

# INSTALLATION . OPERATION . MAINTENANCE

# INSTRUCTIONS

# TYPE DRC-1 RECLOSING RELAY

#### **APPLICATION**

The DRC-1 is a multi shot reclosing relay for initiating the closing of a circuit breaker following protective relay operation.

Experience indicates the vast majority of circuit faults are of a temporary nature. High speed tripping and high speed reclosure minimize damage and system disturbance. Only sufficient dead time for arc deionization need be allowed before reclosing.

Another important function of a reclosing relay when used in distribution circuits is to allow instantaneous tripping to protect a fuse for temporary faults and, by cutting out the instantaneous trip prior to the next reclosure, to allow the fuse to operate, minimizing the outage area for permanent faults.

#### The DRC-1 provides:

- 1. Up to 3 reclosures to lockout.
- 2. Flexible tripping sequence, all instantaneous, all time delay or any combination in any sequence of time delay and instantaneous.
- 3. Static timing and semi-static control.
- 4. Reclose timing adjustment 0-45 seconds.
- 5. Lockout alarm contact and indication.
- 6. Adjustable reset initiation 10 to 60 seconds following successful reclosure.

- 7. Immediate return to "Home" (or reset) position following reset initiation.
- 8. Optional instantaneous trip following manual closing from lockout position.

# **CONSTRUCTION & OPERATION**

The Type DRC-1 Relay is composed of (1) an integrator (2) reclose timer printed circuit board (3) reset timer printed circuit board (4) alarm relay (5) instantaneous trip relay (6) close relay and (7) lockout indication. All timing functions are accomplished through the use of semiconductor components. The identification of all components and their locations is shown in figures 1, 2 and 11.

#### **Reset Timer Board**

Reset Timer — The reset timer is controlled by the integrator and the auxiliary switches on the breaker. The front panel settings allow a choice of 5 different times for the resetting interval. The time delay circuit is of the quick reset type. This enables the reset times to always be consistent with times indicated on the front panel. Refer to figures 3 and 4 for component location and board layout.

#### **Reclose Timer Board**

The reclose timer is controlled by the integrator. The front panel setting allows a choice of 5 different time for each interval of reclosing. The time delay circuit is of the quick reset type which allows a specific timing circuit to be used for all reclosing intervals. Refer to figure 5 for component and board layout.

All possible contingencies which may arise during installation, operation, or maintenance, and all details and variations of this equipment do not purport to be covered by these instructions. If further information is desired by purchaser regarding his particular installation, operation or maintenance of his equipment, the local Westinghouse Electric Corporation representative should be contacted.

# Integrator

The integrator is a continuously rated stepping switch that responds to signals from the reset timer board, 52b contact, close relay and sequences the relay through its preset functions.

## **Close Relay**

The operation of the close relay is controlled by the operation of a breaker auxiliary switch and reclose timer.

# **Alarm Relay and Lockout Indicator**

The alarm relay and the lockout indicator will be energized when the integrator is in the lock out position.

#### **Instantaneous Trip Relay**

Operation of this relay is controlled by the integrator and the settings on the instantaneous tap block.

## **Theory of Operation**

Operation of the DRC-1 relay will be described with the aid of Figures 1 and 6. We will assume that the DCR-1 relay is set for two instantaneous and two time delay operations and that a permanent fault occurs on the line beyond being protected.

Device 50 picks up and sends a trip signal to terminal 15 of the DRC-1 relay through the normally closed contacts of the IT Relay and out terminal 10 and the breaker opens.

When the 52b contact in series with terminal 5 closes, battery positive is placed across the integrator coil through the 52b contact, the normally closed integrator contacts (SS1) and level 2 Step 10 of the integrator. As the armature of the integrator picks up the normally closed contacts of the integrator (SS1) open, stopping current flow. The integrator armature compresses a spring when the coil is energized.

When the SS1 contacts open and the coil is de-energized, the spring moves the take-off arm to step 1.

The reclose timer is now energized through the take-off arm of level 4, step 1 and interval one of the RECLOSE TIMER tap block. With the input removed from the base of transistor T<sub>5</sub>, because of the closing of the 52b switch between battery positive and terminal 5 and 20 (DRC-1 relay), the resistor-capacitor timing circuit commences to charge to a voltage that will be sufficient to allow current to flow into the base of transistor T<sub>6</sub> through zener diode Z2. This signal is amplified by transistor T<sub>6</sub> and applied to the gate of SCR-2 turning SCR-2 on and placing the the close relay across the battery positive through the 52b contact (terminal 5, terminal 20). The CR contacts energize the closing circuit, which closes the main contacts for the breaker and prepares the breaker for another tripping operation. When terminal 20 loses its positive voltage, due to the opening of the 52b, the close relay drops out. The CR contact also energized the stepping switch coil which compresses a spring. When the 52b contact opens, the coil is de-energized, the spring moves the take-off arm to step 2.

When the breaker has closed, terminal 20 goes to zero and base current is applied to transistor T<sub>5</sub> discharging the time delay capacitors (C8, C9 & C10) on the reclose timer (board 670B115 on Fig. 1), thus setting it up for the next reclosing interval.

The reset timer (board 1451C38 on Fig. 1) was energized through step 2, the take-off arm of level 1, and the RESET TIMER tap block. The time delay capacitors (C1 to C3) were kept inoperative by terminal 5 being highly positive and supplying base drive for transistor Q<sub>2</sub>. This kept the time delay capacitors short-circuited. With the breaker closed and base drive removed from transistor Q2, the time delay capacitors will start to charge up and attempt to turn on SCR-1 and reset the integrator to its home position (step 10). Device 50 will trip open the breaker before the reset timer sends a signal to SCR-1 to reset the integrator. (Note: If the breaker opens to make terminal 5 positive at precisely the same time SCR-1 in the RESET TIMER turns on to reset the integrator, the stepping switch will run all the way to step 8 which is the "lockout" position.

Since the DRC-1 Relay was set for two instantaneous operations, a second instantaneous trip takes place in a similar manner to that which was described for the previous operation. When the 52b contact in series with terminal 5 closes, battery positive is placed across the integrator coil through the 52b contact, the normally closed AR relay contacts, the normally closed integrator contacts (SS1) and level 2 step 2 of the integrator. As the armature of the integrator picks up, the normally closed contacts of the integrator (SS1) open, stopping current flow. The integrator armature compresses a spring when the coil is energized.

When the SS contacts open and the coil is deenergized, the spring moves the take-off arm to step 3.

To insure consistent reclose time if set for more than one instantaneous reclosure, the positive side of the reclose timer's time delay capacitors is short circuited by the integrator take-off arm of level 7 on the previous step 10 and 2 and subsequent steps 4 and 6.

The reclose timer's resistor-capacitor time delay circuit is now energized through the moving arm of level 4, step 3 and the setting on the RECLOSE TIMER tap block interval 2 and will operate in accordance with that setting. After a predetermined time delay SCR-2 turns on the close relay is energized. The close relay contacts energize the close circuit, and the stepping switch coil. This prepares the stepping switch for its move to step 4 by compressing its spring. Energizing the close circuit closes the breaker. The 52b contact opens removing the battery voltage from terminal 5. This allows the close relay to drop out and denergizes the stepping switch coil allowing it to move to step 4.

During the time that the reclose timer was operating the reset timer was held inoperative by the positive voltage on terminal 5. This voltage supplies base drive for transistor Q2, making Q2 conduct, short circuiting the capacitors in the reset timer time delay circuitry.

When the base drive is removed from transistor Q2, the reset timer attempts to time out and reset the integrator to the home position (step 10). Device 50 again senses the fault and the trip signal gets as far as terminal 15 of the DRC-1 relay. Due to

the fact that we were only set for two instantaneous tripping operations a tap screw was placed in positions 3 & 4 of the instantaneous selector. This energizes the IT relay opening the IT normally closed contacts and no more instantaneous operations can take place.

Device 51 also senses the fault and after a time delay sends a trip signal to the breaker trip coil.

This again places the station battery across the trip coil opening the breaker. Again the operation of the 52b contact in conjunction with the wiring of level 2 moves the stepping switch to Step 5.

The reclose timer is energized through the moving arm of level 4, step 5 and interval three of the RECLOSE TIMER tap block. After the predetermined timer delay, SCR-2 turns on picking up the close relay. The close relay contacts energize the closing circuit, which closes the breaker main contacts, and prepares the stepping switch to move to step 6. When the 52b contact opens the potential at terminal 5 drops to zero and de-energizes the close relay. The stepping switch moves to Step 6.

The reset timer is energized through the moving arm of level 1, and step 6 and it will attempt to reset the integrator to its home position (step 10).

The fault reappears and device 51 goes through another time delay operation as no instantaneous operation was preset on the INSTANTANEOUS SELECTOR tap block. The breaker opens and the 52b contact again energizes the stepping switch coil through level 2, step 6 and the normally close SS1 contacts. This moves the stepping switch to step 7. The internal wiring of level 3 step 7 moves the stepping switch to step 8. This is the "lockout" step. The reclose timer is kept inoperative by the action of level 7. This level places a short circuit across capacitors C8, C9 and C10.

The reset timer is energized through the moving arm of level 1, step 8 and the RESET TIMER tap block setting. The time delay capacitors are short circuited due to the base drive applied to transistor Q2 by the positive voltage on terminal 5. The relay will remain in this condition until the breaker is manually or electrically closed.

Close the breaker utilizing the 101 switch, the

reset timer will attempt to time out and reset the integrator to its home position (step 10). Assuming the fault still exists, the breaker will trip out time delayed unless no tap screw has been placed in the number 5 position of the INSTANTANEOUS SELECTOR tap block (under this condition an instantaneous operation will take place). When the 52b goes positive again, terminal 5 will go positive, but no signal reaches the stepping switch coil as terminal 5 is connected to the AR relay normally closed contacts. At this point the AR relay is energized and its normally closed contacts are open. Therefore, the stepping switch remains at lockout.

Since the relay was at step 8 after the last operation, the relay will remain at "lockout" until it is manually or electrically closed. If we now assume that the fault has been cleared and the breaker is closed in, the reset timer is energized through the moving arm of level 1, step 8 and the "Reset Timer" tap block setting. With no base drive into transistor Q2, transistor Q2 will not conduct allowing the time delay capacitors C1 to C3 to charge up to a voltage of sufficient magnitude to make Z1 conduct current into the base of transistor Q3. Transistor Q3 amplifies the signal which is applied to the gate of SCR-1. SCR-1 turns on placing the integrator coil across the regulated voltage through the integrator contacts (SS2) and the homing contact (HC). As the armature pulls in, the integrator contacts (SS2) opens, allowing the integrator to move to step 9. SCR-1 fires again which moves the stepping switch to step 10. All circuits are de-energized except for step 10, level 3 which feeds a positive voltage to the base of transistor Q2 through a buffer circuit. This positive voltage makes transistor Q2 conduct, discharging the reset timer's time delay capacitors (C1 to C3) and keeps the capacitors discharged when the integrator is at its home position (step 10). The homing contact (HC), a cam operated switch, is open at step 10 and keeps the integrator coil from being energized when at the integrator's home position. The lockout indicator and alarm relay were energized by level 3, step 8, and will remain energized until the integrator is returned to its home position (step 10). The DRC-1 relay is now reset and ready to go through a full sequence in line with the settings made at the beginning of this description.

## **CHARACTERISTICS**

# **Tripping Sequences**

The tripping sequences can be all instantaneous, all time delayed or any combination of instantaneous and time delayed as desired.

#### Reset Time

The reset timer can be set for 10, 15, 20, 40 and 60 seconds resetting time.

#### **Reclose Time**

The reclose timer can be set for instantaneous, 2, 15, 30 and 45 seconds reclosing time for each reclosing interval or any combination of the aforementioned times.

## **Operations to Lockout**

The DRC-1 relay can be set to lockout the breaker afer 1, 2, 3, or 4 operations.

# O POWER REQUIREMENTS

Station Battery - 48 - 125 VDC

#### **SETTINGS**

#### **FRONT PANEL SETTING**

## 1. Reclosing Timer

Tap screws may be placed in different numbered (reclosing times) taps for all three intervals or in the same number for all intervals. A tap screw must be in each interval, otherwise the breaker will not close on that interval. When operating on less than 4 operations to lockout, the reclosing intervals will be dropped starting with the third interval first; i.e., for 3 operations to lockout the breaker will reclose in accordance with the tap screw in intervals one and two and then the DRC-1 relay will proceed to lockout. The number above the tap indicates the time duration of the reclosing interval.

#### 2. Reset Timer

Place tap screw in proper tap to obtain the desired reset time. The number above the tap

indicates the time duration of the reset interval.

#### 3. Operations to Lockout

Place tap screw in desired tap for obtaining 1 to 4 operations to lockout. The number above tap indicates the number of operations that will occur before lockout is reached.

#### 4. Instantaneous Operation

Do not place tap screws in the desired taps for obtaining instantaneous operation. The numbers above the taps indicate which of the sequence of trips that would be instantaneous. For instantaneous operations on the first two trips, tap screws should not be placed in the taps numbered 1 and 2. Time delayed trips will occur on all positions that do have a tap screw. A tap screw must be placed in position 5 when time delayed tripping is desired during manual closing of the breaker.

#### **ADJUSTMENTS & MAINTENANCE**

The proper adjustments to insure correct operation of this relay have been made at the factory. Upon receipt of the relay, no customer adjustments other than those covered under "SETTINGS" should be required.

#### **Acceptance Check**

The following check is recommended to insure that the relay is in proper working order. Before proceeding, connect relay to breaker as per Figure 6 or to auxiliary test relay per Figure 7.

- 1. a) Instantaneous tap screws in positions 3, 4 and 5.
  - b) Operation to lockout tap screw in position 4.
  - c) Reset timer tap screw in 10 second position.
- 2. Trip open the breaker on the test relay and observe if the DRC-1 relay opens and closes the breaker or test relay in line with the settings made in paragraph 1. It will be necessary

to trip open the device being controlled by the DRC-1 after each reclosure until lockout is reached. The device being controlled by the DRC-1 relay can be tripped open manually or electrically. The reclose timer should be two seconds plus or minus 5%.

3. When at lockout, close the device being controlled by the DRC-1 relay and simultaneously start a stop watch. Time the interval that elapses before the integrator resets. The integrator will be resetting when the lockout light on the front panel of the relay goes out. This time should equal the front panel Reset Timer setting plus or minus 10%.

#### **Routine Maintenance**

All relays should be inspected periodically and the time of operation should be checked at least once every year or at such other intervals as may be indicated by experience to be suitable to the particular application.

#### CALIBRATION

Use the following procedure for calibrating the relay, if the relay has been taken apart for repairs or the adjustments disturbed. This procedure should not be used until it is apparent that the relay is not in proper working order. (See Acceptance Check).

#### 1. RH-1 Calibration

- ◆ Place VTVM from terminal 11 of Reset Module 1451C38 to common test point. Adjust RH-1 (rear sub-base) so that 18 VDC can be seen on the VTVM when terminals 1 and 2 are energized with rated voltage.
- 2. No calibration necessary.

#### **RENEWAL PARTS**

Repair work can be done most satisfactorily at the factory. However, interchangeable parts can be furnished to the customers who are equipped for doing repair work. When ordering parts, always give the complete nameplate data.

# INTEGRATOR LEVEL AND STEP FUNCTIONS PLUS TAP BLOCK SETTINGS

INTEGRATOR	STEP 10 HOME POSITION	STEP 1	STEP 2	STEP 3	STEP 4
Level I and	No connection	Connection	Energize	Same as	Energize _
RESET TIMER		To energize	reset timer	step #1	reset timer
TAP BLOCK		reset timer	time delay	*	time delay
SETTING		if required	circuit †		circuit †
Level 2	Pulses	O Farania	Pulses	0.5	Pulses
Level 2	integrator to	Energize Aux	integrator to	S Energize Aux	integrator to
	step 1 when	relay	step 4 when	relay	step 5 when
	52b closes	relay	52b closes	relay	52b closes
					1
Level 3 and	Supplies base	Pulses	No connection	Pulses	No connection
<b>OPERATIONS TO</b>	drive for Q2	integrator to		integrator to	
LOCKOUT TAP	to keep reset	step 2 when		step 4 when	
BLOCK SETTING	timer	st for one		set for 1 or	
	inoperative	operation to		2 operations	
		lockout		to locko ut	
Level 4 and	No connection	Energize	No connection	Energizes	No connection
RECLOSE TIMER		reclose timers		reclose timers	
TAP BLOCK SETTING		time delay		time delay	
SETTINU		through		circuit through	[ 
	<u> </u>	interval one		interval one	
				interval one	
Level 5	Make contact	Make contact	No connection	No connection	No connection
Level 3	between	hetween	No connection	No connection	No connection
	terminals 16	terminals 19			
	and 17	and 17			
Level 6 and	Pick up IT	Picks up IT	Same as Step	Picks up IT	Same as Step
INST. TAP	relay with	relay with	#1	relay with	#3
	tap screw in	tap screw in		tap screw in	
	position 1	position 2		position 3	
	•	•	•	•	•
Level 7	Shark .'	Maran d'	C	Na and di	C
Level 7	Short circuits reclose timer	No connection	Same as	No connection	Same as
	time delay		Step#10		Step #10
	capacitors				
	εαραειτοίδ				

<sup>†</sup> If fault is cleared, reset timer will time out and energize coil directly.

Instantaneous tripping will not take place in those positions which have a tap screw.

# INTEGRATOR LEVEL AND STEP FUNCTIONS PLUS TAP BLOCK SETTINGS (Cont'd)

		I		OTED A	
INTEGRATOR	STEP 5	STEP 6	STEP 7	STEP 8 Lockout Pos.	STEP 9
Level 1 and	Same as	Energizes	Same as	Energizes	Energizes
RESET TIMER	step #1	reset timer	step #I	reset timer	reset timer
TAP BLOCK	*	time delay	*	time delay	time delay
SETTING	1	circuit †		circuit †	circuit †
Level 2	<b>♦</b> Energize Aux relay	Pulses integrator to step 7 when 5 2b closes	No connection	No connection	No connection
Level 3 and OPERATIONS TO LOCKOUT TAP BLOCK SETTING	Pulses integrator to step 6 when set for 1, 2, 3 operations to lockout	No con nection	Pulses integrator to step 8	Energizes lockout indicator, alarm relay and terminal 7	Energizes terminal 18 with battery positive
Level 4 and RECLOSE TIMER TAP BLOCK SETTING	Energizes reclose timers time delay circuits thru interval 3	No connection	No connection	No connection	No connection
Level 5	No connection	No connection	No connection	Make contact between terminal 16 and 17	No connection
Level 6 and INST. TAP BLOCK SETTING	Picks up IT relay with tap screw in Position 4	Same as Step #4 •	Picks up IT relay with tap screw in position 5	Same as Step #7 ■	Same as Step #1 -
Level 7	No connection	Same as Step Step #10	Same as Step #10	Same as Step #10	Same as Step #10

<sup>†</sup> If fault is cleared, reset timer will time out and energize the integrator coil directly.

Instantaneous tripping will not take place in those positions which have a tap screw.

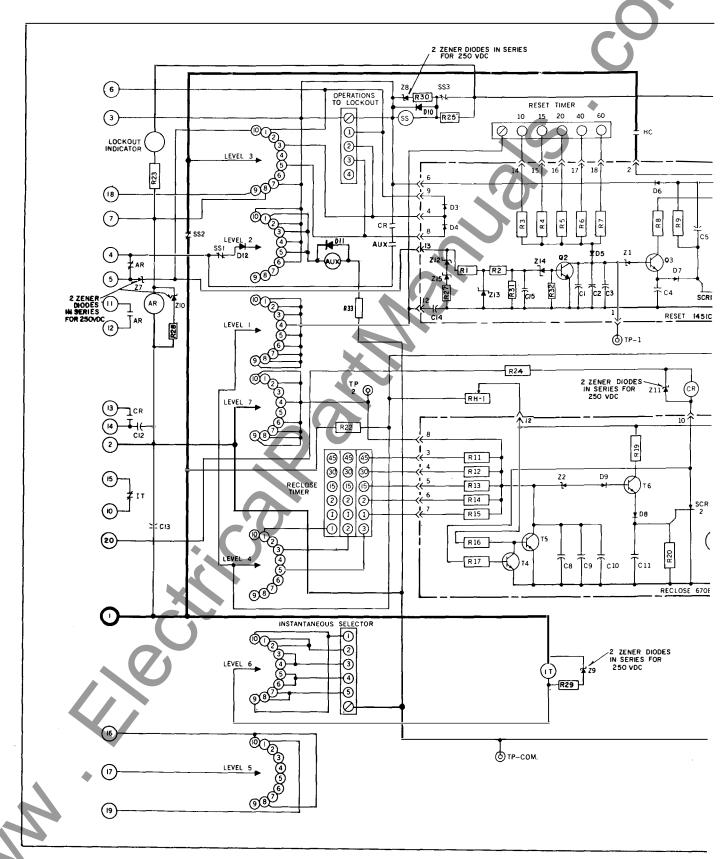
# **ELECTRICAL PARTS LIST**

I			=
CIRCUIT Symbol	DESCRIPTION	MANUFACTURER DESIGNATION	
	RESISTORS (values in Ohms)		
RI	47,000 1/2W 2%	629A531H72	
R2	4.7K 1/2W 2%	629A531H48	
R3	118,000 1/2W 1%	837A131H05	
R4	174,000 1/2W 1%	837A131H04	
R5	232,000 1/2W 1%	837A131H07	
R6	453,000 1/2W 1%	836A503H87	
R7 R8	665,000 1/2W 1%	837A131H06	
R9	2,700 1/2W 5% 1,000 1/2W 5%	184A763 H37	
R10	1,000 1/2W 5% 10 1/2W 5%	184A763H27 187A290H01	
RII	649,000 1/2W 1%	837A131H01	
R12	442,000 1/2W 1%	837A131H03	
R13	221,000 1/2W 1%	836A503H80	
R14	28,700 1/2W 1%	837A131H02	
R15	2,670 1/2W 1%	836A503H36	
R16	1,200 1/2W 5%	184A763H53	
R17	220,000 1/2W 5%	184A763H83	
R19	2,700 1/2W 5%	184 A763 H37	
R20	1,000 1/2W 5%	184A763H27	
R21	220 1/2W 5%	184 A 763 H 1 1	
R22	10,600 250VDC 5%	1267313	ŀ
R22	5,000 125VDC 5%	1205214	ŀ
R22	1,400 48VDC 5%	1267292	ŀ
R23	5,600 250VDC 5%	1267305	-
R23 R23	2,500 125VDC 5% 560 48VDC 5%	1267299	ŀ
R23 R24		1267282	-
R25	100 3W 5% 100 25W (48 VDC)	763A127H20 1207238	-
R25	500 25W (125VDC)	1207238	ŀ
R26	7.5 3W	185A209 H09	ŀ
R27	100 3W 5%	763A127H20	-
R28	100 3W 5%	763A127H20	ŀ
R29	100 3W 5%	763A127H20	ŀ
R30	10 1/2W 5%	187A290H01	-
R31	82,000 1/2W 2%	629A531H78	ŀ
R32	10,000 1/2W 2%	629A531H56	-
<b>⊘</b> R33	2,000 25W (250 VDC)	1267296	
<ul> <li>All resistor values ir</li> </ul>	n Ohms		
	CAPACITORS		
01	100 MED (11 57	1011/2017	
Cl	100 MFD 6V 5%	184A661H06	
C2	100 MFD 6V 5%	184A661H06	
C3	To be determined in test	1974 (241102	
C4 C5	.25 MFD 200VDC 10% 6.8 MFD 35VDC 20%	187A624H02 184A661H10	
C5 C5	6.8 MFD 35VDC 20% (250VDC) .25 MFD 200VDC	187A624H02	
C6	10 MFD 150VDC 20%	27D5476 H09	
C6	(250VDC) 10 MFD 400VDC	862A177H02	
C7 •	.5 MFD 200VDC 10%	187A624H08	
C7 <b>(</b>	(250VDC) .047 MFD 400VDC	763A219H01	
C8	150 MFD 6V 5%	184A661H08	
C9	To be determined in test		
C10	100 MFD 6V 5%	184A661H06	
CII	33 MFD 20V 20%	184A661H11	
C12	1 MFD 20%	187A624H04	
C12	(250VDC) 1 MFD 400VDC	764A278H02	
C13	1 MFD 20%	187A624 H04	
C13	(250VDC) 1 MFD 400VDC	764A278H02	
C14	.047 MFD 50VDC	848A646H07	
C15	.047 MFD 200VDC	849 A437 H04	
C16	22 MFD 35VDC	187A508H17	Į.
C13 C13 C14	1 MFD 20% (250VDC) 1 MFD 400VDC .047 MFD 50VDC .047 MFD 200VDC	187A624 H04 764A278H02 848A646 H07 849A437H04	

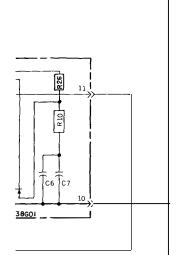
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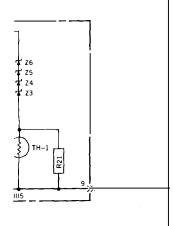
		ELECTRICA	L PARIS LIST	
	CIRCUIT SYMBOL	DESC	RIPTION	MANUFACTURER DESIGNATION
		TRANS	SISTORS	•
ı	Q2		2N3417	848A851H01
	Q2 Q3	į	2N3417 2N3417	848A851H01
	T4		2N3417	848A851H01
	T5		2N3417	848A851H01
	T6		2N3417	848A851H01
		ZENER ·	- DIODES	
		<u> </u>		ļ
	Zl		1N748A	186A797H13
	<b>Z2</b>		1N748A	186A 797 H13
ļ	<b>Z3</b>		1N748A	186A797H13
}	<b>Z4</b>	1	1N748A	186A 797 H 13
1	<b>Z</b> 5		1N748A	186A797H13
	<b>Z</b> 6		1N748A	186A 797 H 13
	Z7 to Z11		IR200	629A369H01
	Z12		1.5KE200	878A619H01
	Z13		1N3686B	185A212H06
	Z14		1N957B	186A 79 7 H 06
	Z15	(250VDC	) 1.5KF200	878A619H01
		THER	MISTOR	
	TH-I		2 D504	185A211H07
Ī		CONTROLLE	D RECTIFIERS	
İ	000		******	1044 (401112
	SCR-1	(45)	K1149-13	184A640H13
ĺ	SCR-1	(250VDC	) K1149-12	184A640H12
]	SCR-2 SCR-2	(250VDC	K1149-13 () K1149-12	184A640H13 184A640H12
1	3C R-2		TIFIERS	104/40/112
ļ		RECI		
	D3		1N4822	188A342H11
	D4		1 N48 22	188A342H11
	D5		1N645A	837A692H03
	D6		1 N4822	188A342H11
	D7		1 N48 22 1 N48 22	188A342H11
	D8 D9			188A342H11
0	D10, D11, D12	(48 VDC	1N645A r) IN4822	837A692H03 188A342H11
			LANEOUS	100/13421111
ŀ	4.	Lockout indication	52410-993	183A825G05
	RH-1	Potentiometer	Series 43-250	762A790H04
	AR	Alarm relay	250Vdc	541D514H15
- }	AR	Alarm relay	125 <b>V</b> dc	541D514H15
	AR	Alarm relay	48Vdc	541D514H08
	Aux	Auxiliary relay	48Vdc	541D514H18
0	Aux	Auxiliary relay	48, 250 <b>V</b> dc	541D514H19
3	IT	Instantaneous relay	250Vdc	541D514H14
	IT	Instantaneous relay	125Vdc	541D514H14 541D514H05
	IT	Instantaneous relay		
	CR		48Vdc	541 D514H07
M	CR CR	Close relay Close relay	250Vdc 125Vdc	541D514H14
7				541D514H05
	CR SS	Close relay	48Vdc	541D514H07
	SS SS	Stepping switch	250Vdc	205C6399G03
	SS SS	Stepping switch	125Vdc	205C399G02
- 1	33	Stepping switch	48Vdc	205C399G01

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• Fig. 2. Internal Schematic of Type DRC-





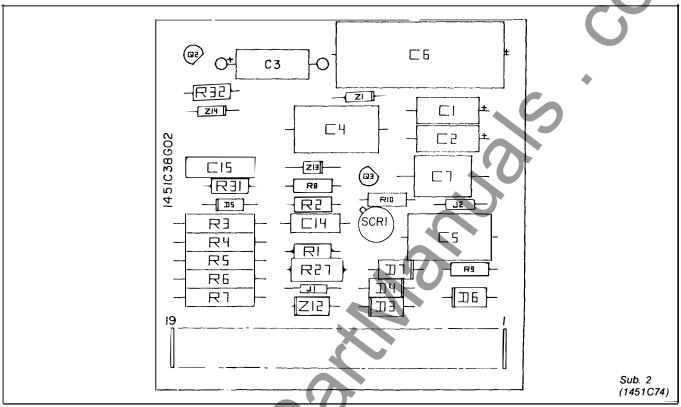
RESISTOR	STYLE NO	REF.
Rí	862A378H34	221,000 N 1/2W
R17	1844763H83	220.000 Ω 1/2w
R3	837A131H25	118.000 € 1/2W
R4	837A131H04	174.000 Ω 1/2W
R5	837A131H07	232.000 N 1/2W
R6	836A503H87	453.000 Ω 1/2W
R7	837A131H06	665.000 ∩ i/2w
R8-R19	1844763H37	2.700 ∩ 1/2W
R9_R20	184A763H27	1.000 Ω 1/2W
R10-R30	187A290H01	10 R 1/2W
R11	837A131H01	649.000 R 1/2W
	1	
R12	837A131H03	442 000 Ω 1/2W
R13	836A503H80	221 000 R 1/2W
R14	837Ai3iH02	28.700 N 1/2₩
R14 A	629A531H84	15 MEG. 1/2W
R15	836A503H36	2,670 N 1/2W
R16	184A763H53	12 000 R 1/2W
R21	184A763H-i 1	220 S 1/2W
R22	1267313	10,600 L
R26	185A2O9HO9	7.5 A. 3 W
R23	1267305	5600 Ω
R24 -R27 - R28 - R29	763A127H20	100 Ω 3W
R25	1267296	2000 n. 25 w
		2000 12 20
R2	629A531H48	4,700 £ 1/2 W
R31	629A53IH78	82,000 A 1/2 W
R32	629A53IH56	10,000 A 1/2 W
R33	185 A 2 D 9 H 2 )	5000A - 10W
K 2 2	103 K203H2)	1 30001L 10 W
		REF.
CAPACITOR	STYLF	
C1 - C2 - C10	184A661HQ6	100 MFD 6V
C3	184A661H06 TO BE DETERMINED I	100 MFD 6V
C3	1848561HQ6 TO BE DETERMINED 1 1878624HO2	100 MFD 6V N TEST 25MFD. 200VDC
C3 04 C5	1848561HQ6 TO BE DETERMINED 1 1878624HO2 1878624HO2	100 MFD 6V N TEST 25MFD. 200VDC
C3 C4 C5 C6	184A661H06 TO BE DETERMINED I 187A624H02 187A624 H02 662A177H02	100 MFD 6V  TEST  25MFD. 200VDC  250 MFD 200VDC  10 MFD 400VDC
C3 C4 C5 C6 C7	1844661H06 TO BE DETERMINED 1 1874624H02 1874624 H02 862A177H02 763A219H01	100 MFD 6V N TEST  25MFD. 200VDC .250 MFD 200VDC 10 MFD 400VDC
C3 C4 C5 C6 C7 C8	1844681406 10 86 DETERMINED 1 1874624402 1874624 HOZ 6624177 HOZ 7634219 HOI 1844661408	100 MFD 6V  N TEST  25MFD 200VDC  -250 MFD 200VDC  10 MFD 400VDC  -047 MFD 400VDC
C3	1844651HQ6  TO BE DETERMINED I 1874624HQ2 187A624HQ2 862A177HQ2 763A219HQ1 1844661HQ8  TO BE DETERMINED	100 MFD 6V  X TEST  25MFD. 200VDC  -250 MFD 200VDC  100 MFD 400 VPC  -0'41 MFD 400 VPC  150 MFD 6V
C3 C4 C5 C6 C7 C8 C9 C11	1844651HQ6 10 8E DETERMINED 1 1874624H02 1874624 H02 862A177 H02 763A219 H01 1844661H08 10 8E DETERMINED 1844661H1	100 MF0 6V  1 TEST  25MFD, 200VDC  250 MFD 200VDC  100 MFD 400 VDC  0747 MFD 400 VDC  150 MF0 6V
C3	1844651HQ6 10 8E DETERMINED I 1874624H02 1874624 H02 662A177H02 763A219H00 1844651H08 1844651H11 764A278H02	100 MF0 6V N TEST 25MF0. 200V0C 2.55MF0. 200V0C 10 MF0. 400 VPC 10 MF0. 400 VPC 150 MF0. 5V IN TEST 33MF0. 20V I MFD. 400 VPC
C3	1844651H06 10 85 DETERMINED 1 1874624H02 1874624H02 862A177H02 765A219H01 1894461H08 10 85 DETERMINED 1894461H11 764A278H02 848464H07	100 MFD 6V  N TEST  25MFD 200VDC  25MFD 200VDC  10 MFD 400VDC  150 MFD 50V  N TEST  33MFD 20V  1 MFD 400VDC  047 MFD 400VDC
C3 C4 C5 C6 C7 C8 C9 Ci1 C12-C13 C14 C15	1844651HQ6 10 BE DETERMINED 1 1874624H02 1874624H02 862A177H02 765A219H01 1844661H08 10 BE DETERMINED 1844661H11 764A278H02 848A646H07 849A437H04	100 MF0 6V  1 TEST  25MFD. 200V0C  250 MFD 200VDC  10 MFD 400 VDC  047 MFD 400 VDC  33MFD 20V  1 MFD 400 VDC  047 MFD 30VDC  047 MFD 30VDC
C3	1844651H06 10 85 DETERMINED 1 1874624H02 1874624H02 862A177H02 765A219H01 1894461H08 10 85 DETERMINED 1894461H11 764A278H02 848464H07	100 MFD 6V  N TEST  25MFD 200VDC  25MFD 200VDC  10 MFD 400VDC  150 MFD 50V  N TEST  33MFD 20V  1 MFD 400VDC  047 MFD 400VDC
C3 C4 C5 C6 C7 C8 C9 Ci1 C12-C13 C14 C15	1844651HQ6 10 BE DETERMINED 1 1874624H02 1874624H02 862A177H02 765A219H01 1844661H08 10 BE DETERMINED 1844661H11 764A278H02 848A646H07 849A437H04	100 MF0 6V  1 TEST  25MFD. 200V0C  250 MFD 200VDC  10 MFD 400 VDC  047 MFD 400 VDC  33MFD 20V  1 MFD 400 VDC  047 MFD 30VDC  047 MFD 30VDC
C3	1844651HQ6 10 BE DETERMINED 1 1874624H02 1874624H02 862A177H02 765A219H01 1844661H08 10 BE DETERMINED 1844661H11 764A278H02 848A646H07 849A437H04	100 MF0 6V  1 TEST  25MFD. 200V0C  250 MFD 200VDC  10 MFD 400 VDC  047 MFD 400 VDC  33MFD 20V  1 MFD 400 VDC  047 MFD 30VDC  047 MFD 30VDC
C3	1844651HQ6 TO BE DETERMINED 1 1874624HO2 1874624 HO2 862A177 HO2 763A219 HO1 1844661H08 TO BE DETERMINED 1844661H11 764A278HO2 8484646HO7 849A437HO4 1874508HIT	100 MF0 6V  1 TEST  25MFD. 200V0C  250 MFD 200VDC  10 MFD 400 VDC  047 MFD 400 VDC  33MFD 20V  1 MFD 400 VDC  047 MFD 30VDC  047 MFD 30VDC
C3	1844651HQ6 10 8E DETERMINED 1 1874624H02 1874624H02 662A177H02 763A219H01 1844661H08 10 8E DETERMINED 1844661H1) 764A278H02 848A646H07 849A437H04 1874508H17	100 MFD 6V  1 TEST  25MFD. 200VDC  250 MFD 200VDC  10 MFD 400VDC  150 MFD 6V  IN TEST  33MFD 20V  I MFD 400 VDC  047 MFD 400 VDC  24 MFD 30VDC  22 MFD 35VDC
C3	1844651HQ6 TO BE DETERMINED 1 1874624HO2 1874624 HO2 862A177 HO2 763A219 HO1 1844661H08 TO BE DETERMINED 1844661H11 764A278HO2 8484646HO7 849A437HO4 1874508HIT	100 MF0 6V  N TEST  25MFD. 200V00  250 MFD 200V00  10 MFD 400V00  150 MF0 5V  IN TEST  33MFD 20V  I MFD 400 VD0  047 MFD 400 VD0  047 MFD 30V00  047 MFD 30V00  22 MFD 38V00
C3	1844651HQ6 10 8E DETERMINED 1 1874624H02 1874624H02 662A177H02 763A219H01 1844661H08 10 8E DETERMINED 1844661H1) 764A278H02 848A646H07 849A437H04 1874508H17	100 MFD 6V  1 TEST  25MFD. 200VDC  250 MFD 200VDC  10 MFD 400VDC  150 MFD 6V  IN TEST  33MFD 20V  I MFD 400 VDC  047 MFD 400 VDC  24 MFD 30VDC  22 MFD 35VDC
C3	1844651HQ6 10 8E DETERMINED 1 1874624H02 1874624H02 662A177H02 763A219H01 1844661H08 10 8E DETERMINED 1844661H1) 764A278H02 848A646H07 849A437H04 1874508H17	100 MFD 6V  1 TEST  25MFD. 200VDC  250 MFD 200VDC  10 MFD 100VDC  047 MFD 100VDC  150 MFD 6V  IN TEST  33MFD 20V  I MFD 400 VDC  047 MFD 90VDC  047 MFD 90VDC  22 MFD 35VDC
C3	1844651HQ6 10 8E DETERMINED 1 1874624H02 1874624H02 662A177H02 763A219H00 1844661H08 10 8E DETERMINED 1844661H1) 764A278H02 848646H07 8498437H04 1874858H02	100 MF0 6V N TEST  25MFD. 200V0C 250 MFD 200V0C 10 MFD 400VDC 047 MFD 400VDC 150 MF0 6V N TEST 33MFD 200 1 MFD 400 VDC 047 MFD 400 VDC 24 MFD 30VDC 27 MFD 30VDC 28 MFD 38 VDC
C3	1844651H02 10 86 DETERMINED 1 1874624H02 1874624H02 862A177H02 76 5A 219H01 1844661H08 10 86 DETERMINED 1844661H11 764 A278H02 848A63H07 849A437H04 18774508H17 8484851H02	100 MF0 6V  N TEST  25MFD. 200VDC  250 MFD 200VDC  10 MFD 400VDC  .047 MFD 400VDC  33MFD 20V  IN TEST  33MFD 20V  .047 MFD 400 VDC  .047 MFD 400 VDC  .047 MFD 200VDC  .047 MFD
C3	1844651HQ6 10 8E DETERMINED 1 1874624H02 1874624H02 662A177H02 763A219H00 1844661H08 10 8E DETERMINED 1844661H1) 764A278H02 848646H07 8498437H04 1874858H02	100 MF0 6V N TEST  25MFD. 200V0C 250 MFD 200V0C 10 MFD 400VDC 047 MFD 400VDC 150 MF0 6V N TEST 33MFD 200 1 MFD 400 VDC 047 MFD 400 VDC 24 MFD 30VDC 27 MFD 30VDC 28 MFD 38 VDC
C3	1844651H02 10 86 DETERMINED 1 1874624H02 1874624H02 862A177H02 76 5A 219H01 1844661H08 10 86 DETERMINED 1844661H11 764 A278H02 848A63H07 849A437H04 18774508H17 8484851H02	100 MF0 6V  N TEST  25MFD. 200VDC  250 MFD 200VDC  10 MFD 400VDC  .047 MFD 400VDC  33MFD 20V  IN TEST  33MFD 20V  .047 MFD 400 VDC  .047 MFD 400 VDC  .047 MFD 200VDC  .047 MFD
C3	1844651H02 10 86 DETERMINED 1 1874624H02 1874624H02 862A177H02 76 5A 219H01 1844661H08 10 86 DETERMINED 1844661H11 764 A278H02 848A63H07 849A437H04 18774508H17 8484851H02	100 MF0 6V  N TEST  25MFD. 200VDC  250 MFD 200VDC  10 MFD 400VDC  .047 MFD 400VDC  33MFD 20V  IN TEST  33MFD 20V  .047 MFD 400 VDC  .047 MFD 400 VDC  .047 MFD 200VDC  .047 MFD
C3	1844651H02 10 86 DETERMINED 1 1874624H02 1874624H02 862A177H02 76 5A 219H01 1844661H08 10 86 DETERMINED 1844661H11 764 A278H02 848A63H07 849A437H04 18774508H17 8484851H02	100 MFD 6V  N TEST  25MFD 200VDC  250 MFD 200VDC  10 MFD 400VDC  150 MFD 50V  N TEST  33MFD 20V  N TEST  34MFD 400 VDC  .047 MFD 400 VDC  .047 MFD 400 VDC  .047 MFD 200VDC  .047 MFD 30VDC
C3	1844651HQ6 10 BE DETERMINED 1 1874624H02 1874624H02 862A177H02 765A219H01 1844661H08 10 BE DETERMINED 1 844661H11 764A278H02 848A437H04 1874508H17 849A437H04 1874508H17	100 MFD 6V  N TEST  25MFD. 200VDC  250 MFD 200VDC  10 MFD 400 VDC  150 MFD 6V  N TEST  33MFD 20V  IN TEST  34MFD 20V  20 47 MFD 400 VDC  047 MFD 400 VDC  047 MFD 30VDC  247 MFD 30VDC  283417  283417  REF.  20504
C3	1844651HQ6 10 BE DETERMINED 1 1874624H02 1874624H02 662A177H02 763A219H01 1844661H08 10 BE DETERMINED 1 844661H1) 764A278H02 849A437H04 1874506H17 849A437H04 1874506H17	100 MFD 6V N TEST  25MFD. 200VDE 250 MFD 200VDE 10 MFD 400 VDE 050 MFD 6V N TEST 33MFD 20V I MFD 400 VDE 047 MFD 400 VDE 047 MFD 400 VDE 247 MFD 38VDC  283417  283417  REF. 20504
C3	1844651H02 10 86 DETERMINED 1 1874624H02 1874624H02 862A177H02 765A219H01 1894461H08 10 86 DETERMINED 1 894461H11 764A278H02 848A646H07 849A437H04 18774508H17 848A851H02 877418	100 MFB 6V  1 TEST  25MFD 200 VDC  1.250 MFD 200 VDC  1.0 MFD 400 VDC  150 MFD 50 VDC  150 MFD 50 VDC  0.47 MFD 400 VDC  0.47 MFD 200 VDC  0.47 MFD 200 VDC  22 MFD 38 VDC  283417  283417  283417  REF.  20504
C3	1844651H02 10 86 DETERMINED 1 1874624H02 1874624H02 862A177H02 765A219H01 1844661H08 10 86 DETERMINED 1 844661H11 764A278H02 849A437H04 1874508H17 849A451H02 848A851H02	100 MFD 6V  N TEST  25MFD. 200VDC  250 MFD 200VDC  10 MFD 400VDC  10 MFD 6V  N TEST  33MFD 20V  IN TEST  33MFD 20V  1 MFD 400 VDC  047 MFD 30VDC  047 MFD 30VDC  247 MFD 30VDC  247 MFD 30VDC  247 MFD 30VDC  283 MFD 34 MDC  283 MFD 34 MDC  REF.  20504
C3	1844651HQ6 10 BE DETERMINED 1 1874624H02 1874624H02 862A177H02 765A219H01 1844661H01 1844661H01 764A278H02 848646H07 849A437H04 1874508H17 849A437H04 1874508H17	100 MF0 6V  N TEST  25MFD. 200V00  250 MFD 200VDC  10 MFD 400 VDC  150 MFD 6V  N TEST  33MFD 20V  I MFD 400 VDC  .047 MFD 50VDC  .047 MFD 50VDC  .047 MFD 30VDC  .047 MFD 30VD
C3	1844651H02 10 86 DETERMINED 1 1874624H02 1874624H02 862A177H02 765A219H01 1894461H08 10 86 DETERMINED 1 1894461H11 764A278H02 848A646H07 849A437H04 18774508H17 848A651H07 848A651H07 85721H07 186A737H13 679A69H01 185A212H06	100 MF0 6V  N TEST  25MFD. 200V00  250 MFD 200VDC  10 MFD 400 VDC  150 MF0 30 VDC  150 MF0 30 VDC  16 MFD 400 VDC  047 MFD 400 VDC  047 MFD 300VC  22 MFD 38 VDC  283417  283417  REF.  20504  REF.  18748A  18200  1.566200  1836868
C3	1844651HQ6 10 BE DETERMINED 1 1874624H02 1874624H02 862A177H02 765A219H01 1844661H01 1844661H01 764A278H02 848646H07 849A437H04 1874508H17 849A437H04 1874508H17	100 MF0 6V  N TEST  25MFD. 200V00  250 MFD 200VDC  10 MFD 400 VDC  150 MFD 6V  N TEST  33MFD 20V  I MFD 400 VDC  .047 MFD 50VDC  .047 MFD 50VDC  .047 MFD 30VDC  .047 MFD 30VD
C3	1844651H02 10 86 DETERMINED 1 1874624H02 1874624H02 862A177H02 765A219H01 1894461H08 10 86 DETERMINED 1 1894461H11 764A278H02 848A646H07 849A437H04 18774508H17 848A651H07 848A651H07 85721H07 186A737H13 679A69H01 185A212H06	100 MF0 6V  N TEST  25MFD. 200V00  250 MFD 200VDC  10 MFD 400 VDC  150 MF0 30 VDC  150 MF0 30 VDC  16 MFD 400 VDC  047 MFD 400 VDC  047 MFD 300VC  22 MFD 38 VDC  283417  283417  REF.  20504  REF.  18748A  18200  1.566200  1836868

SILICON	}	
CONTROLLED SW.	STYLE NO.	REF.
SCR-1 SCR-2	184A64OH12	K1149-12
	<u> </u>	ļ
	Ī	<del> </del>
RECTIFIER	STYLE NO.	REF.
03-04-06-07-08-010-011		1117022
D5 - D9	837A692H03	IN645A
	1	
	T	
	<del> </del>	
		<del>/ / /</del>
	i	
	ATVIC US	200
POI. (RH)	5TYLE NO. 762A790H04	REF. SERIES 43
		501100 45
TEL RELAY (CR)	5410514815	25 <b>0</b> VDC
TEL - RELAY (IT)(AR)	5410514414	250 VDC 250 VDC
STEPPING SW.	2050399603	250 VPQ
STEFF FIND ON	2000393003	230 100
AMBER LITE	183A825G05	52410-993
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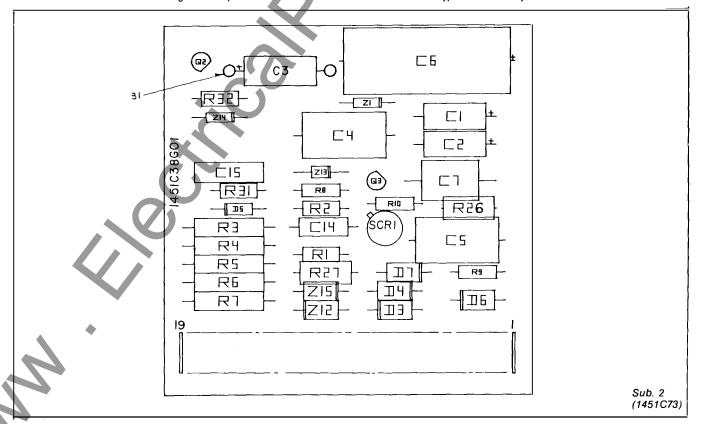
A= RECLOSE TIME 10 TO 50 SEC. • RED HANDLE ON FT CASE.
HC INDICATES"HOMING CONTACT"ON STEPPING SWITCH.
SS-1.SS-28SS-3 INDICATES"SELF STEPPING CONTACTS"ON STEPPING SWITCH.

Sub. 5 (1321D**75**)

Relay in FT-32 Case. (250 Vdc)



G Fig. 3. Component Location of Reset Circuit Board of Type DRC-1 Relay.



G Fig. 4. Component Location of Reset Circuit Board of Type DRC-1 Relay. (250 Vdc)

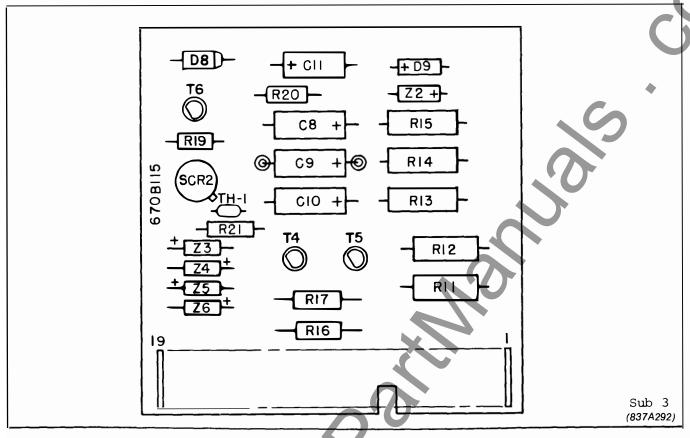
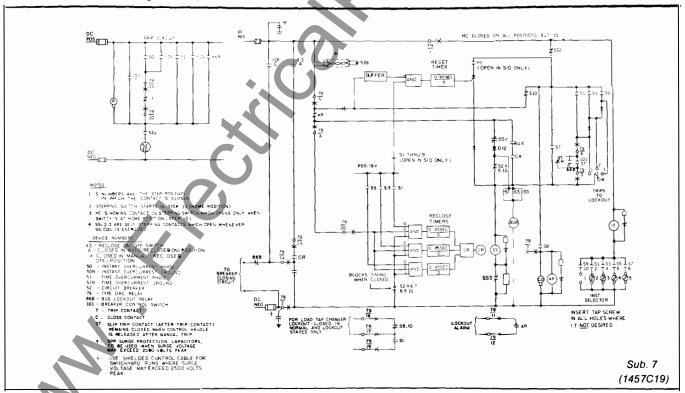


Fig. 5. Component Location of Reclose Circuit Board of Type DRC-1 Relay.



🗘 Fig. 6. External Schematic of Type DRC-1 Relay.

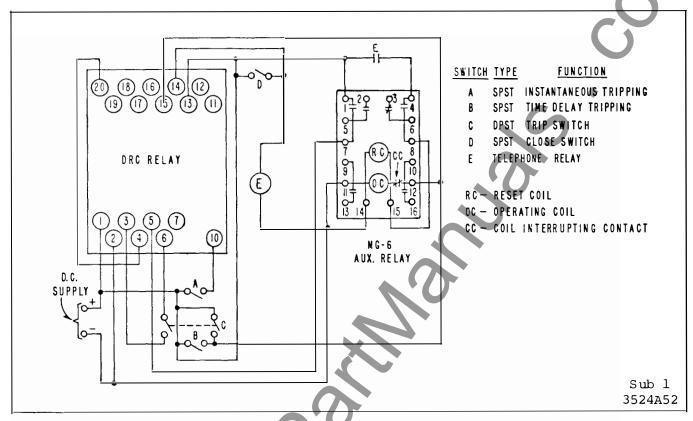


Fig. 7. Diagram of Test Connection for DRC-1 Relay.

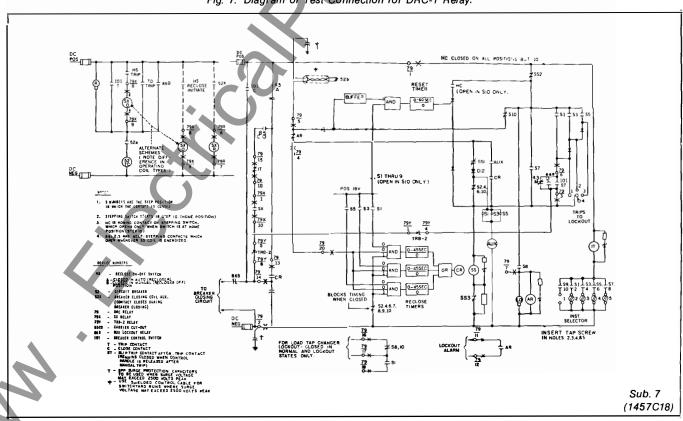


Fig. 8. External DC Schematic for DRC-1 with SX.

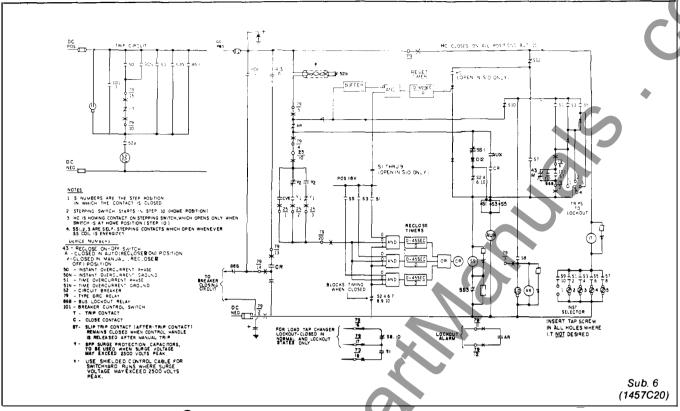


Fig. 9. External DC Schematic for DRC-1 with CVE-1.

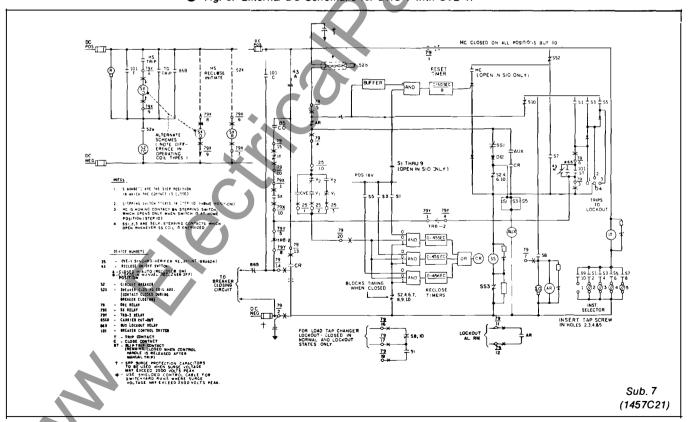
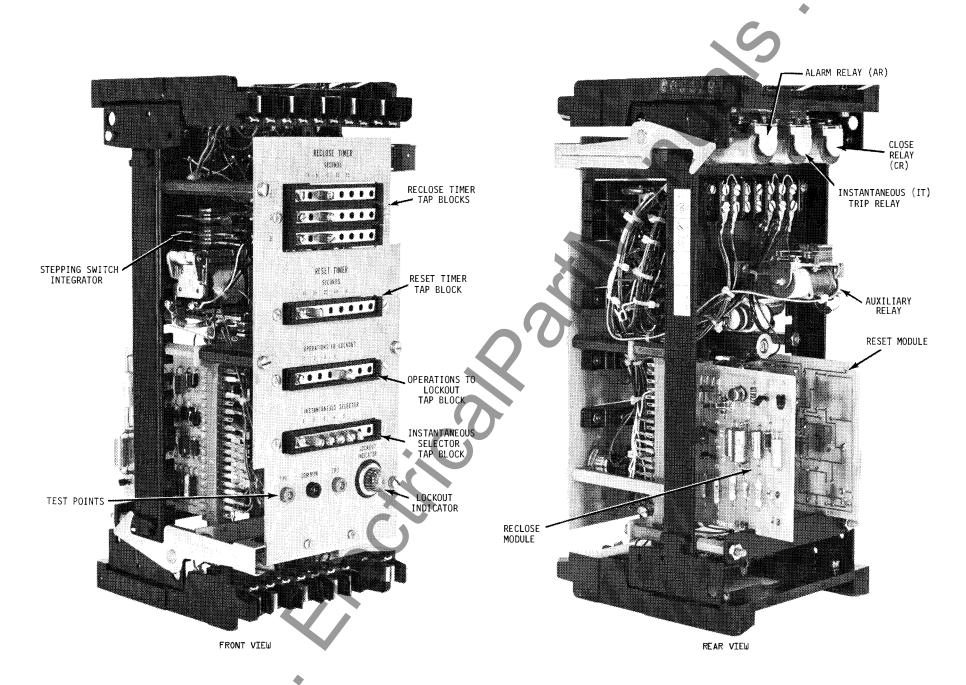


Fig. 10. External DC Schematic for DRC-1 with SX and CVE-1.





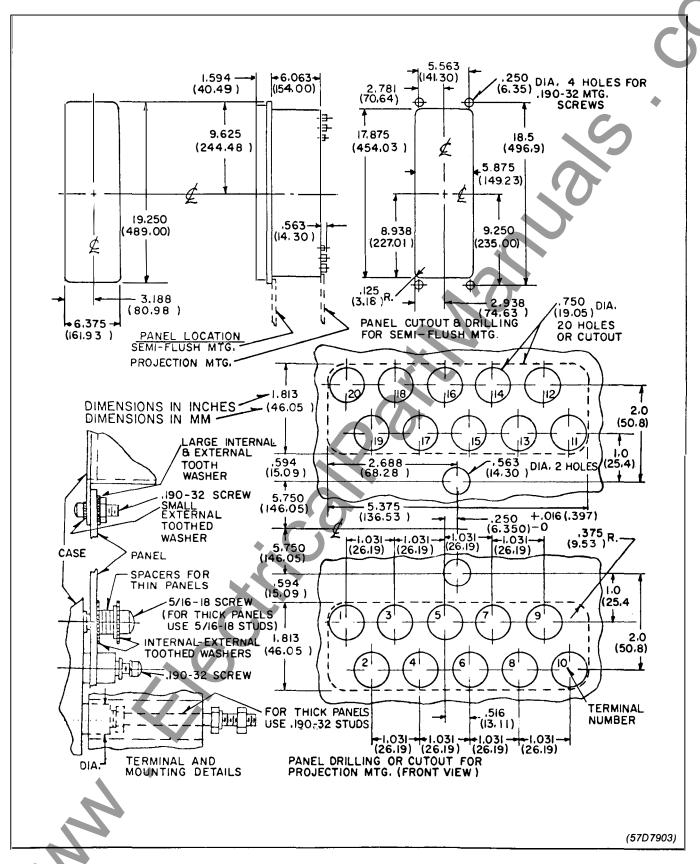


Fig. 12. Outline and Drilling for the Type DRC-1 Relay in the FT-32 Case.

in W. Colical Patientals.



WESTINGHOUSE ELECTRIC CORPORATION RELAY-INSTRUMENT DIVISION CORAL SPRINGS, FL.

**CORAL SPRINGS, FL.** 

Printed in U.S.A.



# INSTALLATION . OPERATION . MAINTENANCE

# INSTRUCTIONS

# **TYPE DRC-1 RECLOSING RELAY**

## **APPLICATION**

The DRC-1 is a multi shot reclosing relay for initiating the closing of a circuit breaker following protective relay operation.

Experience indicates the vast majority of circuit faults are of a temporary nature. High speed tripping and high speed reclosure minimize damage and system disturbance. Only sufficient dead time for arc deionization need be allowed before reclosing.

Another important function of a reclosing relay when used in distribution circuits is to allow instantaneous tripping to protect a fuse for temporary faults and, by cutting out the instantaneous trip prior to the next reclosure, to allow the fuse to operate, minimizing the outage area for permanent faults.

# The DRC-1 provides:

- 1. Up to 3 reclosures to lockout.
- 2. Flexible tripping sequence, all instantaneous, all time delay or any combination in any sequence of time delay and instantaneous.
- 3. Static timing and semi-static control.
- 4. Reclose timing adjustment 0-45 seconds.
- 5. Lockout alarm contact and indication.
- 6. Adjustable reset initiation 10 to 60 seconds following successful reclosure.

- 7. Immediate return to "Home" (or reset) position following reset initiation.
- 8. Optional instantaneous trip following manual closing from lockout position.

#### **CONSTRUCTION & OPERATION**

The Type DRC-1 Relay is composed of (1) an integrator (2) reclose timer printed circuit board (3) reset timer printed circuit board (4) alarm relay (5) instantaneous trip relay (6) close relay and (7) lockout indication. All timing functions are accomplished through the use of semiconductor components. The identification of all components and their locations is shown in figures 1, 2 and 11.

#### **Reset Timer Board**

Reset Timer — The reset timer is controlled by the integrator and the auxiliary switches on the breaker. The front panel settings allow a choice of 5 different times for the resetting interval. The time delay circuit is of the quick reset type. This enables the reset times to always be consistent with times indicated on the front panel. Refer to figures 3 and 4 for component location and board layout.

# **Reclose Timer Board**

The reclose timer is controlled by the integrator. The front panel setting allows a choice of 5 different time for each interval of reclosing. The time delay circuit is of the quick reset type which allows a specific timing circuit to be used for all reclosing intervals. Refer to figure 5 for component and board layout.

All possible contingencies which may arise during installation, operation, or maintenance, and all details and variations of this equipment do not purport to be covered by these instructions. If further information is desired by purchaser regarding his particular installation, operation or maintenance of his equipment, the local Westinghouse Electric Corporation representative should be contacted.

# Integrator

The integrator is a continuously rated stepping switch that responds to signals from the reset timer board, 52b contact, close relay and sequences the relay through its preset functions.

## **Close Relay**

The operation of the close relay is controlled by the operation of a breaker auxiliary switch and reclose timer.

## **Alarm Relay and Lockout Indicator**

The alarm relay and the lockout indicator will be energized when the integrator is in the lock out position.

#### **Instantaneous Trip Relay**

Operation of this relay is controlled by the integrator and the settings on the instantaneous tap block.

# **Theory of Operation**

Operation of the DRC-1 relay will be described with the aid of Figures 1 and 6. We will assume that the DCR-1 relay is set for two instantaneous and two time delay operations and that a permanent fault occurs on the line beyond being protected.

Device 50 picks up and sends a trip signal to terminal 15 of the DRC-1 relay through the normally closed contacts of the IT Relay and out terminal 10 and the breaker opens.

When the 52b contact in series with terminal 5 closes, battery positive is placed across the integrator coil through the 52b contact, the normally closed integrator contacts (SSI) and level 2 Step 10 of the integrator. As the armature of the integrator picks up the normally closed contacts of the integrator (SSI) open, stopping current flow. The integrator armature compresses a spring when the coil is energized.

When the SS1 contacts open and the coil is de-energized, the spring moves the take-off arm to step 1.

The reclose timer is now energized through the take-off arm of level 4, step 1 and interval one of the RECLOSE TIMER tap block. With the input removed from the base of transistor T5, because of the closing of the 52b switch between battery positive and terminal 5 and 20 (DRC-1 relay), the resistor-capacitor timing circuit commences to charge to a voltage that will be sufficient to allow current to flow into the base of transistor T<sub>6</sub> through zener diode Z2. This signal is amplified by transistor T<sub>6</sub> and applied to the gate of SCR-2 turning SCR-2 on and placing the the close relay across the battery positive through the 52b contact (terminal 5, terminal 20). The CR contacts energize the closing circuit, which closes the main contacts for the breaker and prepares the breaker for another tripping operation. When terminal 20 loses its positive voltage, due to the opening of the 52b, the close relay drops out. The CR contact also energized the stepping switch coil which compresses a spring. When the 52b contact opens, the coil is de-energized, the spring moves the take-off arm to step 2.

When the breaker has closed, terminal 20 goes to zero and base current is applied to transistor T<sub>5</sub> discharging the time delay capacitors (C8, C9 & C10) on the reclose timer (board 670B115 on Fig. 1), thus setting it up for the next reclosing interval.

The reset timer (board 1451C38 on Fig. 1) was energized through step 2, the take-off arm of level 1, and the RESET TIMER tap block. The time delay capacitors (C1 to C3) were kept inoperative by terminal 5 being highly positive and supplying base drive for transistor Q2, this kept the time delay capacitors short-circuited. With the breaker closed and base drive removed from transistor Q2, the time delay capacitors will start to charge up and attempt to turn on SCR-1 and reset the integrator to its home position (step 10). Device 50 will trip open the breaker before the reset timer sends a signal to SCR-1 to reset the integrator.

Since the DRC-1 Relay was set for two instantaneous operations, a second instantaneous trip takes place in a similar manner to that which was described for the previous operation. When the 52b contact in series with terminal 5 closes,

battery positive is placed across the integrator coil through the 52b contact, the normally closed AR relay contacts, the normally closed integrator contacts (SS1) and level 2 step 2 of the integrator. As the armature of the integrator picks up, the normally closed contacts of the integrator (SS1) open, stopping current flow. The integrator armature compresses a spring when the coil is energized.

When the SS contacts open and the coil is deenergized, the spring moves the take-off arm to step 3.

To insure consistent reclose time if set for more than one instantaneous reclosure, the positive side of the reclose timer's time delay capacitors is short circuited by the integrator take-off arm of level 7 on the previous step 10 and 2 and subsequent steps 4 and 6.

The reclose timer's resistor-capacitor time delay circuit is now energized through the moving arm of level 4, step 3 and the setting on the RECLOSE TIMER tap block interval 2 and will operate in accordance with that setting. After a predetermined time delay SCR-2 turns on the close relay is energized. The close relay contacts energize the close circuit, and the stepping switch coil. This prepares the stepping switch for its move to step 4 by compressing its spring. Energizing the close circuit closes the breaker. The 52b contact opens removing the battery voltage from terminal 5. This allows the close relay to drop out and denergizes the stepping switch coil allowing it to move to step 4.

During the time that the reclose timer was operating the reset timer was held inoperative by the positive voltage on terminal 5. This voltage supplies base drive for transistor Q2, making Q2 conduct, short circuiting the capacitors in the reset timer time delay circuitry.

When the base drive is removed from transistor Q2, the reset timer attempts to time out and reset the integrator to the home position (step 10). Device 50 again senses the fault and the trip signal gets as far as terminal 15 of the DRC-1 relay. Due to the fact that we were only set for two instantaneous tripping operations a tap screw was placed

in positions 3 & 4 of the instantaneous selector. This energizes the IT relay opening the IT normally closed contacts and no more instantaneous operations can take place.

Device 51 also senses the fault and after a time delay sends a trip signal to the breaker trip coil.

This again places the station battery across the trip coil opening the breaker. Again the operation of the 52b contact in conjunction with the wiring of level 2 moves the stepping switch to Step 5.

The reclose timer is energized through the moving arm of level 4, step 5 and interval three of the RECLOSE TIMER tap block. After the predetermined timer delay, SCR-2 turns on picking up the close relay. The close relay contacts energize the closing circuit, which closes the breaker main contacts, and prepares the stepping switch to move to step 6. When the 52b contact opens the potential at terminal 5 drops to zero and de-energizes the close relay. The stepping switch moves to Step 6.

The reset timer is energized through the moving arm of level 1, and step 6 and it will attempt to reset the integrator to its home position (step 10).

The fault reappears and device 51 goes through another time delay operation as no instantaneous operation was preset on the INSTANTANEOUS SELECTOR tap block. The breaker opens and the 52b contact again energizes the stepping switch coil through level 2, step 6 and the normally close SS1 contacts. This moves the stepping switch to step 7. The internal wiring of level 3 step 7 moves the stepping switch to step 8. This is the "lockout" step. The reclose timer is kept inoperative by the action of level 7. This level places a short circuit across capacitors C8, C9 and C10.

The reset timer is energized through the moving arm of level 1, step 8 and the RESET TIMER tap block setting. The time delay capacitors are short circuited due to the base drive applied to transistor Q2 by the positive voltage on terminal 5. The relay will remain in this condition until the breaker is manually or electrically closed.

Close the breaker utilizing the 101 switch, the

reset timer will attempt to time out and reset the integrator to its home position (step 10). Assuming the fault still exists, the breaker will trip out time delayed unless no tap screw has been placed in the number 5 position of the INSTANTANEOUS SELECTOR tap block (under this condition an instantaneous operation will take place). When the 52b goes positive again, terminal 5 will go positive, but no signal reaches the stepping switch coil as terminal 5 is connected to the AR relay normally closed contacts. At this point the AR relay is energized and its normally closed contacts are open. Therefore, the stepping switch remains at lockout.

Since the relay was at step 8 after the last operation, the relay will remain at "lockout" until it is manually or electrically closed. If we now assume that the fault has been cleared and the breaker is closed in, the reset timer is energized through the moving arm of level 1, step 8 and the "Reset Timer" tap block setting. With no base drive into transistor Q2, transistor Q2 will not conduct allowing the time delay capacitors C1 to C3 to charge up to a voltage of sufficient magnitude to make Z1 conduct current into the base of transistor Q3. Transistor Q3 amplifies the signal which is applied to the gate of SCR-1. SCR-1 turns on placing the integrator coil across the regulated voltage through the integrator contacts (SS2) and the homing contact (HC). As the armature pulls in, the integrator contacts (SS2) opens, allowing the integrator to move to step 9. SCR-1 fires again which moves the stepping switch to step 10. All circuits are de-energized except for step 10, level 3 which feeds a positive voltage to the base of transistor Q2 through a buffer circuit. This positive voltage makes transistor Q2 conduct, discharging the reset timer's time delay capacitors (C1 to C3) and keeps the capacitors discharged when the integrator is at its home position (step 10). The homing contact (HC), a cam operated switch, is open at step 10 and keeps the integrator coil from being energized when at the integrator's home position. The lockout indicator and alarm relay were energized by level 3, step 8, and will remain energized until the integrator is returned to its home possition (step 10). The DRC-1 relay is now reset and ready to go through a full sequence in line with the settings made at the beginning of this description.

#### **CHARACTERISTICS**

## **Tripping Sequences**

The tripping sequences can be all instantaneous, all time delayed or any combination of instantaneous and time delayed as desired.

#### **Reset Time**

The reset timer can be set for 10, 15, 20, 40 and 60 seconds resetting time.

#### **Reclose Time**

The reclose timer can be set for instantaneous, 2, 15, 30 and 45 seconds reclosing time for each reclosing interval or any combination of the aforementioned times.

# **Operations to Lockout**

The DRC-1 relay can be set to lockout the breaker afer 1, 2, 3, or 4 operations.

# **ENERGY REQUIREMENTS**

Station Battery - 48 - 125 VDC

#### **SETTINGS**

#### FRONT PANEL SETTING

#### 1. Reclosing Timer

Tap screws may be placed in different numbered (reclosing times) taps for all three intervals or in the same number for all intervals. A tap screw must be in each interval, otherwise the breaker will not close on that interval. When operating on less than 4 operations to lockout, the reclosing intervals will be dropped starting with the third interval first; i.e., for 3 operations to lockout the breaker will reclose in accordance with the tap screw in intervals one and two and then the DRC-1 relay will proceed to lockout. The number above the tap indicates the time duration of the reclosing interval.

#### 2. Reset Timer

Place tap screw in proper tap to obtain the desired reset time. The number above the tap

indicates the time duration of the reset interval.

#### 3. Operations to Lockout

Place tap screw in desired tap for obtaining 1 to 4 operations to lockout. The number above tap indicates the number of operations that will occur before lockout is reached.

# 4. Instantaneous Operation

Do not place tap screws in the desired taps for obtaining instantaneous operation. The numbers above the taps indicate which of the sequence of trips that would be instantaneous. For instantaneous operations on the first two trips, tap screws should not be placed in the taps numbered 1 and 2. Time delayed trips will occur on all positions that do have a tap screw. A tap screw must be placed in position 5 when time delayed tripping is desired during manual closing of the breaker.

## **ADJUSTMENTS & MAINTENANCE**

The proper adjustments to insure correct operation of this relay have been made at the factory. Upon receipt of the relay, no customer adjustments other than those covered under "SETTINGS" should be required.

#### **Acceptance Check**

The following check is recommended to insure that the relay is in proper working order. Before proceeding, connect relay to breaker as per Figure 6 or to auxiliary test relay per Figure 7.

- 1. a) Instantaneous tap screws in positions 3, 4 and 5.
  - b) Operation to lockout tap screw in position
  - c) Reset timer tap screw in 10 second position.
- 2. Trip open the breaker on the test relay and observe if the DRC-1 relay opens and closes the breaker or test relay in line with the settings made in paragraph 1. It will be necessary

to trip open the device being controlled by the DRC-1 after each reclosure until lockout is reached. The device being controlled by the DRC-1 relay can be tripped open manually or electrically. The reclose timer should be two seconds plus or minus 5%.

3. When at lockout, close the device being controlled by the DRC-1 relay and simultaneously start a stop watch. Time the interval that elapses before the integrator resets. The integrator will be resetting when the lockout light on the front panel of the relay goes out. This time should equal the front panel Reset Timer setting plus or minus 10%.

# **Routine Maintenance**

All relays should be inspected periodically and the time of operation should be checked at least once every year or at such other intervals as may be indicated by experience to be suitable to the particular application.

#### **CALIBRATION**

Use the following procedure for calibrating the relay, if the relay has been taken apart for repairs or the adjustments disturbed. This procedure should not be used until it is apparent that the relay is not in proper working order. (See Acceptance Check).

#### 1. RH-1 Calibration

Place VTVM from terminal II of Reset Module 1451C38 to common test point. Adjust RH-1 (rear sub-base) so that 18 VDC can be seen on the VTVM when terminals 1 and 2 are energized with rated voltage.

2. No calibration necessary.

#### **RENEWAL PARTS**

Repair work can be done most satisfactorily at the factory. However, interchangeable parts can be furnished to the customers who are equipped for doing repair work. When ordering parts, always give the complete nameplate data.

# INTEGRATOR LEVEL AND STEP FUNCTIONS PLUS TAP BLOCK SETTINGS

INTEGRATOR	STEP 10 HOME POSITION	STEP 1	STEP 2	STEP 3	STEP 4
Level 1 and RESET TIMER TAP BLOCK SETTING	No connection	Connection To energize reset timer if required	Energize reset timer time delay circuit †	Same as step #1	Energize reset timer time delay circuit †
Level 2	Pulses integrator to step 1 when 52b closes	No connection	Pulses integrator to step 4 when 52b closes	No connection	Pulses integrator to step 5 when 52b closes
Level 3 and OPERATIONS TO LOCKOUT TAP BLOCK SETTING	Supplies base drive for Q2 to keep reset timer inoperative	Pulses integrator to step 2 when set for one operation to lockout	No connection	Pulses integrator to step 4 when set for 1 or 2 operations to lockout	No connection
Level 4 and RECLOSE TIMER TAP BLOCK SETTING	No connection	Energize reclose timers time delay circuit through interval one	No connection	Energizes reclose timers time delay circuit through interval one	No connection
Level 5	Make contact between terminals 16 and 17	Make contact between terminals 19 and 17	No connection	No connection	No connection
Level 6 and INST. TAP	Pick up IT relay with tap screw in position 1	Picks up IT relay with tap screw in position 2	Same as Step #I ■	Picks up IT relay with tap screw in position 3	Same as Step #3 ■
Level 7	Short circuits reclose timer time delay capacitors	No connection	Same as Step #10	No connection	Same as Step #10

<sup>†</sup> If fault is cleared, reset timer will time out and energize coil directly.

<sup>•</sup> Instantaneous tripping will not take place in those positions which have a tap screw.

# INTEGRATOR LEVEL AND STEP FUNCTIONS PLUS TAP BLOCK SETTINGS (Cont'd)

		-			
INTEGRATOR	STEP 5	STEP 6	STEP 7	STEP 8 Lockout Pos.	STEP 9
Level I and	Same as	Energizes	Same as	Energizes	Energizes
RESET TIMER	step #1	reset timer	step #1	reset timer	reset timer
TAP BLOCK	*	time delay	*	time delay	time delay
SETTING		circuit †		circuit †	circuit †
Level 2	No connection	Pulses integrator to step 7 when 52b closes	No connection	No connection	No connection
Level 3 and OPERATIONS TO LOCKOUT TAP BLOCK SETTING	Pulses integrator to step 6 when set for 1, 2, 3 operations to lockout	No connection	Pulses integrator to step 8	Energizes lockout indicator, alarm relay and terminal 7	Energizes terminal 18 with battery positive
Level 4 and RECLOSE TIMER TAP BLOCK SETTING	Energizes reclose timers time delay circuits thru interval 3	No connection	No connection	No connection	No connection
Level 5	No connection	No connection	No connection	Make contact between terminal 16 and 17	No connection
Level 6 and INST. TAP BLOCK SETTING	Picks up IT relay with tap screw in Position 4	Same as Step #4 ■	Picks up IT relay with tap screw in position 5	Same as Step #7 ■	Same as Step #1 •
Level 7	No connection	Same as Step Step #10	Same as Step #10	Same as Step #10	Same as Step #10

If fault is cleared, reset timer will time out and energize the integrator coil directly.

Instantaneous tripping will not take place in those positions which have a tap screw.

# **ELECTRICAL PARTS LIST**

H72 H48 H05 H04 H07 H87 H06 3H37 3H27 9H01 H01 H03 3H80 H02
H48 H05 H04 H07 H87 H06 8H37 8H27 DH01 H01 H01 H03 8 H80
H48 H05 H04 H07 H87 H06 8H37 8H27 DH01 H01 H01 H03 8 H80
H05 H04 H07 H87 H06 8H37 8H27 DH01 H01 H03 8H80
H04 H07 H87 H06 3H37 3H27 DH01 H01 H03 3 H80
H07 H87 H06 3H37 3H27 DH01 H01 H03 3 H80
H87 H06 BH37 BH27 DH01 H01 H03 BH80
H06 8H37 8H27 9H01 H01 H03 8H80
8H27 9H01 H01 H03 8H80
0H01 H01 H03 5H80
H01 H03 H80
H03 H80
H80
3H36
H53
3H83
H37
3H27 3H11
ни
H20
H09
H20
'H20
'H20
H01
H78 H56
1150
06
06
02
10
02 09
02
08
01
08
06
11
04 02
02 04
02
07
04

# **ELECTRICAL PARTS LIST**

CIRCUIT SYMBOL	DESCR	IPTION	MANUFACTURER DESIGNATION
	TRANS	ISTORS	
	1		<b>T</b> ♦
Q2		2N3417	848A851H01
Q3		2N3417 2N3417	848A851H01
T4		848A851H01	
T5 T6		848A851H01 848A851H01	
10	ZENER -	2N3417	040A031H01
	ZENEN -	DIODES	1
Zl		1N748A	186A797H13
Z2	1	1N748A	186A797H13
<b>Z</b> 3		1N748A	186A797H13
Z4		1N748A	186A797H13
<b>Z</b> 5		1N748A	186A797H13
<b>Z</b> 6		1N748A	186A797H13
Z7 to Z11		I R200	629A369H01
Z12		1.5KE200	878A619H01
Z13		1N3686B	185A212H06
<b>Z</b> 14		1 N957B	186A797H06
Z15	(250VDC)	1.5K E200	878A619H01
	THERN	ISTOR	
TH-1	0	2D504	185A211H07
	CONTROLLE	RECTIFIERS	
0.00			10
SCR-1		K1149-13	184A640H13
SCR-1	(250VDC)		184A640H12
SCR-2 SCR-2	(250VDC)	K1149-13	184A640H13 184A640H12
SCK-2			104A040H12
	RECTI		
D3		1 N4822	188A342H11
D4		1 N4822	188A342H11
D5		1N645A	837A692H03
D6		1 N4822	188A342H11
D7		1 N4822	188A342H11
D8		1 N4822	188A342H11
D9 D10		1N645A	837A692H03
Dio	(48 VDC)	1N4822	188A342H11
	MISCELL	ANEOUS	1
II .	Lockout indication	52410-993	183A - 25G05
RH-I	Potentiometer	Series 43-250	762A790H04
AR	Alarm relay	250Vdc	541D514H15
AŘ	Alarm relay	125 <b>V</b> dc	541D514H06
AR	Alarm relay	48Vdc	541 D514H08
IT	Instantaneous relay	250Vdc	541D514H14
IT.	Instantaneous relay	125Vdc	541 D514H05
IŤ	Instantaneous relay	48Vdc	541D514H07
CR	Close relay	250Vdc	541D514H14
CR	Close relay	125 <b>V</b> dc	541 D514H05
CR	Close relay	48Vdc	541D514H07
SS	Stepping switch	250Vdc	205C6399G03
SS	Stepping switch	125Vdc	205C399G02
SS	Stepping switch	48Vdc	205C399G01

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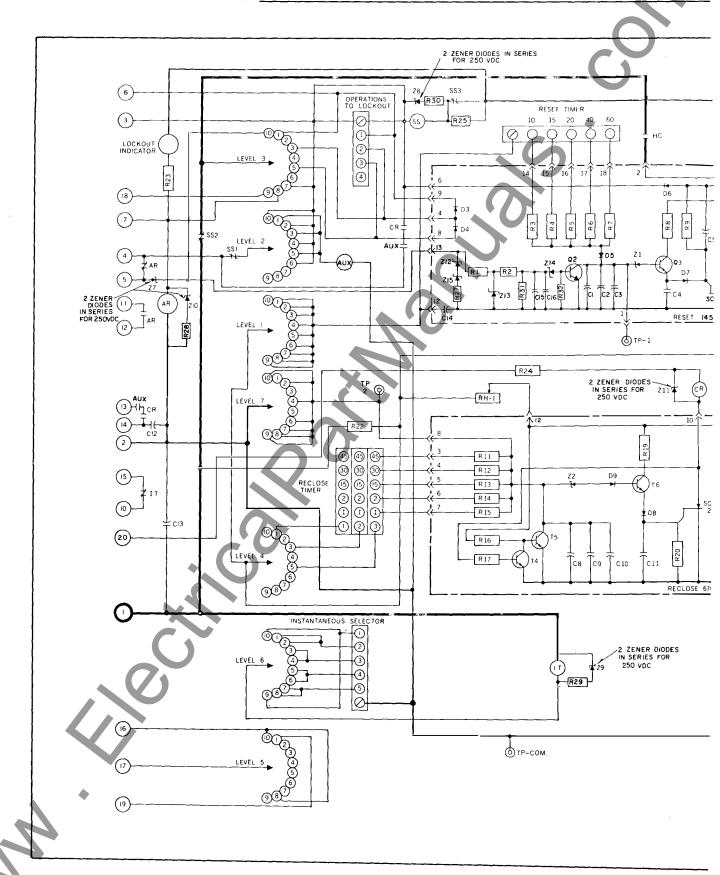
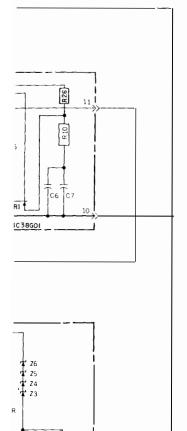


Fig. 2. Internal Schematic of Type DR



F1 5. 5 10 /	5 kg ( 1 N 5	2:1
k1	862A37BH34	221,000 to 1/24
<u>817</u>	18-46-75 291- 3	220,000 B 1/2+
Ri	837A151005	116 000 1. 1/24
Ru	83741311104	174,600 // 1/74
45,	6 -74   3   NO?	247,000 1 1/24
Rr Rr	63FA5038F7	45.3.000 G 1/24
k/		755 600 C + 24
	8374 (3 806	
34-R19	184475,3837	2,700 € 1/2+
R9-R20	+64475,3m27	1,000 0 1/24
910-R30	87A2+9HG.	10 ft 1/2m
Rit	837 A i 3 - HO -	€49,000 0 1/24
		}
R12	8374131H93	442 000 St 1/2*
913	8364503960	22: 000 (2 1/2#
9)14	1837A+3+H02	28.700 Q - 2W
÷14 △	6294537194	15 MEG 1/24
RVS	#35A503*136	2.670 G 1/2#
R16	1844763453	12 000 R 1/2w
92	1844763Hv )	220 S 1/2w
R27	1267313	10,600 Ω
R26	185A2O9HO9	7.5 A. 3 W
R23	1267305	5600 N
		<del> </del>
R24-R27-R28-R29	76,34,27420	100 :: 3a
R25	1267296	2000 N 25 W
R2	629A53IH48	4,700 ft 1/2 W
R31	629A53IH78	82,000 n. 1/2 w
R32	629A53IH56	10,000 Ω 1/2W
CAPACITOR	STYLE	RE F
	10014661906	100 MER E-/
01 - 02 - 010	184A651H06	190 MED 64
- 63	TO SE DETERMINED I	N TEST
C3	10 95 DETERMINED 1 1874624602	25MFD 200VDC
03 14 05	10 95 DETERMINED 1 1874524H02 1874624 Ho2	25MFD 20040C •250MFD 200VDC
CS CS CE	10 95 DETERMINED 1 1874624H02 1874624 H02 8624177H02	25MFD 200VDC .250MFD 200VDC
03 19 05 06 07	10 95 DETERMINED 1 1874624H02 1874624 H02 862A177H02 763A219H01	25MFD 200VDC .250MFD 200VDC IO MFD 400 VDC .047 MFD 400 VDC
C5 C5 C6 C7 C8	10 SE DETERMINED 1 1874624H02 1874624 H02 862A177H02 763A219H01 1844551H08	254FB 2004DC .250 MFD 200VDC IO MFD 400 VDC .047 MFD 400
03 05 06 07	10 95 DETERMINED 1 1874624HD2 1874624 HD2 862A177HOZ 763A219HO1	254FP 2004DC -250MFD 2004DC -0 47 MFD 4004P -0 47 MFD 4004P -150 47 MFD 4004P
03 19 05 06 07 08	10 95 DETERMINED 1 1874524402 187A524 HOZ 862A77HOZ 763A219HOI 1844551HOB 10 86 DETERMINED 1844651H11	2545B 20040C -250MFD 2004DC -250MFD 2004DC IO MFD 4004DC -047 MFD 4004D 158 MFD 404D 158 MFD 404D 18 1041 33MFD 204
03 19 05 06 07 08	10.95 DEFERMINED 1 1874524-02 1874624-402 B6ZA177-102 765A219-101 184455-1008 10.86 DEFERMINED 184465-101 184465-101 764A278-02	254FB 20000C 2596FB 20000C 0.2596FB 2000D 10 MFD 400 VD 0.047 MFD 400 VD 156 VELLEY 1N 1541 331W D 200 4 MFD 400 VDC
53 55 55 56 57 58 69	10 90 DEFERMINED 1 1878624H02 1878624H02 BBZA177H02 763A219H01 1844551H08 TO BE DEFERMINED 1844651H11 764A278H02 888A666H07	25HFB 20040C 250 MFD 2004DC 10 MFD 400 VD 047 MFD 400 VD 158 V7:15 V 1N 1511 3 MFD 200 4 MFD 400 VDC 047 MFD 50 VDC
03 05 05 06 07 08 09 01 CVZ=Cv3	10.95 DEFERMINED 1 1874524-02 1874624-402 B6ZA177-102 765A219-101 184455-1008 10.86 DEFERMINED 184465-101 184465-101 764A278-02	254FB 20000C 2596FB 20000C 0.2596FB 2000D 10 MFD 400 VD 0.047 MFD 400 VD 156 VELLEY 1N 1541 331W D 200 4 MFD 400 VDC
C3 **5 C5 C6 C7 C8 C9 C1 C1 C1/2-C3 C14	10 90 DEFERMINED 1 1878624H02 1878624H02 BBZA177H02 763A219H01 1844551H08 TO BE DEFERMINED 1844651H11 764A278H02 888A666H07	25HFB 20040C 250 MFD 2004DC 10 MFD 400 VD 047 MFD 400 VD 158 V7:15 V 1N 1511 3 MFD 200 4 MFD 400 VDC 047 MFD 50 VDC
63 65 65 66 67 68 69 60 61 612-63 C14	10 SE DETFRINKED I 1878624 HOZ 1878624 HOZ 862A177 HOZ 765A219 HOI 184151 HOB 19 BE DETERMINED 194461 HI 764A278 HOZ 848646 HO7 849A437 HO4	25478 20000C 2550 MFD 200VDC 10 MFD 400 VP 047 MFD 400 VP 18 77. EV 047 MFD 400 VDC 047 MFD 50VDC
C1	10 SE DETFRINKED I 1878624 HOZ 1878624 HOZ 862A177 HOZ 765A219 HOI 184151 HOB 19 BE DETERMINED 194461 HI 764A278 HOZ 848646 HO7 849A437 HO4	25478 20000C 2550 MFD 200VDC 10 MFD 400 VP 047 MFD 400 VP 18 77. EV 047 MFD 400 VDC 047 MFD 50VDC
C3  *5  C5  C6  C7  C8  C9  C1)  C12-C3  C14  C15  C16	10 SE DETFRINKED I 1878624 HOZ 1878624 HOZ 862A177 HOZ 765A219 HOI 184151 HOB 19 BE DETERMINED 194461 HI 764A278 HOZ 848646 HO7 849A437 HO4	25478 20000C 2550 MFD 200VDC 10 MFD 400 VP 047 MFD 400 VP 18 77. EV 047 MFD 400 VDC 047 MFD 50VDC
C3  C5  C5  C7  C8  C9  C11  C12-C13  C14  C15  C16	10 SE DETFRINKED I 1878624 HOZ 1878624 HOZ 862A177 HOZ 765A219 HOI 184151 HOB 19 BE DETERMINED 194461 HI 764A278 HOZ 848646 HO7 849A437 HO4	25478 20000C 2550 MFD 200VDC 10 MFD 400 VP 047 MFD 400 VP 18 77. EV 047 MFD 400 VDC 047 MFD 50VDC
C3  "5  C5  C5  C6  C7  C8  C9  C11  C12-C13  C14  C15  C16  TRANSISTOR  T4-10-T5	10 SE QETF MINED 1 1878624 HOZ 1878624 HOZ 8628171 HOZ 7658219 HOI 1844FE 1408 10 SE DETERMINED 18448E 1411 7648278 HOZ 8488646 HO7 849437 HOZ 1878508 HIT	254FB 20040C 2550 MFD 20040C 10 MFD 400 VB 047 MFD 400 VB 158 VF:15 V 11 7517 33NFD 20/ 4 MFD 400 VDC 047 MFD 300VDC 22 MFD 35 VDC 28 MFD 35 VDC
C3  C5  C5  C7  C8  C9  C11  C12-C13  C14  C15  C16	10 ST QETF THINED IN 1874 2 MIND IN 1874 2 MIND IN 1874 2 MIND IN 1874 1 MIND IN	254FB 20000C 2550 MFD 200VDC 10 MFD 400 VB 047 MFD 400 VB 156 VF-5V 1N 751 33NC 20 1 MFD 400 VDC 047 MFD 50VDC 047 MFD 200VDC 22 MFD 35VDC
C3  "5  C5  C6  C7  C8  C9  C11  C12-C13  C14  C15  C16  TRANSISTOR  T4-10-T5	10 SE QETF MINED 1 1878624 HOZ 1878624 HOZ 8628171 HOZ 7658219 HOI 1844FE 1408 10 SE DETERMINED 18448E 1411 7648278 HOZ 8488646 HO7 849437 HOZ 1878508 HIT	254FB 20040C 2550 MFD 20040C 10 MFD 400 VB 047 MFD 400 VB 158 VF:15 V 11 7517 33NFD 20/ 4 MFD 400 VDC 047 MFD 300VDC 22 MFD 35 VDC 28 MFD 35 VDC
C3  "5  C5  C5  C6  C7  C8  C9  C11  C12-C13  C14  C15  C16  TRANSISTOR  T4-10-T5	10 SE QETF MINED 1 1878624 HOZ 1878624 HOZ 8628171 HOZ 7658219 HOI 1844FE 1408 10 SE DETERMINED 18448E 1411 7648278 HOZ 8488646 HO7 849437 HOZ 1878508 HIT	254FB 20040C 2550 MFD 20040C 10 MFD 400 VB 047 MFD 400 VB 158 VF:15 V 11 7517 33NFD 20/ 4 MFD 400 VDC 047 MFD 300VDC 22 MFD 35 VDC 28 MFD 35 VDC
C3  "5  C5  C5  C6  C7  C8  C9  C11  C12-C13  C14  C15  C16  TRANSISTOR  T4 10 T6  Q2-Q3	10 SE QETERNINED 1878274162 HO 26 1878624 HO 2 B62A177HO 2 765A219HO 1 1844FE HO 8 DETERNINED 1844FE HO 18	254FB 2004DC 2550 MFD 2004DC 10 MFD 400 VB 0 47 MFD 400 VB 155 VF: 5V 1N 75H 33NFD 20/ 4 MFD 400 VDC 047 MFD 50VDC 22 MFD 35VDC 22 MFD 35VDC 28 MFD 35VDC
C3  '%  C5  C6  C7  C8  C9  C1  C1/2-C13  C14  C15  C16  TRANSISTOR  T4 10 T6  Q2-Q3	10 SE DETFRINKED I 1878-24-102 1878-624 HOZ 1878-624 HOZ 26-58-219-HOJ 1844-51-14-108 10 SE DETERMINED 1344-51-14-11 76-48-27-8-HOZ 84-98-64-HOZ 84-98-64-HOZ 84-98-65-14-11 84-98-85-14-12 84-98-85-14-12	1237   20000C   2590 MPD 20000C   2590 MPD 20000D   100 MFD 400 VP   20000C   2000
C3  "5  C5  C5  C6  C7  C8  C9  C11  C12-C13  C14  C15  C16  TRANSISTOR  T4 10 T6  Q2-Q3	10 SE QETERNINED 1878274162 HO 26 1878624 HO 2 B62A177HO 2 765A219HO 1 1844FE HO 8 DETERNINED 1844FE HO 18	254FB 2004DC 2550 MFD 2004DC 10 MFD 400 VB 0 47 MFD 400 VB 155 VF: 5V 1N 75H 33NFD 20/ 4 MFD 400 VDC 047 MFD 50VDC 22 MFD 35VDC 22 MFD 35VDC 28 MFD 35VDC
C3  '%  C5  C6  C7  C8  C9  C1  C1/2-C13  C14  C15  C16  TRANSISTOR  T4 10 T6  Q2-Q3	10 SE DETFRINKED I 1878-24-102 1878-624 HOZ 1878-624 HOZ 26-58-219-HOJ 1844-51-14-108 10 SE DETERMINED 1344-51-14-11 76-48-27-8-HOZ 84-98-64-HOZ 84-98-64-HOZ 84-98-65-14-11 84-98-85-14-12 84-98-85-14-12	1237   20000C   2590 MPD 20000C   2590 MPD 20000D   100 MFD 400 VP   20000C   2000
C3  25  C5  C6  C7  C8  C9  C1  C1/2-C13  C14  C15  C16  TRANSISTOR  T4 10 T6  Q2-Q3	10 SE DETFRINKED I 1878-24-102 1878-624 HOZ 1878-624 HOZ 26-58-219-HOJ 1844-51-14-108 10 SE DETERMINED 1344-51-14-11 76-48-27-8-HOZ 84-98-64-HOZ 84-98-64-HOZ 84-98-65-14-11 84-98-85-14-12 84-98-85-14-12	1237   20000C   2590 MPD 20000C   2590 MPD 20000D   100 MFD 400 VP   20000C   2000
C3  '%  C5  C6  C7  C8  C9  C1  C1/2-C13  C14  C15  C16  TRANSISTOR  T4 10 T6  Q2-Q3	10 SE DETFRINKED I 1878-24-102 1878-624 HOZ 1878-624 HOZ 26-58-219-HOJ 1844-51-14-108 10 SE DETERMINED 1344-51-14-11 76-48-27-8-HOZ 84-98-64-HOZ 84-98-64-HOZ 84-98-65-14-11 84-98-85-14-12 84-98-85-14-12	1237   20000C   2590 MPD 20000C   2590 MPD 20000D   100 MFD 400 VP   20000C   2000
13	10 SE DETFRINKED I 1878-24-102 1878-624 HOZ 1878-624 HOZ 26-58-219-HOJ 1844-51-14-108 10 SE DETERMINED 1344-51-14-11 76-48-27-8-HOZ 84-98-64-HOZ 84-98-64-HOZ 84-98-65-14-11 84-98-85-14-12 84-98-85-14-12	1237   20000C   2590 MPD 20000C   2590 MPD 20000D   100 MFD 400 VP   20000C   2000
C3  25  C5  C6  C7  C8  C9  C1  C1/2-C13  C14  C15  C16  TRANSISTOR  T4 10 T6  Q2-Q3	10 SE DETFRINKED I 1878-24-102 1878-624 HOZ 1878-624 HOZ 26-58-219-HOJ 1844-51-14-108 10 SE DETERMINED 1344-51-14-11 76-48-27-8-HOZ 84-98-64-HOZ 84-98-64-HOZ 84-98-65-14-11 84-98-85-14-12 84-98-85-14-12	254FB 20040C 2550 MFD 20040C 10 MFD 400 VBI 0 47 MFD 400 VBI 33NFD 20 4 MFD 400 VDC 047 MFD 400 VDC 047 MFD 200 VDC 22 MFD 35 VDC  783417 2N3417 2N3417
C3  C5  C5  C6  C7  C8  C9  C9  C14  C15  C16  TRANSISTOR  T4 10 T6  Q2-Q3  THERMISTOR  THERMISTOR  THERMISTOR	10 ST QETF PHINED 1 1878-24 HOZ 1878-24 HOZ BEZATTHOZ 76-5AZ19 HOI 1844 FE HOS 10 SE DETERMINED 1844 FE HOS 8498-34 HOZ 8498-34 HOZ 8498-34 HOZ 8498-35 HOZ 8498-35 HOZ 8498-35 HOZ	259/FB 20000C 2550 MFD 200VDC 10 MFD 400 VB 047 MFD 400 VB 10 MFD 400 VD 10 MFD 400 VDC 047 MFD 50VD 047 MFD 200VDC 22 MFD 35VDC 283417 283417
C3  C5  C5  C6  C7  C8  C9  C9  C14  C15  C16  TRANSISTOR  T4 10 T6  Q2-Q3  THERMISTOR  THERMISTOR  THERMISTOR	10 STYLE NO.  1878-24-102 1878-24-102 1878-24-102 180-24-102 180-24-103 180-2	259/FB 20000C 259/FB 20000C 259/FB 20000C 259/FB 20000C 10 MFD 400 VB 047 MFD 400 VB 1N 75/1 33NFD 20/ 1 MFD 400 VDC 047 MFD 50VDC 22 MFD 35VDC 283417 2N3417 2N3417  98F, 20504
(1) (5) (6) (7) (8) (9) (9) (14) (15) (14) (15) (16) (18) (14) (15) (16) (18) (14) (17) (17) (18) (18) (18) (18) (18) (18) (18) (18	10 SE DETFRINKED I 1878624 HOZ 1878624 HOZ 262A177 HOZ 765A219 HOI 18445514108 10 SE DETERMINED 1844551411 764A278HOZ 848A546HO7 849A437HO4 187A508HI7 845A5514118 848A51HOZ  STYLE NO 185A27HOJ 186A277HI3	254FB 2004DC  254FB 2004DC  2550 MFD 2004DC  10 MFD 400 VB  047 MFD 400 VD  13 MFD 400 VDC  047 MFD 50VDC  24 MFD 35VDC  22 MFD 35VDC  28 MFD 35VDC  28 MFD 35VDC  28 MFD 35VDC
18AMSISTOR  THERMISTOR  THERMISTOR  THERMISTOR  THERMISTOR  THERMISTOR  THERMISTOR  THERMISTOR  THERMISTOR  THERMISTOR	10 ST QETF RINKED I 1878624 HOZ 1878624 HOZ 862A177 HOZ 763A219 HOI 18447 E 1408 10 SE DETERMINED 18447 E 1408 10 SE DETERMINED 18448 E 1411 7644278 HOZ 8498 E 46HO7 8498 E 46HO7 8498 E 51417 84 B 8 B 8 B 1 HOZ 1874 E 140 1874 E 14	25919 20000C 2590 MPD 200VDC 10 MFD 400 VDC 047 MFD 400 VDC 11 VTD 31 MFD 400 VDC 047 MFD 200VDC 22 MFD 35 VDC 283417 283417 283417
C3  "5  C5  C5  C6  C7  C8  C9  C9  C11  C12-C13  C14  C15  C16  TRANSISTOR  T4 10 T6  O2 - O3  THERMISTOR  TH-1  (-N-2-10DE  Z1 (1 25  Z7 (10 4)  Z1 Z- Z15  Z33	10 ST QETF PHINED 1 1878624 HOZ 1878624 HOZ BOZATTHOZ 7658219 HOI 184275 HOS 10 SE DEFERMINED 184475 HOS 184475 HOS 184475 HOS 18446 HOT 1843437 HOZ 84864 6HOT 8494337 HOZ 18745 SETTE HOZ 16532 THOS 16532 THOS 16532 THOS 16232 HOZ 16332	254FB 20000C 2590MPD 200VDC 10 MFD 400 VDC 047 MFD 400 VDC 156 VF- 5V 1N 7501 31N/D 20V 1 MFD 400 VDC 047 MFD 200VDC 22 MFD 35VDC 22 MFD 35VDC 283417 2N3417 2N3417 2N3417
18AMSISTOR  THERMISTOR  THERMISTOR  THERMISTOR  THERMISTOR  THERMISTOR  THERMISTOR  THERMISTOR  THERMISTOR  THERMISTOR	10 SE QETFRINKED 1 1878624 H2 1878624 H02 862A177H02 765A219H01 18442FEH08 10 SE DEFERMINED 18442FEH08 18442FEH08 184437H04 1874508H17 849437H04 1874508H17  849437H04 1874508H17  8194251H18 8484341H02 85FFE H0 165A21H18 8748419H01 1874509H01 1874509H01 1874509H01 1874509H01 1874509H01 1874509H01 1874509H01	259 MFD 2000DC 2590 MFD 2000DC 2590 MFD 400 VBC 047 MFD 50 VBC 047 MFD 50 VBC 047 MFD 200 VBC 22 MFD 35 VBC  283417  283417  283417  283417  283417  187484  18700 1.586200 1.586200
C3  "5  C5  C5  C6  C7  C8  C9  C9  C11  C12-C13  C14  C15  C16  TRANSISTOR  T4 10 T6  O2 - O3  THERMISTOR  TH-1  (-N-2-10DE  Z1 (1 25  Z7 (10 4)  Z1 Z- Z15  Z33	10 SE QETFRINKED 1 1878624 H2 1878624 H02 862A177H02 765A219H01 18442FEH08 10 SE DEFERMINED 18442FEH08 18442FEH08 184437H04 1874508H17 849437H04 1874508H17  849437H04 1874508H17  8194251H18 8484341H02 85FFE H0 165A21H18 8748419H01 1874509H01 1874509H01 1874509H01 1874509H01 1874509H01 1874509H01 1874509H01	259 MFD 2000DC 2590 MFD 2000DC 2590 MFD 400 VBC 047 MFD 50 VBC 047 MFD 50 VBC 047 MFD 200 VBC 22 MFD 35 VBC  283417  283417  283417  283417  283417  187484  18700 1.586200 1.586200

SILI CON		
CONTROLLED SW	STYLE NO	REF
564-1 564-2	184AE40H1Z	x1149-12
		_
RECTAILS	STYLE NO	REF .
03-04-45-27-08	168A342H11	IN4822
01 - 03	837A692H03	
	03140321103	THOTTOM
	<del> </del>	
	t	
	<del> </del>	
	1	
	<del> </del>	<del></del>
		-
	1	
MISC.	STYLE NO.	REF.
POT (RH)	7.624790HO-	SERIES 43
751 651		
	541D514H45	250,007
TEL - RELAY (11)(CR		250 VDC
		250VDC
STEPPING SA.	205(39 <b>3</b> 50 <b>3</b>	250 /06
Augen Vice		
AMBER LITE	183A825G05	52410-993
	1	
	,	
_		
/		
	,	
	1	

Δ = RECLOSE TIME ID TO 50 SEC

RED HANDLE ON FT CASE

HC INDICATES"HOMING CONTACT"ON STEPPING SWITCH

SS-1,SS-2 BSS-3 INDICATES"SELF STEPPING CONTACTS"ON STEPPING SWITCH.

Sub 2 (1321D75)

2.1 Relay in FT-32 Case. (250 Vdc)

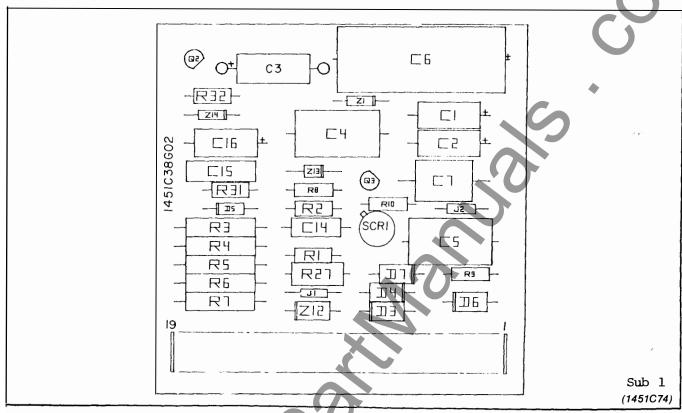


Fig. 3. Component Location of Reset Circuit Board of Type DRC-1 Relay.

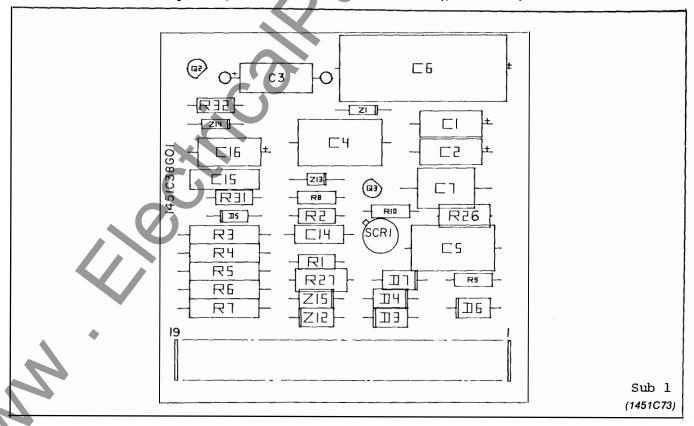


Fig. 4. Component Location of Reset Circuit Board of Type DRC-1 Relay. (250 Vdc)

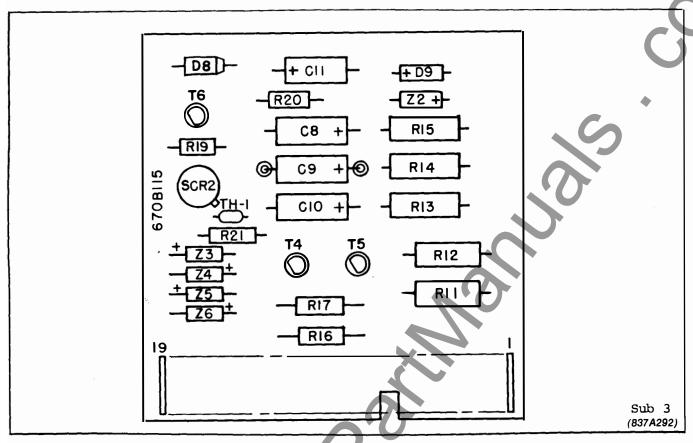


Fig. 5. Component Location of Reclose Circuit Board of Type DRC-1 Relay.

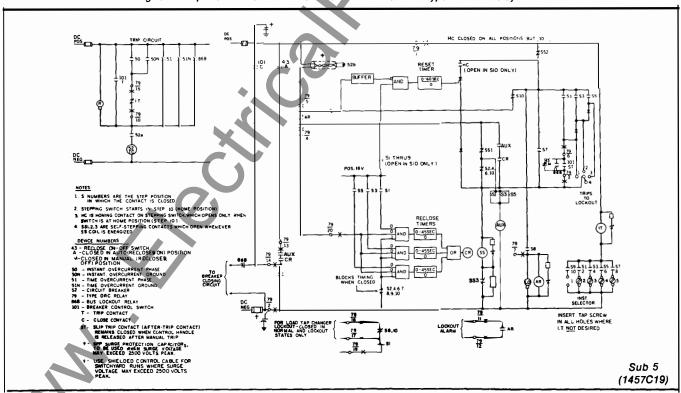


Fig. 6. External Schematic of Type DRC-1 Relay.

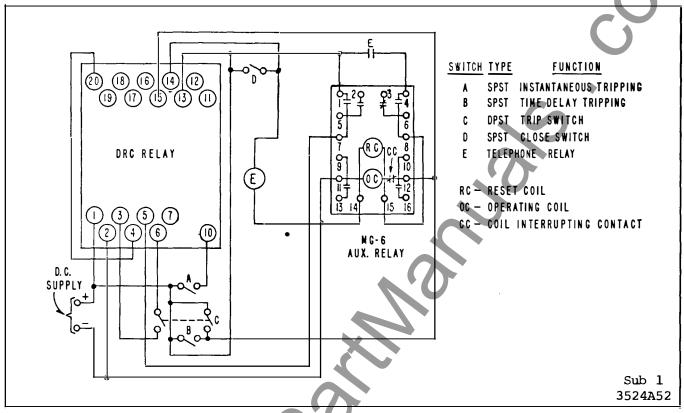


Fig. 7. Diagram of Test Connection for DRC-1 Relay.

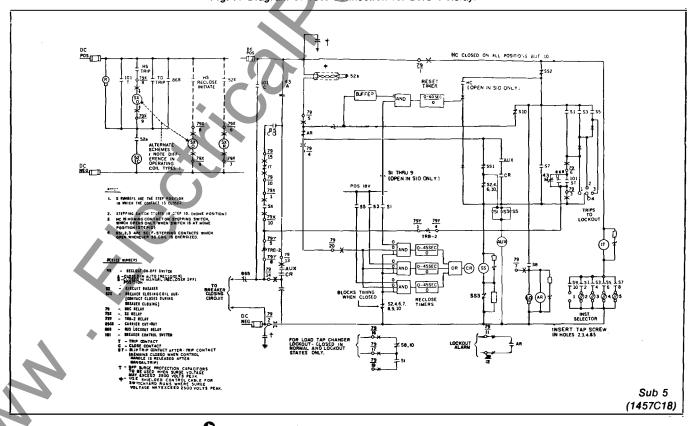


Fig. 8. External DC Schematic for DRC-1 with SX.

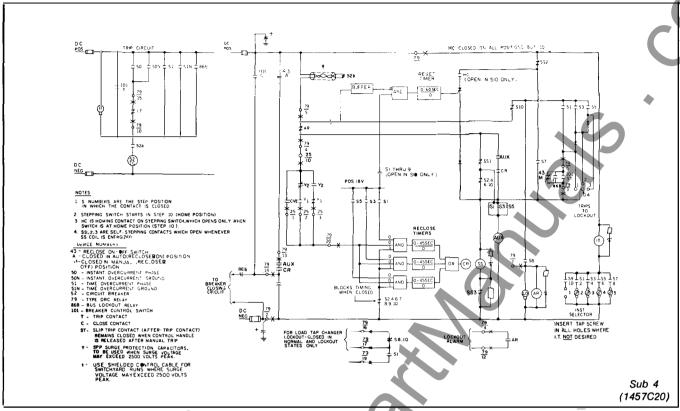


Fig. 9. External DC Schematic for DRC-1 with CVE-1.

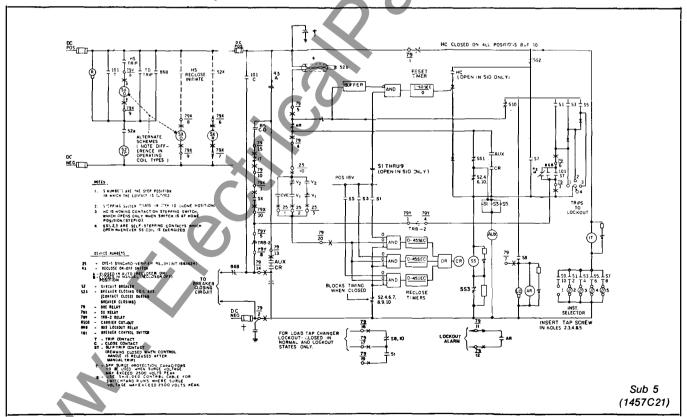
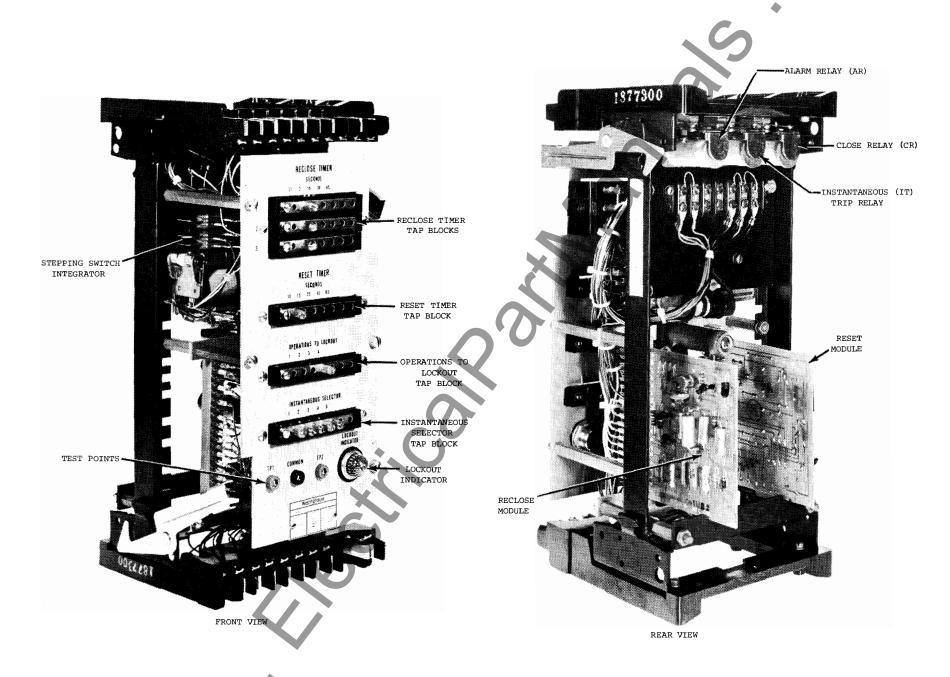
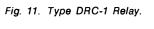


Fig. 10. External DC Schematic for DRC-1 with SX and CVE-1.





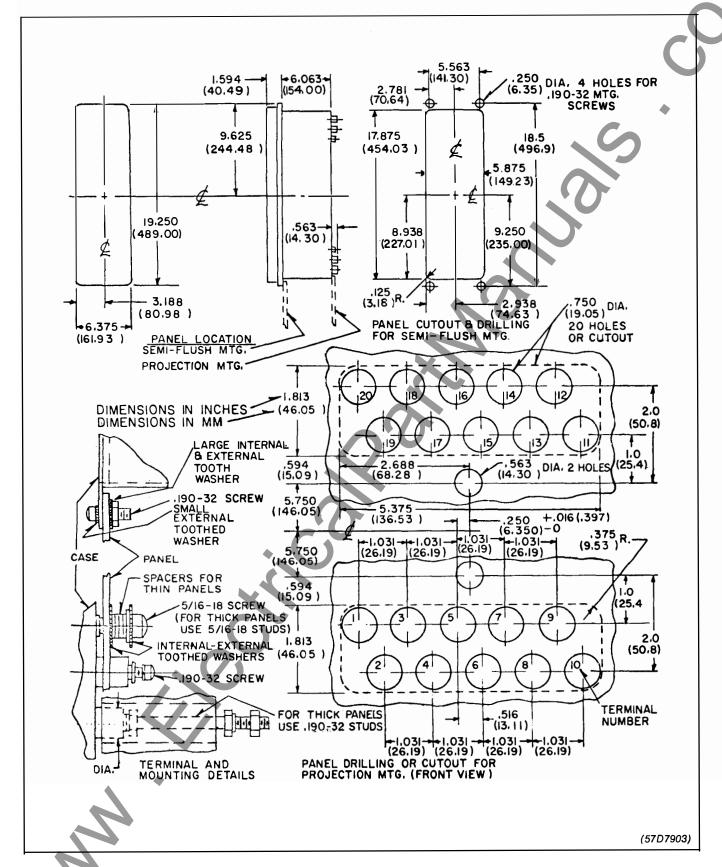


Fig. 12. Outline and Drilling for the Type DRC-1 Relay in the FT-32 Case.

MAN CORE CORE



WESTINGHOUSE ELECTRIC CORPORATION

**RELAY-INSTRUMENT DIVISION** 

**CORAL SPRINGS, FL.** 

Printed in U.S.A.



### INSTALLATION . OPERATION . MAINTENANCE

# INSTRUCTIONS

## **TYPE DRC-1 RECLOSING RELAY**

#### **APPLICATION**

The DRC-1 is a multi shot reclosing relay for initiating the closing of a circuit breaker following protective relay operation.

Experience indicates the vast majority of circuit faults are of a temporary nature. High speed tripping and high speed reclosure minimize damage and system disturbance. Only sufficient dead time for arc deionization need be allowed before reclosing.

Another important function of a reclosing relay when used in disturbution circuits is to allow instantaneous tripping to protect a fuse for temporary faults and, by cutting out the instantaneous trip prior to the next reclosure, to allow the fuse to operate, minimizing the outage area for permanent faults.

#### The DRC-1 provides:

- 1. Up to 3 reclosures to lockout.
- Flexible tripping sequence, all instantaneous, all time delay or any combination in any sequence of time delay and instantaneous.
- 3. Static timing and semi-static control.
- 4. Reclose timing adjustment 0-45 seconds.
- 5. Lockout alarm contact and indication.
- 6. Adjustable reset initiation 10 to 60 seconds following successful reclosure.

- 7. Immediate return to "Home" (or reset) position following reset initiation.
- 8. Optional instantaneous trip following manual closing from lockout position.

#### **CONSTRUCTION & OPERATION**

The Type DRC-1 Relay is composed of (1) an integrator (2) reclose timer printed circuit board (3) reset timer printed circuit board (4) alarm relay (5) instantaneous trip relay (6) close relay and (7) lockout indication. All timing functions are accomplished through the use of semiconductor components. The identification of all components and their locations is shown in figures 1, 2 and 11.

#### **Reset Timer Board**

Reset Timer — The reset timer is controlled by the integrator and the auxiliary switches on the breaker. The front panel settings allow a choice of 5 different times for the resetting interval. The time delay circuit is of the quick reset type. This enables the reset times to always be consistent with times indicated on the front panel. Refer to figures 3 and 4 for component location and board layout.

#### **Reclose Timer Board**

The reclose timer is controlled by the integrator. The front panel setting allows a choice of 5 different time for each interval of reclosing. The time delay circuit is of the quick reset type which allows a specific timing circuit to be used for all reclosing intervals. Refer to figure 5 for component and board layout.

All possible contingencies which may arise during installation, operation, or maintenance, and all details and variations of this equipment do not purport to be covered by these instructions. If further information is desired by purchaser regarding his particular installation, operation or maintenance of this equipment, the local Westinghouse Electric Corporation representative should be contacted.

## INTEGRATOR LEVEL AND STEP FUNCTIONS PLUS TAP BLOCK SETTINGS

INTEGRATOR	STEP 10 HOME POSITION	STEP 1	STEP 2	STEP 3	STEP 4
Level I and RESET TIMER TAP BLOCK SETTING	No connection	Connection To energize reset timer if required	Energize reset timer time delay circuit †	Same as step #1	Energize reset timer time delay circuit †
Level 2	Pulses integrator to step 1 when 52b closes	No connection	Pulses integrator to step 4 when 52b closes	No connection	Pulses integrator to step 5 when 52b closes
Level 3 and OPERATIONS TO LOCKOUT TAP BLOCK SETTING	Supplies base drive for Q2 to keep reset timer inoperative	Pulses integrator to step 2 when set for one operation to lockout	No connection	Pulses integrator to step 4 when set for 1 or 2 operations to lockout	No connection
Level 4 and RECLOSE TIMER TAP BLOCK SETTING	No connection	Energize reclose timers time delay circuit through interval one	No connection	Energizes reclose timers time delay circuit through interval one	No connection
Level 5	Make contact between terminals 16 and 17	Make contact between terminals 19 and 17	No connection	No connection	No connection
Level 6 and INST. TAP	Pick up IT relay with tap screw in position I	Picks up IT relay with tap screw in position 2	Same as Step #1	Picks up IT relay with tap screw in position 3	Same as Step #3
Level 7	Short circuits reclose timer time delay capacitors	No connection	Same as Step #10	No connection	Same as Step #10

<sup>†</sup> If fault is cleared, reset timer will time out and energize coil directly.

Instantaneous tripping will not take place in those positions which have a tap screw.

## INTEGRATOR LEVEL AND STEP FUNCTIONS PLUS TAP BLOCK SETTINGS (Cont'd)

STEP 5	STEP 6	STEP 7	STEP 8 Lockout Pos.	STEP 9
Same as	Energizes	Same as	Energizes	Energizes
step #1	reset timer	step #1	reset timer	reset timer
*	time delay	*	time delay	time delay
	circuit †		circuit †	circuit †
No connection	Pulses integrator to step 7 when 52b closes	No connection	No connection	No connection
Pulses integrator to step 6 when set for 1, 2, 3 operations to lockout	No connection	Pulses integrator to step 8	Energizes lockout indicator, alarm relay and terminal 7	Energizes terminal 18 with battery positive
Energizes reclose timers time delay circuits thru interval 3	No connection	No connection	No connection	No connection
No connection	No connection	No connection	Make contact between terminal 16 and 17	No connection
Picks up IT relay with tap screw in Position 4	Same as Step #4 •	Picks up IT relay with tap screw in position 5	Same as Step #7 ■	Same as Step #I -
No connection	Same as Step Step #10	Same as Step #10	Same as Step #10	Same as Step #10
	Same as step #1  *  No connection  Pulses integrator to step 6 when set for 1, 2, 3 operations to lockout  Energizes reclose timers time delay circuits thru interval 3  No connection  Picks up IT relay with tap screw in Position 4	Same as step #1  * Energizes reset timer time delay circuit †  No connection Pulses integrator to step 7 when 52b closes  Pulses integrator to step 6 when set for 1, 2, 3 operations to lockout  Energizes reclose timers time delay circuits thru interval 3  No connection No connection  Picks up IT relay with tap screw in Position 4  No connection Same as Step	Same as step #1  *	Same as step #1  * Interpretation of the properties of the propert

If fault is cleared, reset timer will time out and energize the integrator coil directly.

Instantaneous tripping will not take place in those positions which have a tap screw.

## **ELECTRICAL PARTS LIST**

	ELECTRICAL PARTS LIST	
CIRCUIT Symbol	DESCRIPTION	MANUFACTURER DESIGNATION
	RESISTORS (values in Ohms)	
RI	47,000 1/2W 2%	629A531H72
R2	4.7K 1/2W 2%	629A531H48
R3	118,000 1/2W 1%	837A131H05
R4	174,000 1/2W 1%	837A131H04
R5	232,000 1/2W 1%	837A131H07
R6	453,000 1/2W 1%	836A503H87
<b>R</b> 7	665,000 1/2W 1%	837A131H06
R8	2,700 1/2W 5%	184A763H37
R9	1,000 1/2W 5%	184A763H27
R10	10 1/2W 5%	187A290H01
RII	649,000 1/2W 1%	837A131H01
R12	442,000 1/2W 1%	837A131H03
R13	221,000 1/2W 1%	836A503H80
R14	28,700 1/2W 1%	837A131H02
R15	2,670 1/2W 1%	836A503H36
R16	1,200 1/2W 5%	184A763H53
R17	220,000 1/2W 5%	184A763H83
R19	2,700 1/2W 5%	184A763H37
R20	1,000 1/2W 5%	184A763H27
R21 R22	220 1/2W 5% 10,600 250VDC 5%	184A763H11
R22 R22	10,600 250VDC 5% 5,000 125VDC 5%	1267313
R22	1,400 48VDC 5%	1205214 1267292
R23	5,600 250VDC 5%	1267292
R23	2,500 125VDC 5%	1267303
R23	560 48VDC 5%	1267282
R24	100 3W 5%	763A127H20
R25	100 25W (48 VDC)	1207238
R25	500 25W (125VDC)	1202522
R26	7.5 3W	185A209H09
R27	100 3W 5%	763A127H20
R28	100 /3W 5%	763A127H20
R29	100 3W 5%	763A127H20
R30	10 1/2W 5%	187A290H01
R31	82,000 1/2W 2%	629A531H78
R32	10,000 1/2W 2%	629A531H56
All resistor values	in Ohms	
	CAPACITORS	
Cl	100 MFD 6V 5%	184A661H06
C2	100 MFD 6V 5%	184A661H06
C3	To be determined in test	104/10011100
C4	.25 MFD 200VDC 10%	187 <b>A</b> 624H02
C5	6.8 MFD 35VDC 20%	184A661H10
C5	(250VDC) .25 MFD 200VDC	187A624H02
C6	10 MFD 150VDC 20%	27D5476H09
C6	(250VDC) 10 MFD 400VDC	862A177H02
C7	.5 MFD 200VDC 10%	187A624H08
C7 .	(250VDC) .047 MFD 400VDC	763A219H01
C8	150 MFD 6V 5%	184A661H08
C9	To be determined in test	
C10	100 MFD 6V 5%	184A661H06
CH	33 MFD 20V 20%	184A661H11
Cl2	1 MFD 20%	187 <b>A</b> 624H04
C12	(250VDC) 1 MFD 400VDC	764A278H02
C13	1 MFD 20%	187A624H04
C13	(250VDC) 1 MFD 400VDC	764A278H02
C14	.047 MFD 50VDC	848A646H07
C15	.047 MFD 200VDC	849A437H04
C16	22 MFD 35VDC	187A508H17

# **ELECTRICAL PARTS LIST**

CIRCUIT	DESCR	IPTION	MANUFACTURER
CIRCUIT SYMBOL	DESCR	IF HON	DESIGNATION
	TRANS	ISTORS	
02		2N3417	848A851H01
Q2 Q3	1	2N3417 2N3417	848A851H01
T4		2N3417	848A851H01
T5		2N3417	848A851H01
T6		2N3417	848A851H01
	ZENER	DIODES	
Zl		1N748A	186A797H13
Z2	Ì	1N748A	186A797H13
<b>Z</b> 3		1N748A	186A797H13
Z4		1N748A	186A797H13
<b>Z</b> 5		1N748A	186A797H13
<b>Z</b> 6		1N748A	186A797H13
<b>Z7</b> to <b>Z</b> 11	{	I R200	629A369H01
<b>Z</b> 12		1.5K E200	878A619H01
Z13	1	1N3686B	185A212H06
<b>Z</b> 14	Į.	1N957B	186A797H06
Z15	(250VDC)	1.5KE200	878A619H01
	THERM	IISTOR	
TH-1		2D504	185A211H07
	CONTROLLE	RECTIFIERS	'
SCR-1		K1149-13	184A640H13
SCR-1	(250VDC)		184A640H12
SCR-2		K1149-13	184A640H13
SCR-2	(250VDC)	K1149-12	184A640H12
	RECTI	FIERS	
D3		1 N4822	188A342H11
D4		1 N4822	188A342H11
D5		1N645A	837A692H03
D6		1N4822	188A342H11
D7 D8		1N4822	188A342H11
D6 D9		1N4822 1N645A	188A342H11
D10	(48 VDC)		837A692H03 188A342H11
. (	MISCELL		100/23421111
I <sub>1</sub>	Lockout indication	52410-993	183A825G05
RH-1	Potentiometer	Series 43-250	762A790H04
AR	Alarm relay	250Vdc	541D514H15
AR	Alarm relay Alarm relay	125 <b>V</b> dc	541D514H06
AR	Alarm relay	48Vdc	541 D514H08
IT	Instantaneous relay	250 <b>V</b> dc	541D514H14
IT 🍁	Instantaneous relay	125 <b>Vdc</b>	541D514H05
IT	Instantaneous relay	48Vdc	541 D514H07
CR	Close relay	250Vdc	541D514H14
CR	Close relay	125 <b>V</b> dc	541D514H05
CR	Close relay	48Vdc	541D514H07
SS	Stepping switch	250Vdc	205C6399G03
SS	Stepping switch	125 <b>V</b> dc	205C399G02
SS	Stepping switch	48Vdc	205C399G0I
	116		

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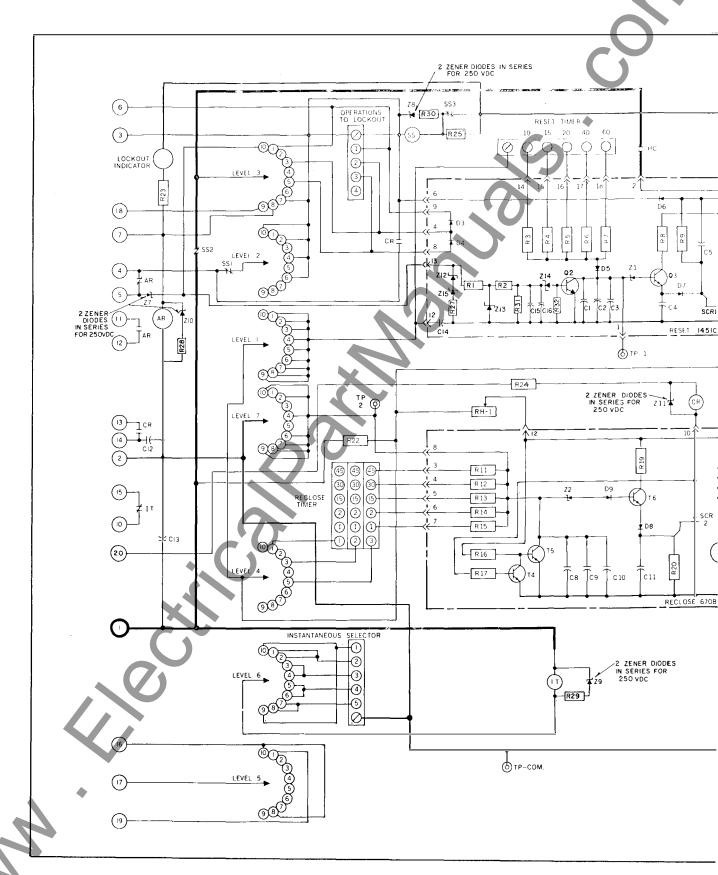
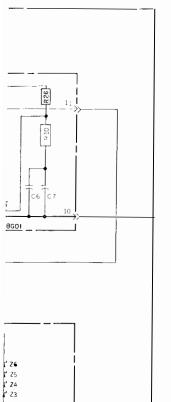


Fig. 2. Internal Schematic of Type DR



	_	
41 516.	\$18,6 NO	pit
	862A378H34	221,590 ( 1/2m
417	1854 (C38+3)	220.000 (: 1/2+
E 4	63741507	116.900 D 1/2W
R-	8.37A (3.1HDN	174,600 it 1/2*
45.	8374131907	232,000 6 1/2+
	e at \$1,03H=7	453,900 ii 1/2w
87	10- 614768	644.860 H 1/24
n =, = 2 , =1		
	1844763+37	2.700 £ 1/2×
K 3- P20	1844763H27	1.600 ft 1/2w
310-R30	(87A2H9+0+	i0 ∩ 1/2+
51,	8,374,3140	649.000 1 1/2*
912	837A131H03	4-2 000 E 1/24
813	8364503460	22: 000 N 1/2#
RIL	1837 A . 3 HC2	26,700 G 112w
ει. Δ	6294531H85	5 MEG 1/2 A
R+5	936A5C3H36	2.670 0 1/2*
R.6	1844767653	12 000 R 1/2m
92	1844*63451	220 :: 1/2%
s 27	1267313	
R26	185A2O9HO9	10,600 N
	<del>+</del>	7.5 \Lambda 3 W
R?:	1267305	5600 L
R24-R27-R26-R29	263A;27H20	100 .1 34
325	1267296	2000 n 25 w
	1	
		1
R2	629A53IH48	4,700 A 1/2
R31	629A531H78	82,000 A. 1/2 V
R32	629A53IH56	10,000 £ 1/2 w
		1
/ 121/2 222	CTW/ T	
CAPAC.15.i	SIYLE	139
11 = 12 = 1,0	1548661906	100 MEG 63
	COMINEDIAC 38 0"	
	6*462-502	25MFB. 200+00
	187A624 Ho2	.250MFD 200VD
CF	862A177HOZ	TOMED 400VD
- 67	763A219H01	.047 MFX 400VB
CB	1644 <u>57</u> 6 1806	150 MA - 6V
C9	TO BE DETERM NE	
Cii	184466 : H1 i	339FD 207
617-013	_764A278H02	I MFD 400 VDC
C14-C13	764A278H02 848A646H07	1 MFD 400 VDC
C14		.047 MFD 50VDC
C14	848A646H07 849A437H04	.047 MFD 50VDC
C14	848A646H07	.047 MFD 50VDC
C14	848A646H07 849A437H04	.047 MFD 50VDC
C14 C15 C16	848A646H07 849A437H04	.047 MFD 50VDC
C14 C15 C16 TRANSISTOR	848A646H07 849A437H04 187A508H17	.047 MFD 50VDC .047 MFD 200VDC 22 MFD 35VDC
C14 C15 C16 TRANSISTOR T4:0 T6	848A646H07 849A437H04 187A508H17	.047 MFD 50VDC .047 MFD 200VDC .22 MFD 35VDC
C14 C15 C16 TRANSISTOR	848A646H07 849A437H04 187A508H17	.047 MFD 50VDC .047 MFD 200VDC 22 MFD 35VDC
C14 C15 C16 TRANSISTOR T4:0 T6	848A646H07 849A437H04 187A508H17	.047 MFD 50VDC .047 MFD 200VDC .22 MFD 35VDC
C14 C15 C16 TRANSISTOR T4:0 T6	848A646H07 849A437H04 187A508H17	.047 MFD 50VDC .047 MFD 200VDC .22 MFD 35VDC
C14 C15 C16 1FANSISTOR T4:0 T6 O2-O3	849A646H07 849A437H04 187A508H17 5+425(5)422 848A851H02	047 MFD 20VDC 22 MFD 35VDC 22 MFD 35VDC 33417 2N3417
C14 C15 C16  1144515105 T4:0.76 02-03	848A646H07 849A437H04 187A508H17 ************************************	047 MFD 50VDC 22 MFD 30VDC 22 MFD 35VDC 781417 2N3417
C14 C15 C16 1FANSISTOR T4:0 T6 O2-O3	849A646H07 849A437H04 187A508H17 5+425(5)422 848A851H02	047 MFD 20VDC 22 MFD 35VDC 22 MFD 35VDC 33417 2N3417
C14 C15 C16  1144515105 T4:0.76 02-03	848A646H07 849A437H04 187A508H17 ************************************	047 MFD 50VDC 047 MFD 200VDC 22 MFD 35VDC 783417 283417
C14 C15 C16  1144515105 T4:0.76 02-03	848A646H07 849A437H04 187A508H17 ************************************	047 MFD 50VDC 047 MFD 200VDC 22 MFD 35VDC 783417 283417
C14 C15 C16  1144515105 T4:0.76 02-03	848A646H07 849A437H04 187A508H17 ************************************	047 MFD 50VDC 22 MFD 30VDC 22 MFD 35VDC 781417 2N3417
C14 C15 C16  1144515105 T4:0.76 02-03	848A646H07 849A437H04 187A508H17 ************************************	047 MFD 50VDC 22 MFD 30VDC 22 MFD 35VDC 781417 2N3417
C14 C15 C16  134/515108 T4-10-76 O2-03  THERMISTOR THERMISTOR	848A646H07 849A437H04 187A508H17 5-645(1-47) 848A851H02 STYLE NO.	047 MFD 50VDC 047 MFD 200VDC 22 MFD 35VDO 783417 2N3417 4EF 20504
C14 C15 C16  114A1515108 T4 10 T6 O2 - O3  THERMISTOR TH-1 TH-1 TH-1	849A646H07 849A437H04 187A508H17 197A551W12 848A851H02 51VLE MQ 125421H07	047 MFD 20VDC 22 MFD 35VDC  22 MFD 35VDC  383417  283417  48F 20504
C14 C15 C16  174:015108 T4:0 T6 O2-O3  THERMISTOR TH-1 TH-1 TH-1 T-1 T-1 T-1 T-1 T-1 T-1 T-1 T-1 T-1 T	848A646H07 849A437H04 187A508H17 5H46457H472 848A851H072 5H454 MC 155421H07	047 MFD 20VDC 22 MFD 20VDC 22 MFD 35VDC  783417  283417  485 20504
C14 C15 C16  1148/515708 T4-10_T6 O2-O3  THERMISTOR TH-1  214/61-2100E 76 27-T0-78	848A646H07 849A437H04 187A508H17 5-M13(5)-W2 848A851H02 SIME NO 15942(1H07) 51YLE NO 1664727H13 C234369H01	047 MFD 50VDC 22 MFD 35VDC 22 MFD 35VDC  7 N3417 2N3417 2EF 20504
C14 C15 C16  134/515108 T4-10-76 O2-O3  THERMISTOR	848A646H07 849A437H04 187A508H17 5-6557W2 848A851H02 STATE NO 1:94211H07 CTYLE NO 1:864*37H13 C234369H01	047 MFD 20VDC 22 MFD 35VDC 22 MFD 35VDC  383417  283417  28504  666  18708 18200 1.58 E200
C14 C15 C16  1FANSISTOR T4:0 T6 O2-03  THERMISTOR TH-1 TH-1 T-1 T-10-Th T2-2-15 T3 3	848A646H07 849A437H04 I 87A508H17 5H45457H47 848A851H072 STAYLE MO 159421H07 CTYLE MO 1664737H13 C23369M01 878A619H01 I 85A212H06	.047 MFD 50VDC .047 MFD 200VDC 22 MFD 35VDC 783417 2N3417 2N3417 4EF .20504
C14 C15 C16  134/515108 T4-10-76 O2-O3  THERMISTOR	848A646H07 849A437H04 187A508H17 5-6557W2 848A851H02 STATE NO 1:94211H07 CTYLE NO 1:864*37H13 C234369H01	.047 MFD 50VDC .047 MFD 200VDC .22 MFD 35VDC  3N3417 .2N3417 .2N3417 .2N3417 .2N3417 .2N3417 .2N3417
C14 C15 C16  1FANSISTOR T4:0 T6 O2-03  THERMISTOR TH-1 TH-1 T-1 T-10-Th T2-2-15 T3 3	848A646H07 849A437H04 I 87A508H17 5H45457H47 848A851H072 STAYLE MO 159421H07 CTYLE MO 1664737H13 C23369M01 878A619H01 I 85A212H06	.047 MFD 50VDC .047 MFD 200VDC 22 MFD 35VDC 783417 2N3417 2N3417 4EF .20504
C14 C15 C16  1FANSISTOR T4:0 T6 O2-03  THERMISTOR TH-1 TH-1 T-1 T-10-Th T2-2-15 T3 3	848A646H07 849A437H04 I 87A508H17 5H45457H47 848A851H072 STAYLE MO 159421H07 CTYLE MO 1664737H13 C23369M01 878A619H01 I 85A212H06	.047 MFD 50VDC .047 MFD 200VDC 22 MFD 35VDC 783417 2N3417 2N3417 4EF .20504
C14 C15 C16  1FANSISTOR T4:0 T6 O2-03  THERMISTOR TH-1 TH-1 T-1 T-10-Th T2-2-15 T3 3	848A646H07 849A437H04 I 87A508H17 5H45457H47 848A851H072 STAYLE MO 159421H07 CTYLE MO 1664737H13 C23369M01 878A619H01 I 85A212H06	.047 MFD 50VDC .047 MFD 200VDC 22 MFD 35VDC 783417 2N3417 2N3417 4EF .20504

SILICON		
CONTROLLED SA	STYLE NO	R5+
50%-1 50R-2	18446-0-12	K1149-12
		F1143-12
	·	
PECTIFIER	STYLE NO	REF.
03-04-06-07-06	1684342н	IN4522
DE - 03	837A692H03	
		-
MISC.	STYLE NO	REF.
POT (RH)	762A796H04	SERIES 43
TEL RELAY (AR)	E410414HI5	25 <b>0</b> 730
'ELIRELAY (IT)(CR)	E4105 jun 14	250 VDC
<u> </u>		220 900
STEPPING SA	205013:14	***
3.2	2050239,03	250 /89
******		
AMBER LITE	183A825G05	52410-993
	1	
	ļ	
	l l	
	i	

Δ= RECLOSE TIME 10 TO 50 SEC.

RED HANDLE ON FT CASE.
HC INDICATES"HOMING CONTACT"ON STEPPING SWITCH.
SS-1.SS-2 & SS-3 INDICATES "SELF STEPPING CONTACTS"ON STEPPING SWITCH.

Sub 1 (1321D75)

C-1 Relay in FT-32 Case. (250 Vdc)

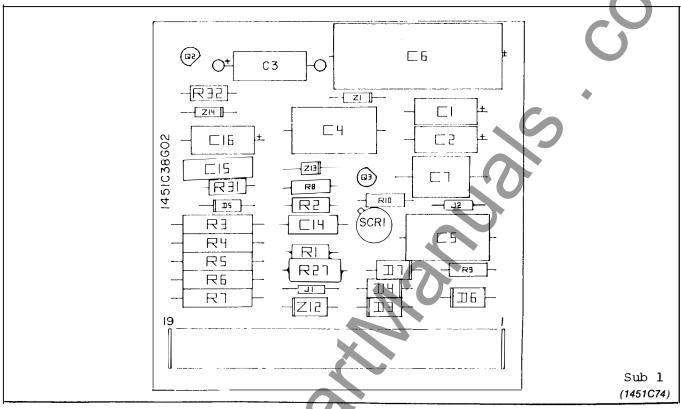


Fig. 3. Component Location of Reset Circuit Board of Type DRC-1 Relay.

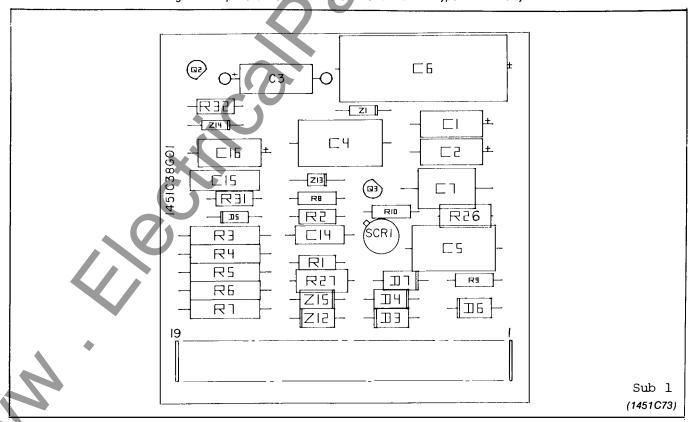


Fig. 4. Component Location of Reset Circuit Board of Type DRC-1 Relay. (250 Vdc)

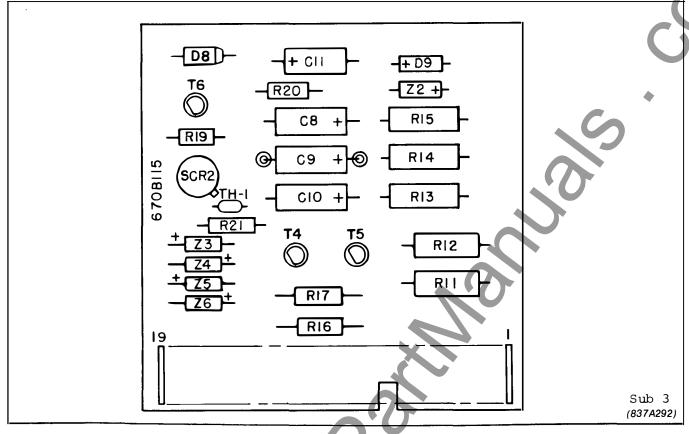


Fig. 5. Component Location of Reclose Circuit Board of Type DRC-1 Relay.

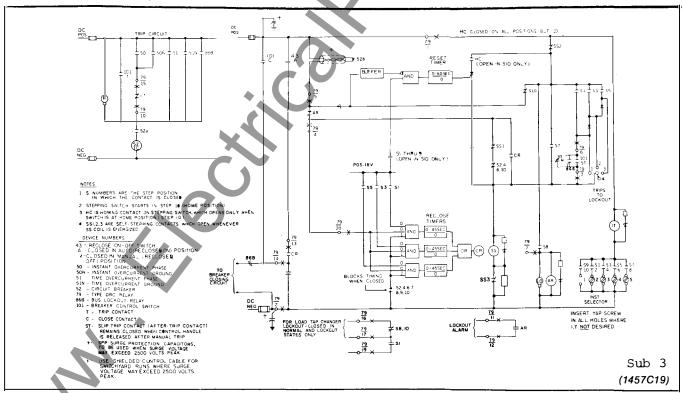


Fig. 6. External Schematic of Type DRC-1 Relay.

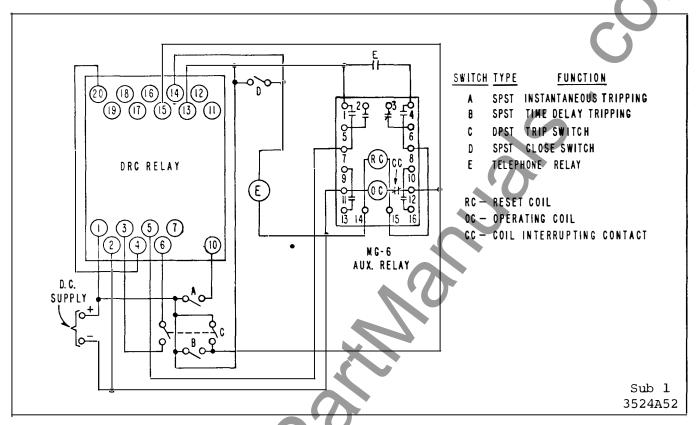


Fig. 7. Diagram of Test Connection for DRC-1 Relay.

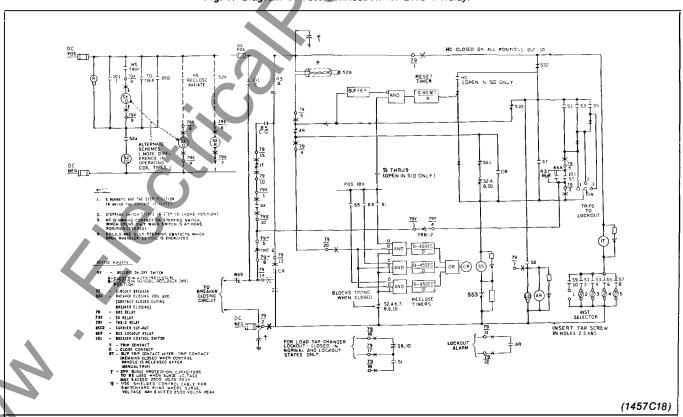


Fig. 8. External DC Schematic for DRC-1 with SX.

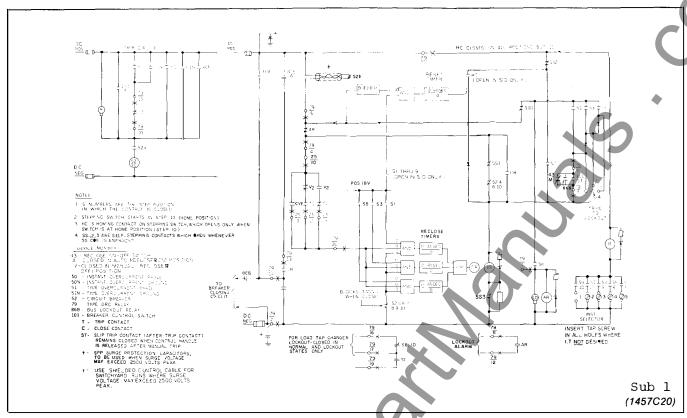


Fig. 9. External DC Schematic for DRC-1 with CVE-1.

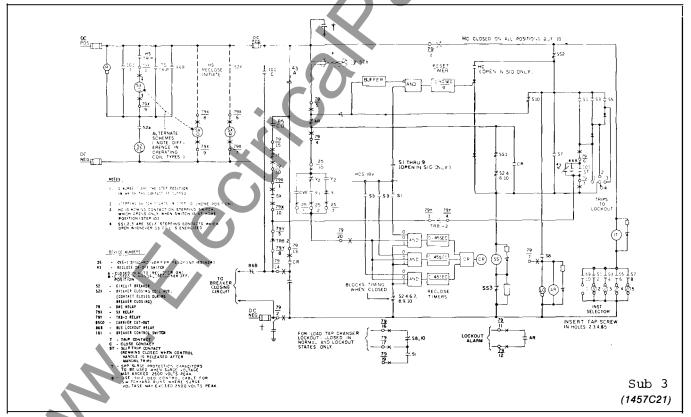
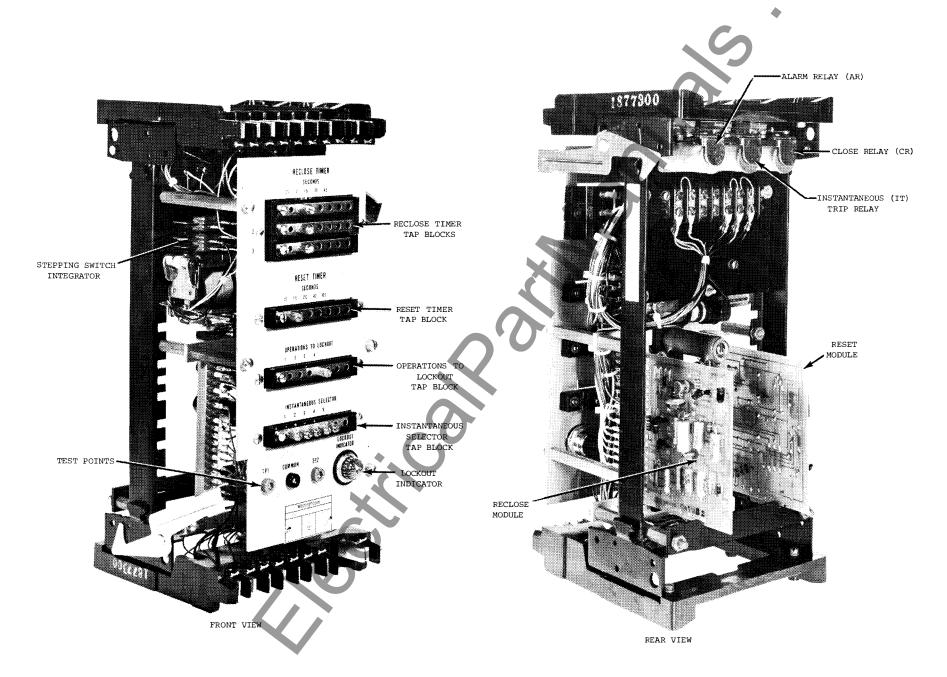
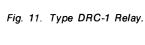


Fig. 10. External DC Schematic for DRC-1 with SX and CVE-1.





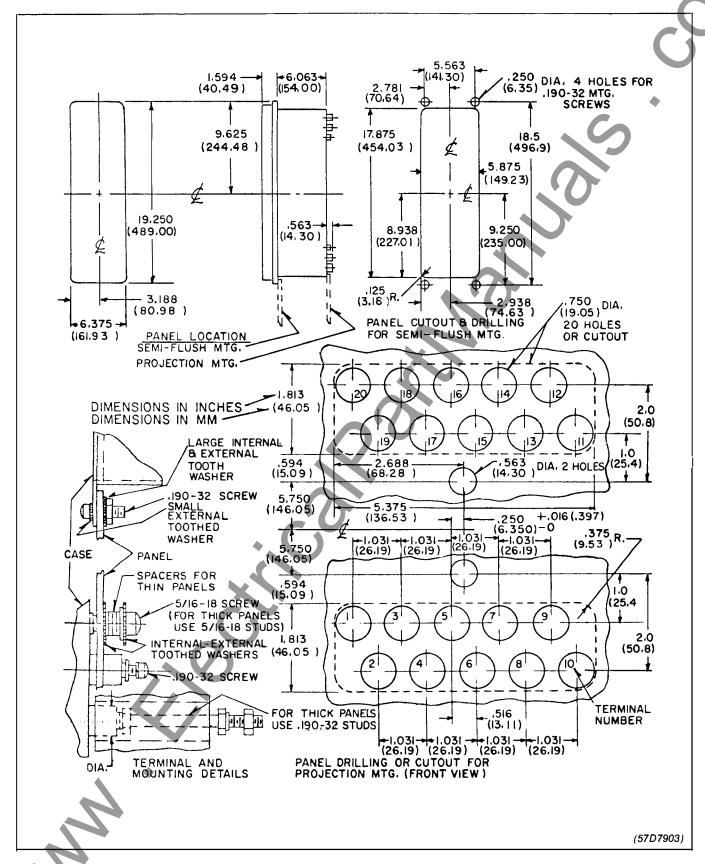


Fig. 12. Outline and Drilling for the Type DRC-1 Relay in the FT-32 Case.

MAN COR



WESTINGHOUSE ELECTRIC CORPORATION

**RELAY-INSTRUMENT DIVISION** 

**CORAL SPRINGS, FL.** 

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