SM600BA10N1									M83383/01-03	11.25/318
SM600BA15A1	15	15	15	15	15	15	15	15	M83383/02-04	11.75/332
SM600BA15N1									M83383/01-04	11.25/318
SM600BA20A1	20	20	20	20	20	20	20	20	M83383/02-05	11.75/332
SM600BA20N1									M83383/01-05	11.25/318
SM600BA25A1	25	25	25	25	25	25	25	25	M83383/02-06	11.75/332
SM600BA25N1									M83383/01-06	11.25/318
SM600BA35A1	35	35	35	35	35	35	35	35	M83383/02-07	12.00/339
SM600BA35N1									M83383/01-07	11.50/325
SM600BA40A1	40	40	40	40	40	40	40	40	M83383/02-08	12.00/339
SM600BA40N1									M83383/01-08	11.50/325
SM600BA50A1	50	50	50	50	50	50	50	50	M83383/02-09	12.00/339
SM600BA50N1									M83383/01-09	11.50/325
SM600BA60A1	60	60	60	—	60	60	60	—	M83383/02-10	12.25/346
SM600BA60N1									M83383/01-10	11.75/332
SM600BA75A1	75	75	75	—	75	75	75	—	M83383/02-11	12.25/346
SM600BA75N1									M83383/01-11	11.75/332
SM600BA100A1	100	100	100	—	100	100	100	—	M83383/02-13	12.25/346
SM600BA100N1									M83383/01-13	11.75/332

#### Three Pole Single Throw (Double Break Contacts)

Catalog Number <sup>①</sup>	Rated Contact Load (Amperes)				MIL-PRF-83383 Part Number
	115/200 V 400 Hz				
	Res.	Ind.	Motor	Lamp	
SM601BA10A1	10	10	10	10	M83383/04-03
SM601BA15A1	15	15	15	15	
SM601BA20A1	20	20	20	20	M83383/04-05
SM601BA25A1	25	25	25	25	
SM601BA35A1	35	35	35	35	M83383/04-07
SM601BA40A1	40	40	40	40	M83383/04-08
SM601BA50A1	50	50	50	50	
SM601BA60A1	60	60	60	60	M83383/04-10

① Contact factory on alternate amperage, trip times, control configurations, grounding, auxiliary switches, and mounting systems.

## Remote Controlled Circuit Breaker (RCCB)

### ORDERING INFORMATION

AMPERE RATING	Single Pole Single Throw (Double Break Contacts)				Three Pole Single Throw (Double Break Contacts)	
	Standard		w/ Auxiliary Contacts		w/ Auxiliary Contacts	
	MS P/N	EATON P/N	MS P/N	EATON P/N	MS P/N	EATON P/N
5	M83383/01-01	SM600BA5N1	M83383/02-01	SM600BA5A1		**
7.5		**		**		**
10	M83383/01-03	SM600BA10N1	M83383/02-03	SM600BA10A1	M83383/04-03	SM601BA10A1
15	M83383/01-04	SM600BA15N1	M83383/02-04	SM600BA15A1		SM601BA15A1
20	M83383/01-05	SM600BA20N1	M83383/02-05	SM600BA20A1	M83383/04-05	SM601BA20A1
25	M83383/01-06	SM600BA25N1	M83383/02-06	SM600BA25A1		SM601BA25A1
35	M83383/01-07	SM600BA35N1	M83383/02-07	SM600BA35A1	M83383/04-07	SM601BA35A1
40	M83383/01-08	SM600BA40N1	M83383/02-08	SM600BA40A1	M83383/04-08	SM601BA40A1
50	M83383/01-09	SM600BA50N1	M83383/02-09	SM600BA50A1		SM601BA50A1
60	* M83383/01-10	SM600BA60N1	M83383/02-10	SM600BA60A1	M83383/04-10	SM601BA60A1
75	* M83383/01-11	SM600BA75N1	M83383/02-11	SM600BA75A1		
80	*	**		**		
100	* M83383/01-13	SM600BA100N1	M83383/02-13	SM600BA100A1		

All Ampere Ratings equal to Rated Contact Loads (Resistive, Inductive, Motor, and Lamp) except as noted.

\* No Lamp Load Rating

\*\* Contact Factory

Note: Contact factory on alternate amperage, trip times, control configurations, grounding, auxiliary switches, mounting systems, etc.

### SINGLE POLE

#### OVERLOAD CALIBRATION DATA

Ratings	Percent Rated Current	Ambient Temperature Degrees C. ± 5°	Tripping Time
All	115%	25°C & 71°C	No Trip
	138%		1 Hour Max.*
	115%	-54°C	No Trip
	150%		1 Hour Max.*

\* Must trip in one hour.

#### OVERLOAD CALIBRATION DATA — SINGLE POLE

AMPERE RATING	200% Trip Times -54°C to +71°C		400% Trip Times -54°C to +71°C		1000% Trip Times -54°C to +71°C	
	MIN SECONDS	MAX SECONDS	MIN SECONDS	MAX SECONDS	MIN SECONDS	MAX SECONDS
5	7	40	1.2	6.4	0.3	1.2
7.5	11	40	2.4	6.8	0.33	1.1
10	12	42	2.8	8.5	0.42	1.05
15	13	45	1.7	8.3	0.35	1.2
20	14	46	2.9	7.6	0.4	1.15
25	15	50	2.6	8.7	0.4	1.3
35	16	55	2.8	8.3	0.35	1.3
40	16	55	2.9	9.2	0.36	1.3
50	13	55	2.9	10	0.4	1.25
60	13	60	2.6	13	0.26	1.8
75	13	60	2.5	13	0.26	1.8
80	14	60	2.7	12.5	0.3	2
100	17	63	3.5	13	0.38	1.9

### TRIP CURVE

Contact business unit for trip curve.

### TRIPLE POLE

#### OVERLOAD CALIBRATION DATA

Ratings	Percent Rated Current	Ambient Temperature Degrees C. ± 5°	Tripping Time
All	115%	25°C & 71°C	No Trip
	138%		1 Hour Max.*
	115%	-54°C	No Trip
	150%		1 Hour Max.*

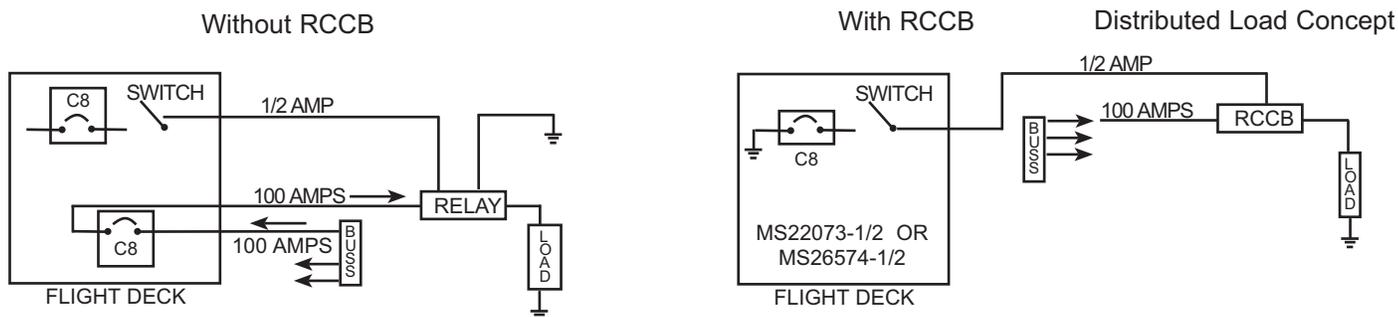
\* Must trip in one hour.

#### OVERLOAD CALIBRATION DATA — THREE POLE

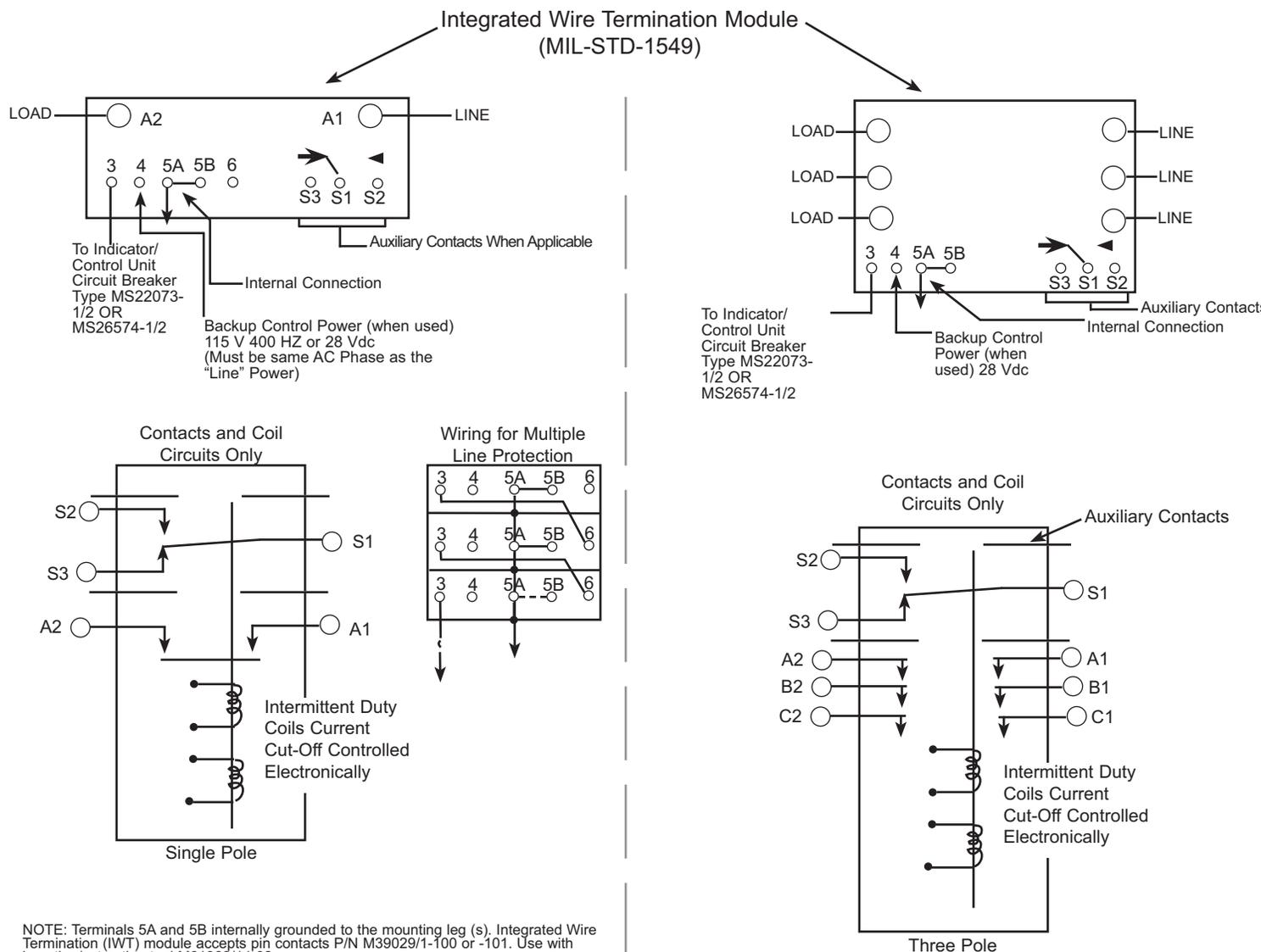
AMPERE RATING	200% Trip Times -54°C to +71°C		400% Trip Times -54°C to +71°C		1000% Trip Times -54°C to +71°C	
	MIN SECONDS	MAX SECONDS	MIN SECONDS	MAX SECONDS	MIN SECONDS	MAX SECONDS
10	12	80	2.8	11	0.42	1.3
15	13	80	1.7	10	0.35	1.2
20	14	80	2.9	9.6	0.4	1.15
25	15	80	2.6	10	0.4	1.3
35	16	80	2.8	11	0.35	1.3
40	16	80	2.6	10	0.36	1.3
50	13	80	2.9	10	0.4	1.25
60	13	80	2.4	16	0.26	1.8

# Remote Controlled Circuit Breaker (RCCB)

## Engineering Data Application Note



## Typical Wiring Diagrams

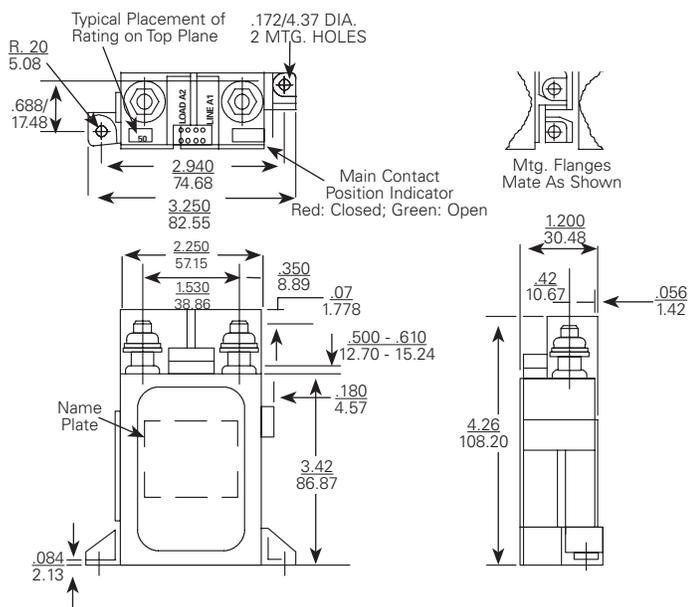


NOTE: Terminals 5A and 5B internally grounded to the mounting leg (s). Integrated Wire Termination (IWT) module accepts pin contacts P/N M39029/1-100 or -101. Use with insertion/extraction tool M81969/14-02.

# Remote Controlled Circuit Breaker (RCCB) — 1 Pole and 3 Pole

## Engineering Data

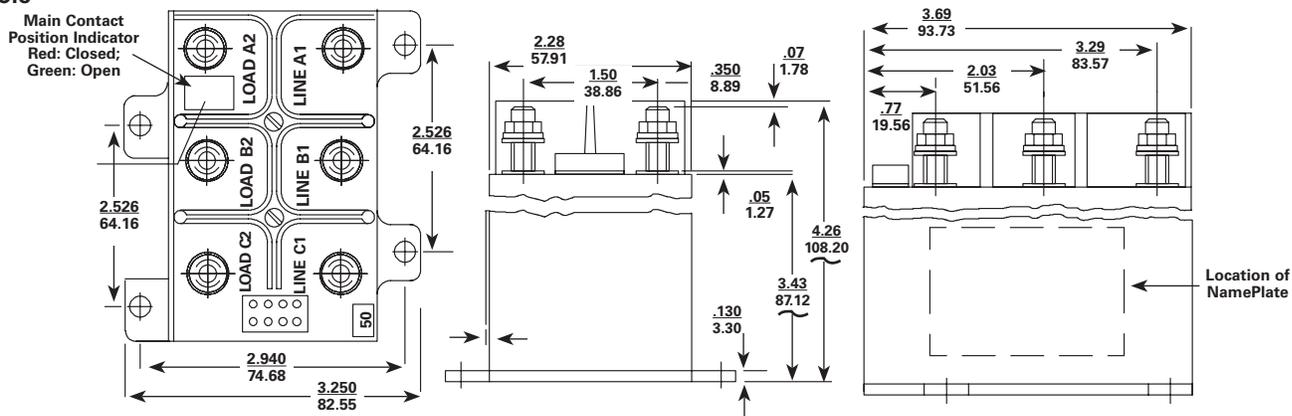
### Approximate Dimensions - 1 Pole



### Options

- Special application auxiliary switches
- Unique grounding
- Power sources
- Other current ratings
- Control via systems other than I/CU
- Low level auxiliary contacts available
- Data Bus/Interface capability available
- Electronically held coil
- Moisture resistant sealing

### Three Pole



### Coil Operate Current/Set And Trip Time RCCB

Circuits	Nominal System Voltage	I/CU Set Current @ Nom Voltage (Mulliamper)	Set Coil Current @ Nom Voltage Pulse	MAX. Set Time		*I/CU. Trip Current Nominal					MAX. Standby Current Milliamp
				Nominal Voltage & Room Temp.	Most Adverse Condition - MIN. Voltage 71°C. Ambient	71°C & Nominal Voltage	-54°C & Nominal Voltage	Room Temp. Nominal Voltage	71°C & Nominal Voltage	-54°C & Nominal Voltage	
1 Pole	28 Vdc (18 Volts MIN.)	2	3.0 AMP MAX	20 Millisec	35 Millisec	1.4 AMP	1.9 AMP	1.6 AMP	0.9 AMP ***	2.1 AMP	10
	115 Vac 400 Hz (104 V. MIN.)	2	10 AMP MAX	15 Millisec	30 Millisec	6.8 AMP **	6.3 AMP **	8.6 AMP **	6.1 AMP **	7.0 AMP **	10
3 Pole	28 Vdc (18 Volts MIN.)	2	7.0 AMP MAX	20 Millisec	35 Millisec	1.5 AMP	2.0 AMP	1.7 AMP	0.9 AMP ***	2.2 AMP	10
	115 Vac 400 Hz (104 V. MIN.)	2	13.0 AMP MAX	15 Millisec	30 Millisec	4.3 AMP **	3.3 AMP **	4.5 AMP **	4.0 AMP **	3.1 AMP **	10

\* MAX. I/CU. Line Impedance 75  
 \*\* Average Half-Wave Rectified DC Current

Current Decreases w/Time so that I<sup>2</sup>t  
 \*\*\*Absolute Min. Value from -54° to +71°C

## Remote Controlled Circuit Breaker (RCCB) — 1 Pole and 3 Pole

### Engineering Data

#### Description

The Remote Control Circuit Breakers (RCCB) concept, as load controllers in distributed-load applications, provides for a more efficient power distribution system with less line loss at a lower cost and with less weight than the conventional relay-flight deck circuit protector method.

Designed to meet the requirements of MIL-PRF-83383, the RCCB's capability and advantages include:

- Fusible link fail safe
- Remote on/off operation from the flight deck
- Visual indicators for open (green) and closed (red) on top surface
- Substantial reduction in weight and size
- Most direct route from power source to load
- Single wire control line from I/CU to RCCB
- Double-break power contact assembly
- Indication of trip or set by position of the ½ ampere circuit breaker on the flight deck
- Elimination of long runs of heavy and costly cables
- Magnetically latched coils (low power consumption)
- Use as a relay or circuit breaker or both
- Flanges mate for in-line or side-by-side mounting
- 1PST FOR DC OR SINGLE PHASE AC
- 3PST FOR THREE PHASE AC ONLY

#### Application

The Remote Control Circuit Breaker (RCCB) is a combination relay and circuit breaker which can be released or set by applying a release or set coil current electronically controlled by a command from the Indicator/Control Unit (I/CU) (a ½ ampere fast trip, thermal circuit breaker). With power available to terminal

#4 and/or terminal A1 (28 Vdc or 115V 400 Hz) on 1PST RCCB: to terminal #4 (28 Vdc) and/or both terminals B1 and C1 (115V 400 Hz) on 3PST RCCB, the RCCB will assume the state requested/indicated by the I/CU. If power is removed from terminal #4 and A1 on 1PST or from terminal #4 and both B1 and C1 on 3PST, the RCCB will remain in the state it was in prior to power removal. When power is reapplied to the terminals, the RCCB will assume the state indicated by the I/CU.

With the RCCB closed, an overload or fault current on any line or lines will cause the RCCB to trip and in turn will cause a controlled overload of the I/CU, causing it to trip also. A fault or overload on any power contact will cause the RCCB to trip open within the time limits specified regardless of the availability of coil power. To reclose the RCCB, the I/CU line (line 3 to ground) or series switch and reconnected to ground.

#### Other Performance Parameters For MIL-PRF-83383

- Coordination. An overload applied to two devices in series with a 2 to 1 current rating will result in only the lower rated device opening.
- Rupture capability to 3600A (115 Vac rms or 28 Vdc for SM600BA and 115 Vac rms for SM601BA series)
- Dielectric. 1500 V, 60 Hz, MIL-STD-202, Test Method 301, 0.5 MA maximum
- Explosion-proof. MIL-STD-202, Test Method 109
- Thermal Temperature Range. -54°C to 71°C (-65°F to 160°F). MIL-STD-202, Test Method 107
- Insulation Resistance. MIL-STD-202, Test Method 302,



- 100 Megohms minimum
- Aircraft Electrical Power. MIL-STD-704
- Vibration. 10 g's to 2000 Hz. MIL-STD-202, Test Method 204. Condition C (-54°C, 25°C, and 71°C). Maximum duration of contact transfer to uncommanded state:  $10 \times 10^{-6}$  seconds.
- Shock. 25 g's. MIL-STD-202, Test Method 213. Maximum duration of contact transfer to uncommanded state:  $10 \times 10^{-6}$  seconds.
- Altitude. 50,000 feet
- EMI, MIL-STD-461, Class 1D
- Moisture Resistance. MIL-STD-202, Test Method 106
- Fungus Resistance. MIL-STD-454, Guideline 4
- Sand and Dust Resistance. MIL-STD-202, Test Method 110, Test Condition A
- Salt Spray Resistance. MIL-STD-202, Test Method 101, Test Condition B

# Remote Controlled Circuit Breaker (RCCB)

## Single Pole

- 28 VDC
- 115/200 VAC 400 Hz

## Three Phase

- 115/200 VAC 400 Hz
- Three Phase Only

## Qualified

Meets MIL-PRF-83383

## Weight and Cost Savings

Saves fuel by eliminating long runs of heavy, costly cables

## Space Savings

Keeps larger breakers out of cockpit

## RCCB System for Remote Operation

To form an RCCB system enabling remote On/Off operation from the flight deck, combine the Eaton RCCB with Indicator Control Unit (ICU) model #1500-053-05 on pg. 13.

## Single Wire from Flight Deck

Control of the RCCB requires only one #22 AWG control wire from the ICU on the flight deck to the RCCB.

## Use as a Relay, Circuit Breaker, or Both

Combines the best attributes of a circuit breaker and a relay. Automatically protects the wires and the load device during circuit/load breakdown, but allows the flight deck control of the load during normal operation.

## Design Concept

### Introduction

Part of the weight of the modern jet aircraft comes from the electrical wires and power control systems needed to distribute the electrical energy. As these aircraft increase their passenger carrying capability, the electrical power management system becomes more complex and could become heavier. Wire runs of more than 300 feet from the flight deck circuit breakers to the load become common.

Utilization of Eaton's Remote Controlled Circuit Breakers (RCCB) close to the load or power source will eliminate much of these long, heavy, and expensive wire/cable. Control of the RCCB requires only one #22 AWG control wire from the flight deck to the RCCB.

Weight reduction, directly from wire use and indirectly from (generator) line heat loss, and installation and maintenance cost reductions becomes significant.

The RCCB combines the best attributes of a circuit breaker and a relay. The RCCB automatically protects the wires and the load device during circuit/load breakdown, but allows flight deck control of the load during normal operation.

### Operation

The RCCB is basically a relay and a circuit breaker and allows the utilization of each identity singularly or in combination, depending upon the application. All of the RCCB's capabilities apply in either application.

It can be employed as a relay located adjacent to its load and remotely operated much like relays are today through control wiring and a switching device in the flight deck.

It can also be utilized as a

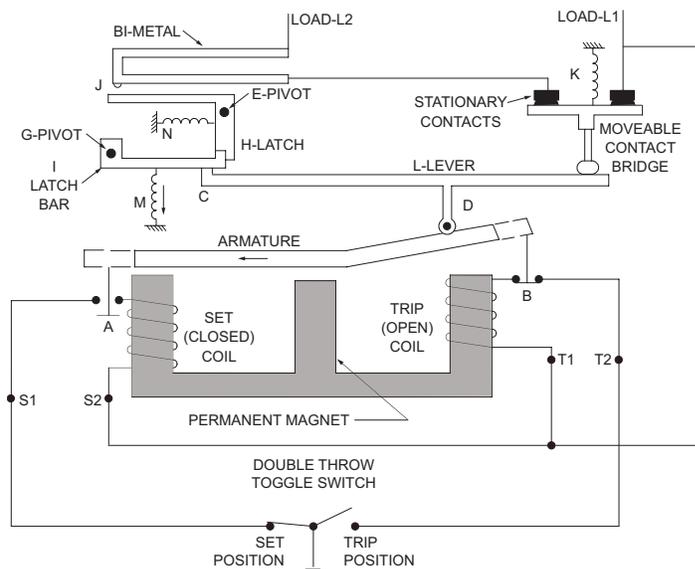


Figure 1

circuit breaker and mounted adjacent to the load, the power source, or even the flight deck.

## Single Pole RCCB

### Motor Operation

Figure 1 depicts a simplified presentation of the RCCB.

Figure 2 describes the "motor", which when "energized", will result in typical armature transfer operation.

The magnetic circuit utilizes a permanent magnet as a fulcrum and latch for the rocking armature and uses electro-magnets (coils) at each end of the armature stroke for transfer purpose. In the set position (Figure 2), the flux generated by the permanent magnet follows a path from the top of the permanent

magnet through the armature, through the left leg of the electro-magnet and back to the permanent magnet.

When the coil T1 -T2 is energized, the flux generated is such that it "flows" through the permanent magnet in the same direction as the flux generated by the permanent magnet itself. Its path now, however, is through the right leg of the electro-magnet. The flux generated by the electro-magnet increases in magnitude as power is applied, and as the flux builds up in the path through the right leg of the electro-magnet, the flux tending to latch the armature in the left leg of the electro-magnet becomes very small in comparison. The armature then "transfers" and seals at the pole face of the right leg of the electro-magnet.

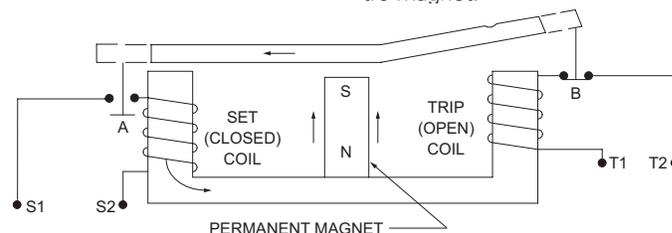


Figure 2

# Remote Controlled Circuit Breaker (RCCB) — Design Concept

The cutthroat contact B in series with coil T1-T2 is opened by mechanical actuation due to the armature movement. In Figure 2, a "dotted extension" of the armature represents the mechanical actuator of the cutthroat contacts. In actual design, this is accomplished more conveniently through only one armature extension and an appropriate actuator which drives both contacts B and A.

The opening of contact B occurs in the last several thousandths of an inch travel of the armature movement. After coil opening, the armature movement continues (until it seats i.e. seals) due in some degree to the inertia of the armature, but mostly due to the magneto-motive force of the permanent magnet in conjunction with the decreasing air gap at the right pole face.

The device now is again in a stable position, but the armature has transferred and the following conditions exist:

Contact A is closed and contact B is open, and the armature is sealed and latched at the right leg of the electro-magnet. To transfer the armature to its original position, energizing the coil S1-S2 allows the process described above to occur in the opposite direction.

There are a number of advantages to this design approach of the "motor."

1. The coils open upon transfer of the armature; hence, the actual "on time" or duty cycle approximately equals the operate time of the relay. Accordingly, the coil can be driven hard without fear of burnout. The "hot coil" with the low timer constant results, in turn, in fast operate times.
2. Using intermittent duty coils (smaller coils with less copper) results in less weight and smaller sizes.
3. Power is conserved. This is important for two reasons.

If a relay is to use power, it must be available. In some of the present day and future vehicles, power remains an expensive commodity, and elimination of coil power drawing (10-35 watts) in power devices can add up especially when vehicles sophistication requires use of a significant number of these devices. Also, it must be remembered that power utilized by relay coils generate heat which must be dissipated. The necessary elimination of this heat, in turn, requires the use of additional energy from the main power source.

4. As indicated, the cutthroat contacts are opened by the armature mechanically during the last several thousandths of an inch travel of armature movement. Note: In actual RCCB, the cutthroat contact function is replaced by electronic control of coil on time.

## RCCB Operation As A Relay

To examine the RCCB operation as a relay, refer to **Figure 3 and 4**. The device is shown in the set position in **Figure 3** and in the tripped position in **Figure 4**. The circuit path is from L2, through the bimetal to one of the stationary contacts. L1 is connected directly to the other stationary contact.

The movable bridge closes the circuit by bridging between the two stationary contacts.

As can be seen, movement of the armature about its fulcrum will determine the position of the contacts. When coil S1-S2 has been energized such that the armature seals on the left-hand pole face (**Figure 3**), the mechanical linkage system closes the contacts. Conversely, when coil T1-T2 has been energized, such that the armature seals on the right-hand pole face (**Figure 4**), the relay contacts will open due to the spring forces exerted by compression spring K.

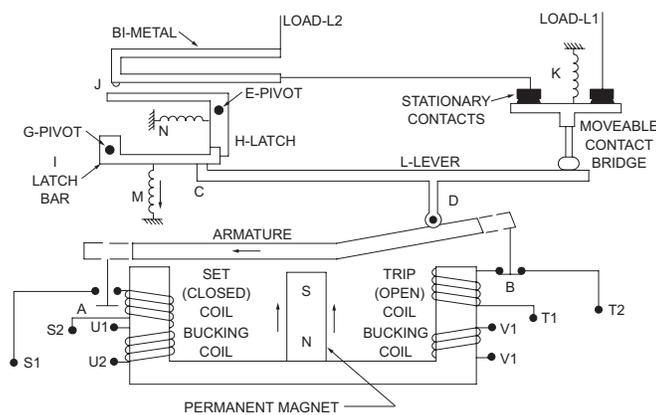


Figure 3

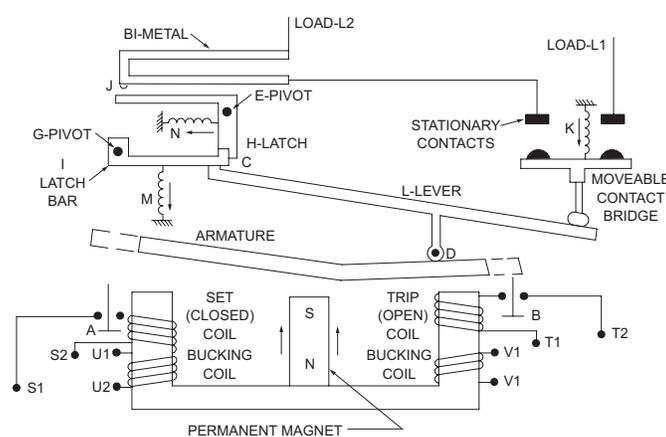


Figure 4

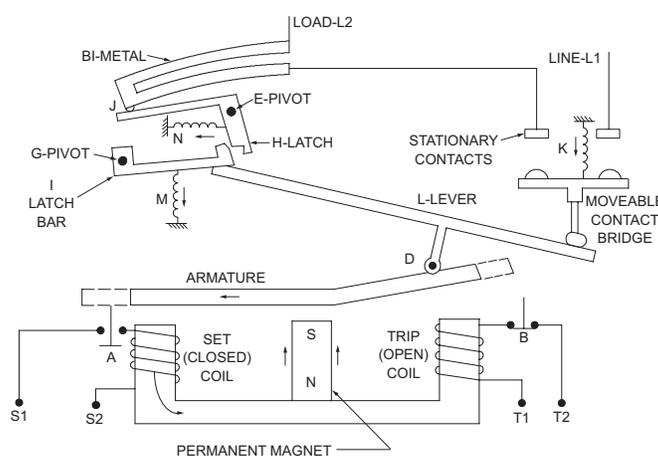


Figure 5

Note: there is an "upward force" directed on the lever L through the linkage tying into the armature at point D. During operation as a relay, point C (interface between lever L and latch bar I) is "fixed" in place, and the lever L actually rotates about point C when moving the contact structure from the opening to the closed, and from the closed to the open position.

## Remote Controlled Circuit Breaker (RCCB) — Design Concept

Note that the coil U1-U2 is connected in parallel with T1-T2. It is wound on the left-hand core of the electro-magnet such that when energized along with T1-T2, the force it generates will be in a direction opposing the latching force generated in that core by the permanent magnet.

The utilization of a permanent magnet and intermittent duty coils, in conjunction with cut-throat contacts, allows a considerable reduction in copper and iron from that normally required in electro-magnets for continuous duty operation.

### RCCB Operation as a Circuit Breaker

To examine the operation of the device as a breaker, refer to **Figures 3, 4, and 5**.

In **Figure 3**, the device is shown in the closed contact position (presumably) carrying rated current. Should an overload occur, currents greater than rated currents now "flow" through the device "entering" through L2, passing through the bimetal, through the connection of the bimetal to one stationary contact, through the bridging moveable contact structure, to the other stationary contact, and "out" through L1.

Depending upon the size of the overload, the bimetal will begin to deflect as shown in **Figure 5** until the actuating end of the bimetal engages latch H at point J.

Motion and force due to the deflection of the bimetal moves latch H such that it rotates in a counter-clockwise direction around its pivot point E.

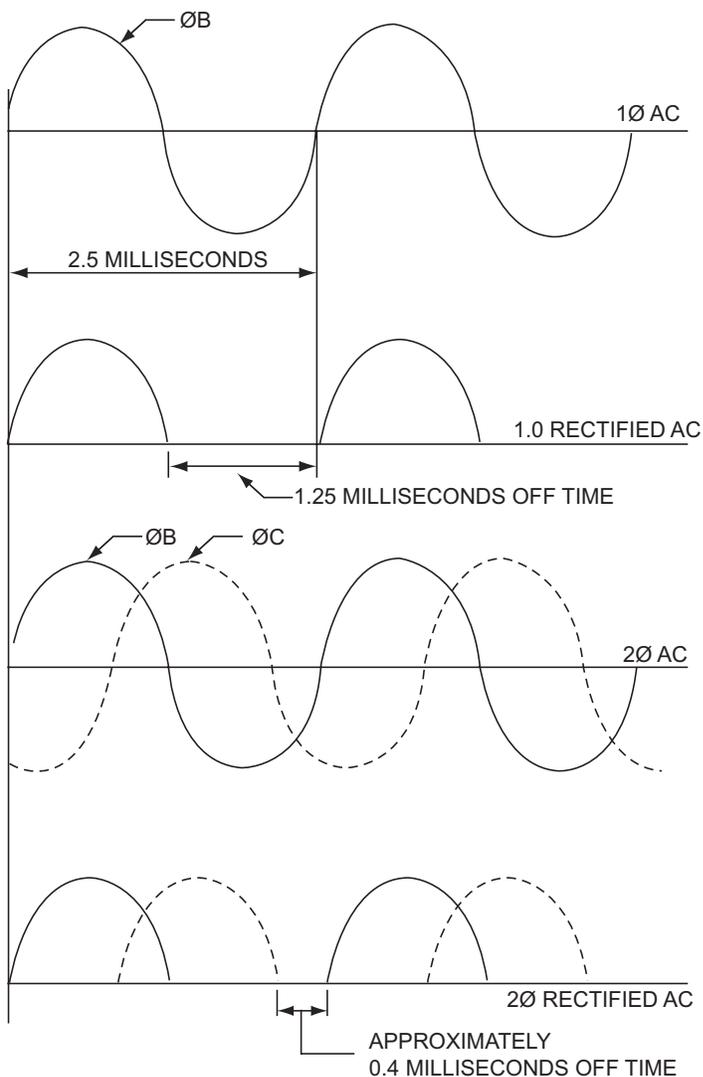
When latch H has moved an adequate distance, the upward force of lever L, applied at point

C to latch bar I, will rotate latch bar I counter-clockwise around its pivot point G. This allows the main lever L to rotate clockwise around point D (where it is engaged with the armature) due to the "contact return" spring (compression spring) force K acting upon the moveable contact bridge.

Note that when this overload occurs, the armature is not transferred to the "off" (tripped) position, but instead remains in the latched position normally associated with the "on" (set) position of the device.

To "reset" the device after the fault or overload clears could be readily accomplished by energizing the "trip" coil (T1-T2) through a toggle or push-button switch (see **Figure 1**) located in the flight deck. The armature would then transfer and seal on the right-hand core of the electro-magnet, which is the "open" position shown in **Figure 4**. At that time, springs M and N (tension springs) would reposition latch bar I and latch H to the position shown in **Figure 4**, providing that the bimetal has now cooled sufficiently and returned to its original position as shown in **Figure 4**. At this stage, the RCCB is still in an "open position" i.e. (the contacts are open), but as outlined above, the fault or overload has been cleared through action and operation of the device through bimetallic activity, i.e. "Circuit Breaker" operation.

To re-close the contacts, it is now only necessary to energize coils S1-S2 and re-establish a mechanism position similar to that shown in **Figure 3**. If the fault or overload condition is still in existence, the device would again trip through bimetallic activity as just described.



**Figure 6**

## Remote Controlled Circuit Breaker (RCCB) — Design Concept

### Three Pole RCCB

The design principles employed in the 3-pole RCCB have followed many of the same paths utilized in the 1-pole RCCB. Differences other than the obvious, such as size, weight, shape, etc., are explained below.

### Motor Operation

The principles of motor operation and construction of the three pole devices are similar to those employed in the single pole RCCB. In the 3-pole device, the AC operating power is drawn from two of the three

phases. The "off" time between current pulses during coil energization is approximately 0.4 milliseconds. In comparison, the "off" time for single-phase power is approximately 1.25 milliseconds. See **Figure 6**.

The timing circuit establishes a coil "on" time longer than the actual transfer time of the armature. The operation of the 3-pole RCCB is identical to the 1-pole.

### Control Circuit

Refer to **Figure 7**. There is one minor difference in operating principles and parameters from

the single pole devices.

The difference is the addition of a power junction area in the electronics. (see **Figure 7**). The 3-pole RCCB is designed for use in 3-phase circuits and is a 400 Hz AC load controller. The power junction is designed to use AC power only. DC operate (coil) power may be used even though AC loads are to be controlled. This connection is made at terminal 4 of the IWTS connector. In **Figure 7**, two separate power junctions are shown: one for AC and one for DC. In the event both AC and DC are connected to the RCCB, only AC

would be utilized by the logic circuit. Should AC power be lost, the DC connection would automatically take over the control function.

The other differences between 1-phase and 3-phase control circuitry, i.e. timer addition, is directly related as described in the above Motor Operation section.

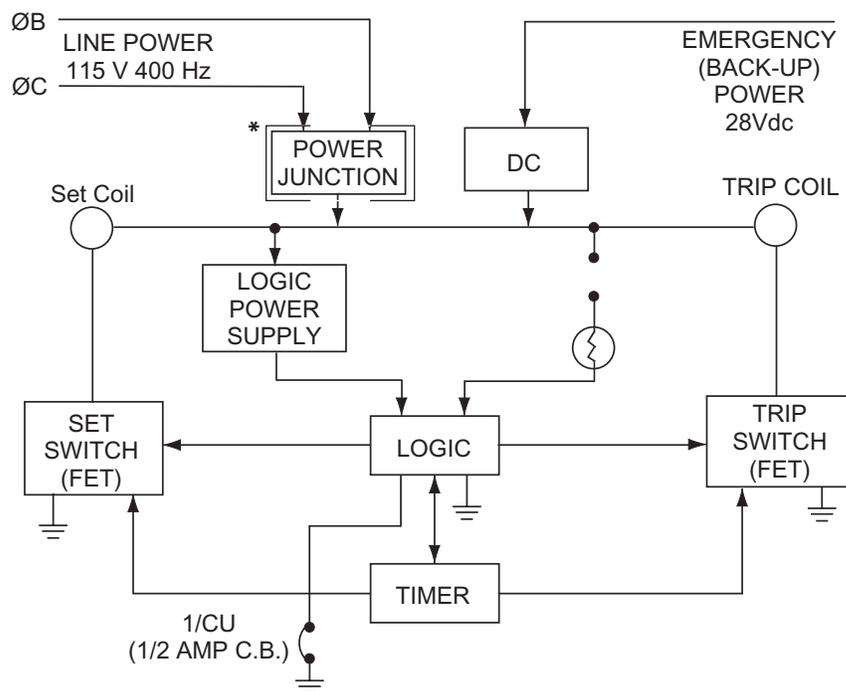


Figure 7

\*Indicates In 3 Phase Electronics