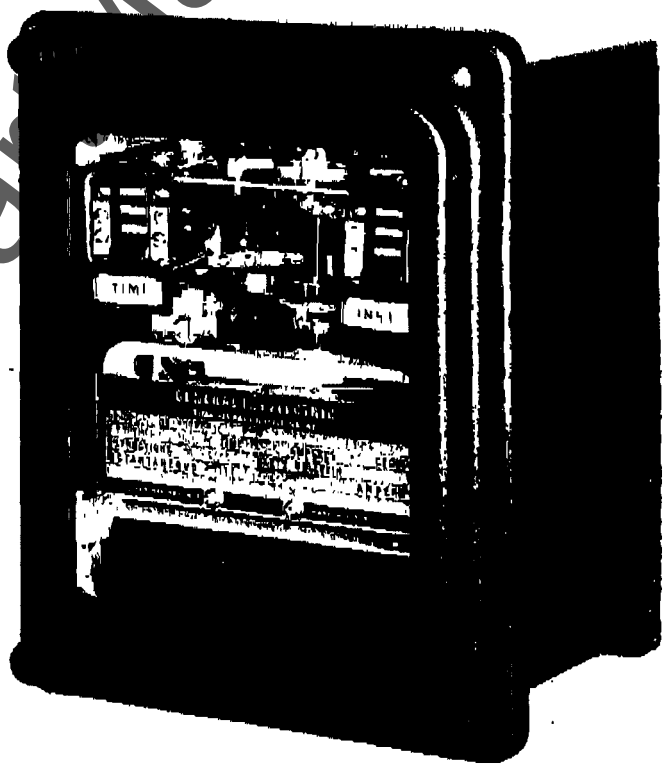
INSTRUCTIONS

GEH-2059C

Time Overcurrent Relays

Types:
IAC77A Form 11 and Up
IAC77B Form 31 and Up
IAC78A Form 4 and Up
IAC78B Form 11 and Up



GENERAL ELECTRIC

CONTENTS

The disk shaft is restrained by a spiral spring to give the proper contact closing current and its motion is retarded by a permanent magnet acting on the disk to give the correct time delay.

SEAL-IN UNIT

A seal-in unit is mounted to the left side of the shaft as shown in Fig. 1. This unit has its coil in series and its contacts in parallel with the main contacts such that when the main contacts close, the seal-in unit picks up and seals in. When the seal-in unit picks up, it raises a target into view which latches up and remains exposed until released by pressing a button beneath the lower left corner of the cover.

INSTANTANEOUS UNIT

The instantaneous unit is a small instantaneous hinge-type unit which may be mounted on the right front side of the induction unit (see Fig. 1). Its contacts are normally connected in parallel with the contacts of the main unit. Its coil is connected in series with the operating coil of the main unit.

When the current reaches a predetermined value, the instantaneous unit operates, closing the contact circuit and raising its target into view. The target latches in the exposed position until released by pressing the button beneath the lower left-hand corner of the relay cover.

The instantaneous unit operates over a 4 to 1 range and has its calibration stamped on a scale mounted beside the adjustable pole piece.

INSTALLATION

LOCATION

The location should be clean and dry, free from dust and excessive vibration, and well lighted to facilitate inspection and testing.

MOUNTING

The relay should be mounted on a vertical surface. The outline and panel diagrams are shown in Figures 14 and 15.

CONNECTIONS

Internal connection diagrams for the various relay types are shown in Fig. 10 to 13 inclusive. Typical wiring diagrams are given in Fig. 4 and 5.

One of the mounting studs or screws should be permanently grounded by a conductor not less than No. 12 B&S gage copper wire or its equivalent.

CAUTION:

EVERY CIRCUIT IN THE DRAWOUT CASE HAS AN AUXILIARY BRUSH. IT IS ESPECIALLY IMPORTANT ON CURRENT CIRCUITS AND OTHER CIRCUITS WITH SHORTING BARS THAT THE AUXILIARY BRUSH BE BENT HIGH ENOUGH TO ENGAGE THE CONNECTING PLUG OR TEST PLUG BEFORE THE MAIN BRUSHES DO. THIS WILL PREVENT CT SECONDARY CIRCUITS FROM BEING OPENED.

ADJUSTMENTS

INDUCTION UNIT

The minimum current at which the contacts will just close is determined by the position of the tap screw in the tap block at the top of the relay.

When changing the current setting of the relay while in the case, remove the connection plug to short the current transformer secondary circuit. Next, screw the tap screws into the tap marked for the desired current and then replace the connection plug.

The pickup of the unit for any current tap setting is adjusted by means of the variable resistor in the phase-shifting circuit. This adjustment also permits any desired setting intermediate between the various tap settings to be obtained. The control spring is prewound approximately 660 degrees with the

BURDENS

Burdens for the induction unit coils are given in Table IV. These are calculated burdens at five amperes based on burden of minimum tap.

TABLE IV

COIL RATING	FREQ.	TAP	VA	Z	PF
4-16	60	4	0.63	0.025	0.5
1.5-6	60	1.5	5.0	0.20	0.5
0.5-2	60	0.5	40.0	1.60	0.5
0.1-0.4	60	0.1	1050	42	0.5

The instantaneous unit burdens at 5 amps are listed in Table V.

TABLE V

COIL RATING	FREQ.	UNIT SETTING	VA	Z	PF
10-40	60	10	0.83	.033	.95
20-80	60	20	0.21	.008	.95

RECEIVING, HANDLING AND STORAGE

These relays, when not included as a part of a control panel, will be shipped in cartons designed to protect them against damage. Immediately upon receipt of the relay, an examination should be made for any damage sustained during shipment. If injury or damage resulting from rough handling is evident, a claim should be filed at once with the transportation company and the nearest Sales Office of the General Electric Company notified promptly.

Reasonable care should be exercised in inpacking the relay in order that none of the parts are injured or the adjustments disturbed.

If the relays are not to be installed immediately, they should be stored in their original cartons in a place that is free from moisture, dust, and metallic chips. Foreign matter collected on the outside of the case may find its way inside when the cover is removed and cause trouble in the operation of the relay.

DESCRIPTION

These relays consist of an induction unit, seal-in unit, and in some types an instantaneous unit, all assembled with their associated parts in a S1 case.

RELAY TYPES

The Type IAC77A relay has single-circuit closing contacts. The contacts close as the current increases to pickup value as set on the tap block. The time delay in closing the contacts is determined by the settinh of the time dial at the top of the disk shaft.

The Type IAC77B relay is similar to the Type IAC77A relay except that it has in addition an instantaneous unit.

The Type IAC78A relay is similar to the Type IAC77A relay except that it has two-circuit closing contacts.

The Type IAC78B relay is similar to the IAC77B relay except that it has two circuit closing contacts.

INDUCTION UNIT

The disk is actuated by a wattmetric type current operating element. This is similar to the standard element as used in watthour meters, except the actuating coils above and below the operating disc are connected in series. A capacitor and variable resistor connected in series with the inner coil on the upper laminated structure make up the phase-shifting circuit. The disk shaft carries the moving contact which completes the trip or alarm circuit when it touches the stationary contact or contacts.

TABLE I

RELAY	FREQ. CYCLES	CURRENT OPER. RANGE, AMPERES	
		MAIN (TIME) UNIT	INSTANTANEOUS UNIT
IAC77A & IAC78A	60	4-16 1.5-6 0.5-2 0.1-0.4	
IAC77B && IAC78B	60	4-16 4-16 1.5-6 0.5-2	20-80 10-40 10-40 10-40

The continuous and one-second thermal ratings are listed in Table II.

TABLE II

INDUCTION UNIT RATING (AMPS)	*CONTINUOUS RATING (AMPS)	ONE-SEC. RATING (AMPS)
4-16	10	260
1.5-6	6	200
0.5-2	3	65
0.1-0.4	1	15

* The continuous rating of the coil circuit which appears in the table applies to all induction-unit taps up to, and including, the value of the rating. For taps above this value the rating is the same as the tap value.

Continuous rating of relays having instantaneous units is the value shown in Table II or 1.5 times the minimum setting of the instantaneous unit, whichever is the lower of the two values.

The available taps of the induction units are shown in Table IIA.

TABLE IIA

RATING	TAPS AVAILABLE
4-16	4,5,6,7,8,10,12,16
1.5-6.0	1.5,2.0,2.5,3.0,4.0,6.0
0.5-2.0	0.5,0.6,0.8,1.0,1.2,1.5,2.0
0.1-0.4	0.1,0.15,0.2,0.25,0.3,0.35,0.4

INSTANTANEOUS UNIT

The available adjustment ranges of instantaneous units are 1-4, 2-8, 4-16, 10-40, 20-80 and 40-160 amperes. For continuous ratings see Table II and the notes following Table II.

SEAL-IN

Ratings of the seal-in unit are given in Table III.

TABLE III SEAL-IN UNIT RATINGS

	2-AMP TAP	0.2-AMP TAP
CARRY-TRIPPING DUTY	30 AMPS	5 AMPS
CARRY CONSTANTLY	3 AMPS	0.3 AMPS
D-C RESISTANCE	0.13 OHMS	7 OHMS
IMPEDANCE (60 CYCLES)	0.53 OHMS	52 OHMS

If the tripping current exceeds 30 amperes an auxiliary relay should be used, the connections being such that the tripping current does not pass through the contacts or the target and seal-in coils of the protective relay.

CONTACTS

The current-closing rating of the contacts is 30 amperes for voltages not exceeding 250 volts. The current-carrying rating is limited by the ratings of the seal-in unit.

TIME OVERCURRENT RELAY

TYPE IAC

INTRODUCTION

These relays are of the induction disk construction with a wattmetric type current operating element. They have an extremely-inverse time-current characteristic as shown in Fig. 6.

	NUMBER N.O. CONTACT OUTPUTS	INSTANTANEOUS UNIT
IAC77A	1	NO
IAC77B	1	YES
IAC78A	2 *	NO
IAC78B	2 *	YES

* Not electrically separate - see Figure 12.

APPLICATION

The extremely inverse time current characteristics of the IAC77 and IAC78 relays make these relays particularly well suited for the protection of primary distribution feeder circuits.

In such applications, because the relay characteristics closely parallel those of power fuses, it is possible to obtain selective fault protection with a minimum time delay. For example, the system illustrated in Fig. 3, it is necessary that the protective relays (device 51) co-ordinate with the fuses on the high side of the power bank as well as with those on the load side of the power circuit breaker. Fig. 2 illustrates that this can be done most effectively with extremely inverse IAC77 or IAC78 relays whose characteristics most nearly parallel those of the fuses.

The extremely inverse relay also is better suited than both the inverse and very inverse relays for picking up cold load. For any given cold load pick up capability, the resulting settings will provide faster protection at high fault currents with the extremely inverse relay than with the less inverse relays.

The zero current reset time of the extremely inverse IAC77 and IAC78 is approximately 60 seconds when set on time dial 10. For other time dial settings the zero current reset time is proportionately less. For example, the reset time from time dial 2 is approximately 12 seconds.

RATINGS

INDUCTION UNIT

Ratings of the induction unit are given in Table I.

Model	Disk Unit Tap Ranges (amperes)	Instantaneous Unit Adjustment Ranges (amperes)		Number of Contacts	Case Size	Internal-Connection Diagram (Fig. No.)	Instruction Book Number	Comments
		Standard	Hi-Dropout					
VERY INVERSE TIME CHARACTERISTIC (FIG. NO. 14)								
IAC53A	4.0–16.0 1.5–6.0 0.5–2.0	.....	.....	1 NO	S-1	A-1	GEH-1788	
IAC53B	4.0–16.0 1.5–6.0 0.5–2.0 0.1–0.4	40–160 20–80 10–40 4–16 2–8 1–4 0.5–2.0	.....	1 NO	S-1	A-2	GEH-1788	
IAC53C	4.0–16.0	.....	.....	1 NC	S-1	A-3	GEH-1788	A-c trip unit
IAC53M	4.0–16.0 1.5–6.0 0.5–2.0	.....	10–30 4–12 2–6 1–3	1 NO	S-1	A-5	GEI-50254	High-dropout instantaneous unit
IAC53R	4.0–16.0	20–80 10–40 4–16	.....	1 NC	S-1	A-4	GEH-1788	A-c trip unit
IAC54A	4.0–16.0 1.5–6.0 0.5–2.0 0.1–0.4	.....	.....	2 NO	S-1	A-6	GEH-1788	
IAC54B	4.0–16.0 1.5–6.0 0.5–2.0	40–160 20–80 10–40 4–16 2–8	.....	2 NO	S-1	A-7	GEH-1788	
IAC54M	4.0–16.0 1.5–6.0	.....	10–30 4–12	2 NO	S-1	A-8	GEI-50254	High-dropout instantaneous unit
IAC80A	4.0–16.0 1.5–6.0 0.5–2.0	.....	.....	1 NO	S-1	A-22	GEI-39019	Torque controlled by external contact
IAC80B	4.0–16.0 1.5–6.0 0.5–2.0	20–80 10–40 4–16	.....	1 NO	S-1	A-23	GEI-39019	Torque controlled by external contact
IAC80E	4.0–16.0	.....	.....	1 NO	M-1	A-24	GEI-83956	Similar to IAC60E
IAC80H	4.0–16.0	10–40 4–16	.....	1 NO	L-2	A-25	GEI-83952	Similar to IAC60H
EXTREMELY INVERSE TIME CHARACTERISTIC (FIG. NO. 17)								
IAC77A	4.0–16.0 1.5–6.0 0.5–2.0 0.1–0.4	.....	.....	1 NO	S-1	A-16	GEH-1787	
IAC77B	4.0–16.0 1.5–6.0 0.5–2.0 0.1–0.4	40–160 20–80 10–40 4–16 2–8 1–4	.....	1 NO	S-1	A-17	GEH-1787	
IAC77C	4.0–16.0	.....	.....	1 NC	S-1	A-18	GEI-31033	A-c trip unit
IAC77R	4.0–16.0	20–80 10–40 4–16	.....	1 NC	S-1	A-19	GEI-38889	A-c trip unit

SEE TABLE NOTES ON PAGE 4

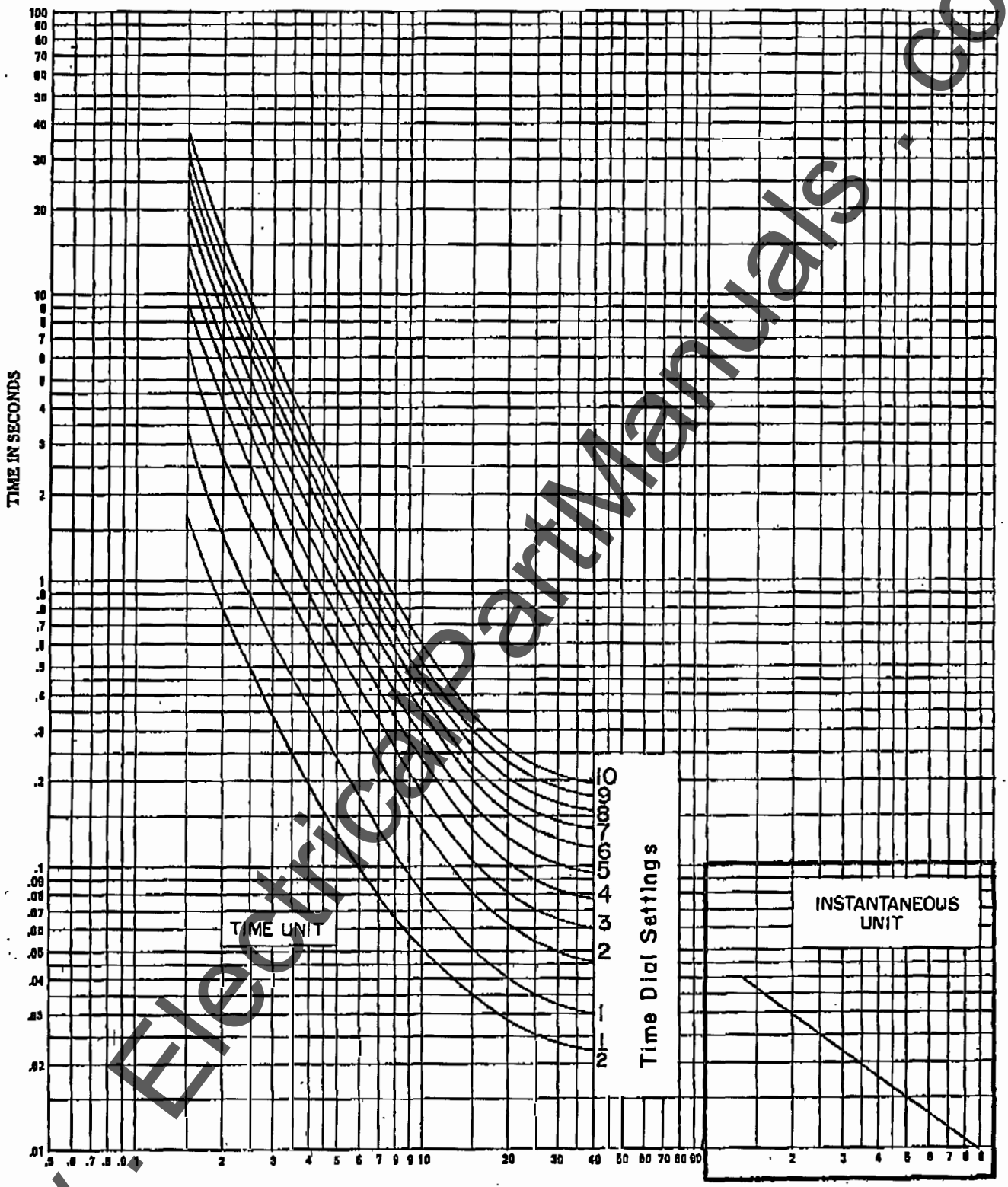


Fig. 17. Type IAC relays. Extremely Inverse Standard-time-characteristic Curve (GES-7005)