



ABB Power T&D Company Inc.  
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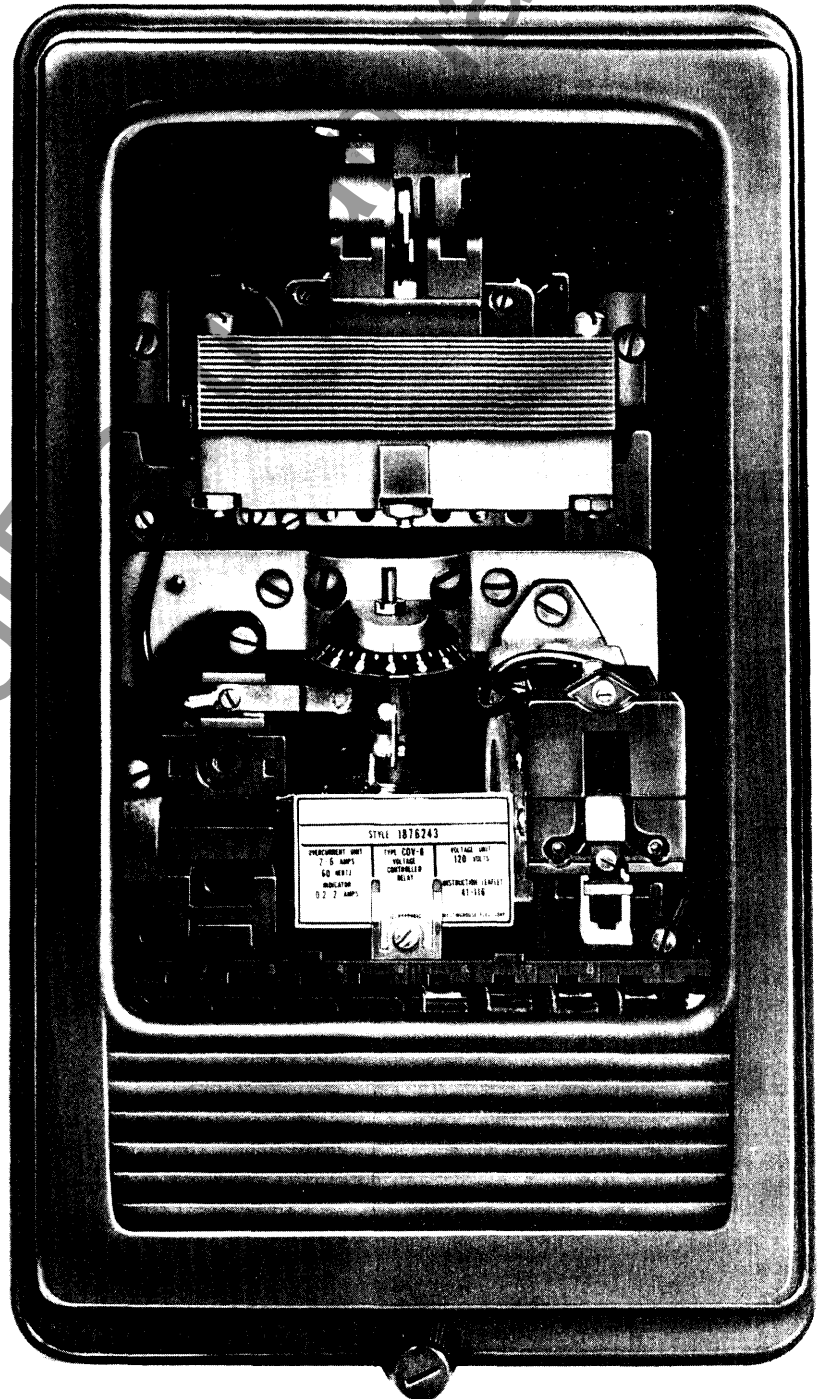
Descriptive Bulletin  
**41-165E**

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September, 1990  
Supersedes DB 41-115, pages 1-8,  
dated February, 1988  
Mailed to: E, D, C/41-100A

Device Number: 51/27

## Type COV Voltage Controlled Overcurrent Relay



### Application

The COV relay provides back-up protection for the generator and system from damage due to phase faults which are not cleared by primary relays and associated breakers.

It consists of a low-burden time-overcurrent unit which is torque controlled by a high-speed cylinder-design voltage unit, and is applicable where it is desired to set the overcurrent unit to operate on less than full load current when the voltage decreases below a predetermined value.

Less than full load setting of the overcurrent unit is required in overcurrent protection of generators because the synchronous reactance of the machine limits the fault current during sustained faults to about the same or less than rated load current.

Since the voltage and overcurrent units of the COV relay are independently adjustable, the voltage controlled COV is preferable to a voltage restrained type because of simplified application and setting. The timing of a voltage restrained relay is affected by bus voltage variation, making it difficult to coordinate with primary relays.

Generator three-phase faults cannot be detected by negative sequence current relays. Hence, one type COV relay is recommended for generator back-up protection, in conjunction with one type SOQ negative sequence current relay. If the SOQ is not used, three COV relays are required.

Relay Type	Time Curve
COV-6	Definite Minimum
COV-7	Moderately Inverse
COV-8	Inverse
COV-9	Very Inverse
COV-11	Extremely Inverse

### Overcurrent Unit Tap Range (Amperes)

0.5-2.5      2-6      4-12

The relays may have either single or double circuit closing contacts for tripping either one or two circuit breakers.

### Voltage Unit Volts (Line-to-Line)

The contact is adjustable over a range of 80 to 100 volts. The contact will open if the voltage is higher than the set value. The dropout ratio of the unit is 98% or higher.

### Construction

#### (1) Voltage Unit

Induction cylinder type. The moving element consists of a spiral spring, a contact carrying arm, and an aluminum cylinder which rotates

in the air gap formed by the electromagnet and the magnetic core. The electromagnet has two pairs of voltage coils. Each pair of diametrically opposed coils is connected in series. In addition, one pair is in series with an adjustable resistor which provides the necessary voltage drop-out adjustment, as well as to shift the phase angle of one flux with respect to the other in order to produce rotational torque of the cylinder.

A spiral spring adjuster is located on the underside of the supporting bridge and is used to adjust the minimum setting of 80 volts.

**Supporting Bridge:** Houses the upper guide bearing of the moving element.

**Stationary Contact:** Made of silver. Spring mounted within circular assembly to provide adequate contact follow.

**Moving Contact:** Also made of silver, and attached to the molded hub of the moving cylinder unit. The contact can be adjusted to close over a range of 80 to 100 volts. It opens if the voltage is higher than the set value. Drop-out ratio is 98% of pickup, or higher.

**Adjustable Resistor:** Provides adjustment of the voltage unit between 80 and 100 volts ac (mounted on rear of relay chassis).

#### (2) Overcurrent Unit

Consists of an "E" shaped laminated core which has a main tapped coil, and a shading coil on one of the outer legs to shift the flux out of phase.

This out-of-phase flux interacts with the main coil flux to create a torque on the induction disc. Disc rotation is opposed by the spiral spring which resets the contacts to their normal position when applied current is below tap value setting.

**Frame:** One-piece die-cast aluminum. Assures accurate and permanent alignment of all components.

**Tap Block:** Indicates minimum current required to close relay contacts.

**Tap Screw:** Two supplied. When changing taps, the spare is inserted into the new tap position prior to removing the already inserted one from the old position. This prevents open-circuiting of the associated current transformers.

**Magnetic Plugs:** May be threaded into or out of the magnetic circuit to control saturation and adjust calibration at high currents.

**Time Dial:** Indicates initial position of the moving contact over a 260° range. It is indexed from position ½ (minimum time) to position 11 (maximum time).

**Stationary Contact:** Made of pure silver. Will close 30 amperes at 250 volts dc. Has sufficient wipe to assure positive contact. On double trip relays, adjustment of ¼-inch contact follow or "wipe" is obtained by use of a vernier adjusting screw on the stationary contact plate.

**Moving Contact:** Clamped to the insulated section of the induction disc shaft. Electrical connection is made through the spiral spring, from the moving contact to the spring adjuster frame, then to the relay terminal. Contacts will close 30 amperes at 250 volts dc.

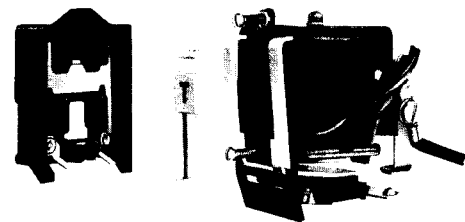
**Damping Magnet:** Made of high strength Alnico. Controls operating time of the relay at low current values.

**Induction Disc:** Spiral shaped to compensate for spring wind-up throughout moving contact travel; provides accurate pickup at any disc position.

**Spring Adjuster:** Used to set the minimum trip current of the relay, and to provide in-between tap pickup adjustment when desired.

#### (3) Indicating Contactor Switch (ICS)

The dc Indicating Contactor Switch unit is a small clapper type device having a magnetic armature to which leaf-spring mounted contacts are attached. The armature is attracted to the core when the coil is energized at or above pick-up value, causing the moving contacts to bridge two stationary contacts, completing the trip circuit. The ICS contacts



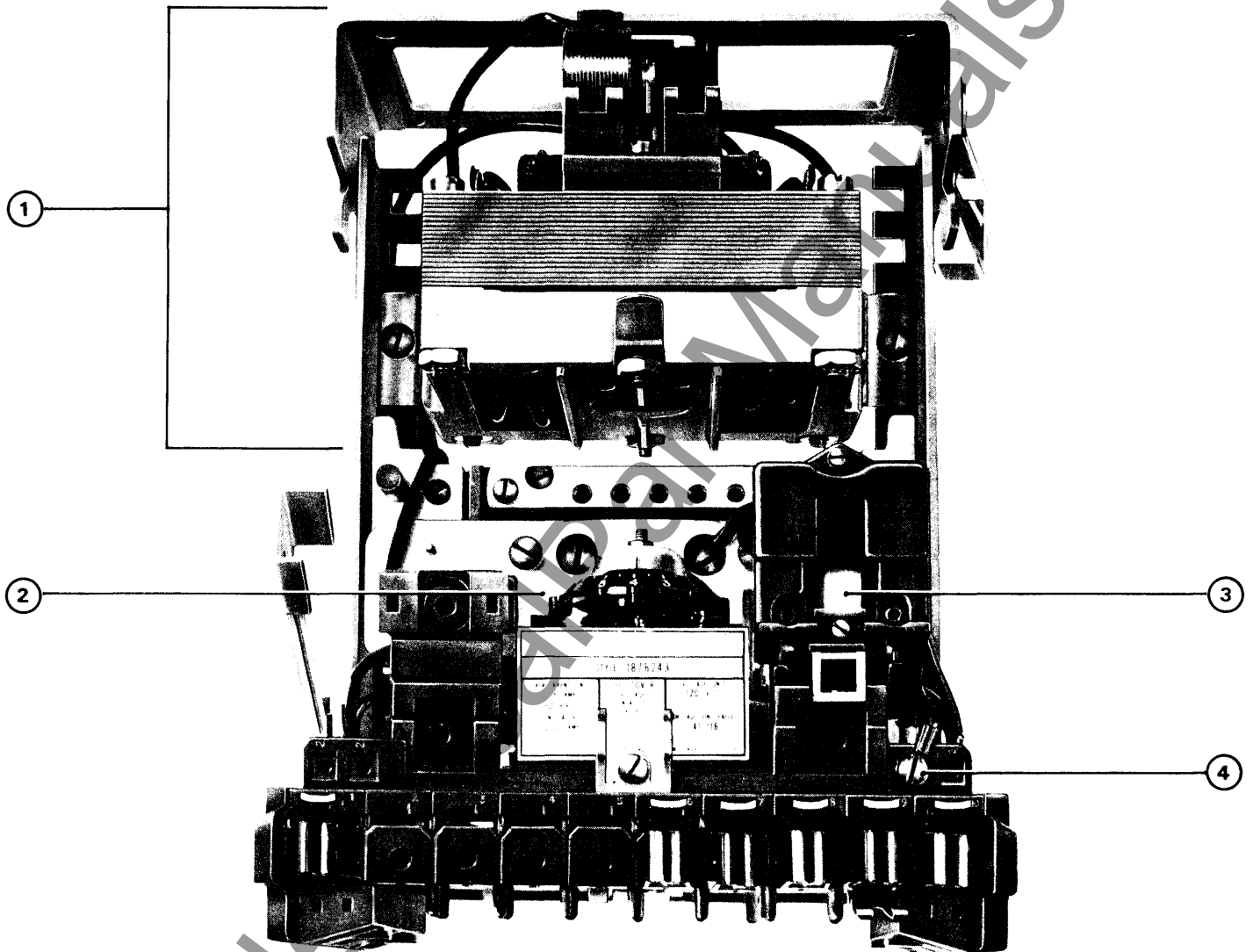
are connected in parallel with the main relay contacts, and relieve them of carrying heavy trip currents. The main relay contacts will close 30 amperes at 250 volts dc, and the ICS contacts will safely carry this current long enough to trip a circuit breaker.

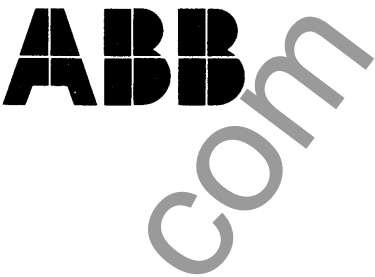
The target is reset external to the case by a push rod located at the bottom of the relay case cover.

#### (4) ICS Taps

Taps on the front of the relay provide connection of the Indicating Contactor Switch for either 0.2 (left) or 2.0 (right) ampere dc minimum pick-up setting.

When the protective relay energizes a WL relay rated 125 or 250 volts dc, the 0.2 ampere is recommended. The 2.0 ampere tap is used on 24 or 48 volt dc circuits energizing a WL relay.





**Time-Overcurrent Unit Coordination**

Type COV back-up relays should use the same operating time characteristics as the primary protective relays on the adjacent system should be used to assure selective coordination.

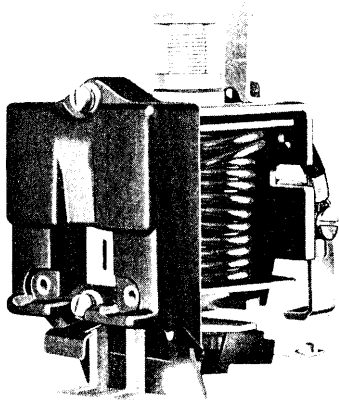
A minimum coordinating time of 0.3 second, plus breaker operating time, is recommended between the COV relay and the relays with which coordination is to be effected.

Overcurrent unit settings are defined either by (a) time dial setting and current tap setting or (b) tap setting and multiples of tap value current applied - providing a specific operating time.

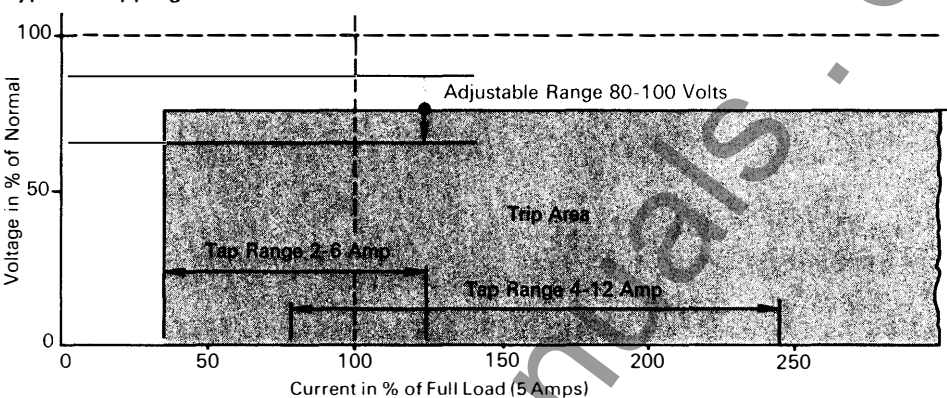
**Instantaneous Trip**

The COV may be equipped with the IIT unit. It provides high-speed clearing of severe faults. It is applicable only if the fault contribution from the system to a fault at the terminals of the machine greatly exceeds the machine subtransient contribution and ct's are used on the system side rather than the neutral side of the machine.

**Indicating Instantaneous Trip (IIT)**



**Typical Tripping Characteristics①**



① 90 volt setting when shipped from factory.

The IIT provides high speed protection from heavy fault currents. Also mounted on the test-jack pedestal, the Indicating Instantaneous Trip is similar in construction to the Indicating Contactor Switch, with the exception that it is ac operated and is adjustable over a range of 1 to 4 times minimum pickup. Variable pickup is provided by core-screw adjustment on top of switch. When energized above pickup setting, IIT contacts close to complete the trip circuit and the target drops. The IIT unit is accurate within 10% of setting and has a variable drop-out to pickup ratio from 65% at minimum setting to 90% at maximum setting.

**Suggested Settings**  
(Normal Application)

- 1. Voltage Unit**  
Set for 90 volts drop-out (80 to 100 volts adjustable range).
- 2. Overcurrent Range**  
Set on 2.0 ampere tap (2-6 ampere range).
- 3. Time Dial**  
Set for selective time coordination with relays on adjacent circuits
- 4. Instantaneous**  
Set above maximum contribution to an external fault.

**Characteristics**

**Voltage Unit Burden Data and Thermal Capacities**

Frequency Cycles	Drop out Adjustment, Volts	Drop-out Ratio in Percent of Pickup	Burden at 120 Volts in Volt-Amperes①	Voltage Rating, Continuous
50	80-100	98	7.2	132
60	80-100	98	8.0	132

① Average for various settings

**Further Information**

List Prices: PL 41-020  
Technical Data: TD 41-025  
Instructions: IL 41-116  
Renewal Parts: RPD 41-919  
Flexitest Case Dimensions: DB 41-076  
Contactor Switches: DB 41-081  
Other Protective Relays:  
Application Selector Guide, TD 41-016



December, 1990

Supersedes TD 41-020, Type COV on  
pages 13 and 14, dated November, 1987  
Mailed to: E, D, C/41-100A

## Type COV Voltage Controlled Overcurrent Relay

### Overcurrent, Voltage Controlled, Non-Directional, Single-Phase, (Device Number: 27/51)

Type	Time Curve	Adjustable Voltage Range	Contacts	Indicating Contactor Switch <sup>③</sup>	Current Range: Amps Ac		Relay Data		
					Time Unit	Instantaneous Trip: IIT Unit <sup>④</sup>	Internal Schematic	Style Number	Case Size
COV-6 <sup>①</sup>	Definite	80-100 volts ac	Spst-cc	0.2/2.0 amp dc	0.5-2.5	None	183A047	288B774A19	FT-21
					2-6			1878 495	
					4-12			1878 496	
					0.5-2.5	2-8	183A048	288B774A20	
					4-16	4-16		288B774A21	
					10-40	10-40		288B774A22	
					2-6	2-8	183A048	1878 497	
					4-16	4-16		1878 498	
					10-40	10-40		1878 499	
					20-80	20-80		1878 500	
					4-12	4-16	183A048	1878 501	
					10-40	10-40		1878 502	
					20-80	20-80		1878 503	
					40-160	40-160		1878 504	
COV-7 <sup>①</sup>	Moderately Inverse	80-100 volts ac	Spst-cc	0.2/2.0 amp dc	0.5-2.5	None	183A047	288B773A19	FT-21
					2-6			1878 505	
					4-12			1878 506	
					0.5-2.5	2-8	183A048	288B773A20	
					4-16	4-16		288B773A21	
					10-40	10-40		288B773A22	
					2-6	2-8	183A048	1878 507	
					4-16	4-16		1878 508	
					10-40	10-40		1878 509	
					20-80	20-80		1878 510	
					4-12	4-16	183A048	1878 511	
					10-40	10-40		1878 512	
					20-80	20-80		1878 513	
					40-160	40-160		1878 514	
COV-8 <sup>①</sup>	Inverse	80-100 volts ac	Spst-cc	0.2/2.0 amp dc	0.5-2.5	None	183A047	288B776A20	FT-21
					2-6			1878 243 <sup>⑤</sup>	
					4-12			1878 244	
					0.5-2.5	2-8	183A048	288B776A21	
					4-16	4-16		288B776A22	
					10-40	10-40		288B776A23	
					2-6	2-8	183A048	1878 515	
					4-16	4-16		1878 516	
					10-40	10-40		1878 517	
					20-80	20-80		1878 518	
					4-12	4-16	183A048	1878 519	
					10-40	10-40		1878 520	
					20-80	20-80		1878 521	
					40-160	40-160		1878 522	

⑤ Denotes item available from stock.

① 50 Hertz relays and auxiliaries can be supplied at same price. Order "Similar to Style Number . . . . ., except 50 Hertz".

③ 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.

④ ITT: Indicating Instantaneous Trip rated per ranges shown in price tables. Unit is nondirectional, adjustable, and has target actuated when coil is energized at or above pickup setting. Unit has a dropout ratio of 65% at minimum setting and 90% at maximum setting.

**Overcurrent, Voltage Controlled, Non-Directional, Single-Phase, (Device Number: 27/51), Continued**

Type	Time Curve	Adjustable Voltage Range	Contacts	Indicating Contactor Switch <sup>③</sup>	Current Range: Amps Ac		Relay Data		
					Time Unit	Instantaneous Trip: IIT Unit <sup>④</sup>	Internal Schematic	Style Number	Case Size
COV-9 <sup>①</sup>	Very Inverse	80-100 volts ac	Spst-cc	0.2/2.0 amp dc	0.5-2.5	None	183A047	288B775A19	FT-21
					2-6			1876 245	
					4-12			1876 246	
					0.5-2.5	2-8	183A048	288B775A20	
						4-16		288B775A21	
						10-40		288B775A22	
					2-6	2-8	183A048	1878 523	
						4-16		1878 524	
						10-40		1878 525	
						20-80		1878 526	
COV-11 <sup>①</sup>	Extremely Inverse	80-100 volts ac	Spst-cc	0.2/2.0 amp dc	0.5-2.5	None	183A047	1956 083	FT-21
					2-6			1956 084	
					4-12			1956 085	
					0.5-2.5	2-8	183A048	1956 086	
						4-16		1956 087	
						10-40		1956 088	
					2-6	2-8	183A048	1956 089	
						4-16		1956 090	
						10-40		1956 091	
						20-80		1956 092	
					4-12	4-16	183A048	1956 093	
						10-40		1956 094	
						20-80		1956 095	
						40-160		1956 096	

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