

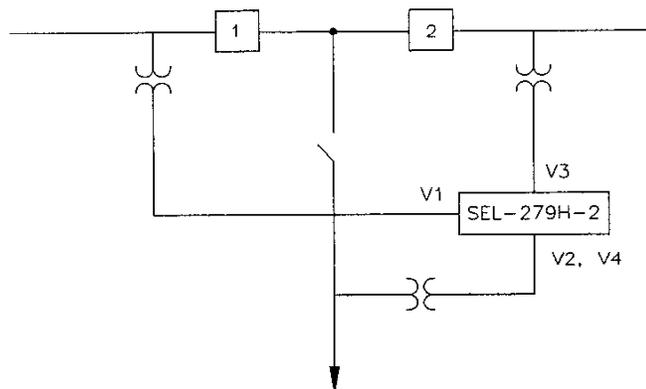
## SEL-279H-2 Relay Application for Two Breakers

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### INTRODUCTION

The SEL-279H-2 Relay includes all logic and voltage elements to control reclosing sequences and perform voltage and synchronism check functions for a two-breaker line.

This application guide includes AC and DC schematics (Figures 1 and 2), settings, and SELOGIC™ Control Equations to auto reclose two breakers, using hot line/dead bus, dead line/hot bus, sync-check, and manual/supervisory closing of the breakers. For complete logic and Relay Word bit descriptions, consult *Section 2 of the SEL-279H-2 Relay Instruction Manual*.



DWG: AG96027

Figure 1: AC Schematic

### How Does It Work?

We initiate reclosing by asserting the RELAY TRIP contact shown in Figure 2. This contact energizes input SPRI, which provides the logic for the first reclose shot (timers SOI1 and SOI2). After the first reclose, the shot counter (M79SH) advances, which closes output OUT3. If the RELAY TRIP contact asserts again, both SPRI and 3PRI assert (3PRI overrides), which provides the logic for the second reclose shot (timers 3OI1 and 3OI2). Figure 3 shows a successful two-shot reclose.

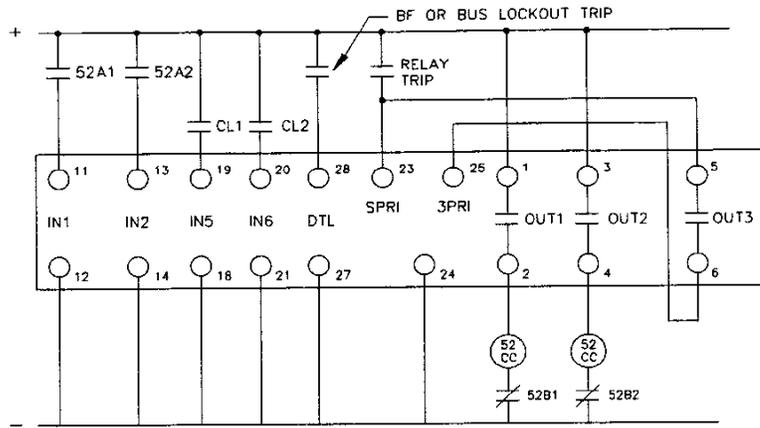
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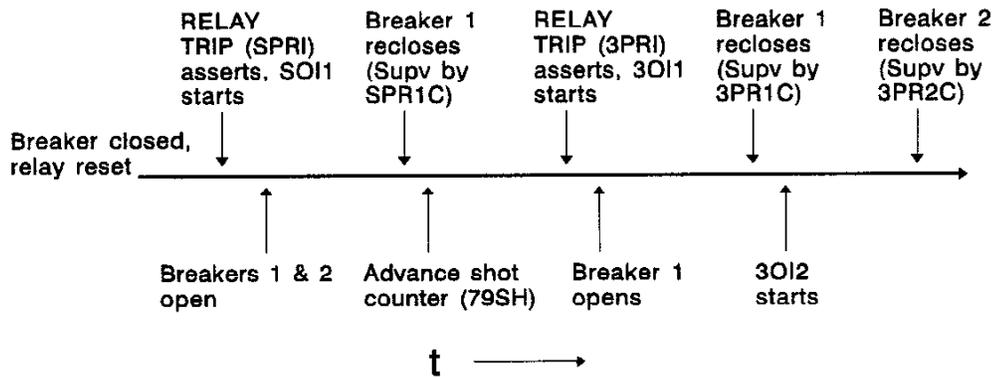
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**Figure 2: DC Schematic**



**Figure 3: Timing Diagram for Successful Two-Shot Reclose**

**Example Settings**

**Settings for: Example 230 kV Line**

VSRC = 4	LNLM = 1	BSM = 1	BKRC = 0
27B = 23	27L = 23	59B = 54	59L = 54
25DV = 62	25D = 180	25D1 = 180	
SOI1 = 30	SOI2 = 30	3OI1 = 1800	3OI2 = 1800
79RS = 600	M79SH = 011	CFT = 0	
52PU1 = 3600	52DO1 = 60	52PU2 = 3600	52DO2 = 60
TSPU = 0	TSDO = 0	TZPU = 0	TZDO = 0
TIME1 = 30	TIME2 = 30	AUTO = 2	OTD = 0

## SELogic Control Equations

A(12367) = 27B  
B(12367) = 52BT1  
C(12367) = 25T2  
D(12367) = 27B3  
E(12367) = 59L  
S(12367) = 59L4  
L(12367) =  
G(12346) = 27L\*59B  
H(12346) = 27L4\*59B3  
I(12346) = 25T2\*52A1  
M(12346) =  
W(45) = A\*E  
X(45) = B\*D\*ST  
Y(45) = B\*H  
Z(45) = B\*C  
SPR1S(123456) =  
SPR1C(123456) = G+25T1+W  
3PR1S(123456) =  
3PR1C(123456) = G+25T1+W  
SPR2S(123456) =  
SPR2C(123456) = I+Y+X+ZT  
3PR2S(123456) =  
3PR2C(123456) = I+Y+X+ZT  
RLTCH(123456) =  
SLTCH(123456) =  
RC(123456) =  
RS(123456) =  
MC1S(123456) = 25T1+W+G  
MC2S(123456) = 25T2+X+Y  
ER(123456) = CLS1+CLS2+SPRI  
OUT1(123456) = CLS1  
OUT2(123456) = CLS2  
OUT3(123456) = 79SH  
OUT4(123456) =

## Input Assignments

IN1 = 52A1    IN2 = 52A2    IN3 =    IN4 =  
IN5 = CL1    IN6 = CL2    IN7 =    RE =  
=>>

## Description of Logic

### **Shot Counter**

Set  $M79SH = 011$ . Relay Word bit  $79SH$  is not asserted on the first shot, then asserts on shot 2. The shot counter advances when a reclose is attempted.  $OUT3$  ( $79SH$ ) supervises input  $3PRI$ . Therefore, we use “single-pole” logic for first reclose attempt, and “three-pole” logic for second reclose attempt.

### **Dead Line/Hot Bus Reclose**

Breaker 1 recloses for a dead line/hot bus condition ( $G = 27L*59B$ ) with delay  $SOI1$  on the first shot. If Breaker 1 trips again, Breaker 1 recloses for a dead line/hot bus condition, but since Relay Word bit  $79SH$  asserts ( $OUT3$  closes), the second reclose delay is  $3OI1$ . Reclose Breaker 2 using sync-check ( $I = 25T2 *52A1$ ).

### **Hot Line/Dead Bus Reclose**

Breaker 1 recloses for a hot line/dead bus condition ( $W = A*E = 27B*59L$ ) with delay  $SOI1$  on first shot. If Breaker 1 trips again, Breaker 1 recloses for a hot line/dead bus condition, with delay  $3OI1$ , as in **Dead Line/Hot Bus Reclose**.

### **Hot Line/Hot Bus Reclose**

Breaker 1 recloses for a hot line/hot bus condition using sync-check with delay  $SOI1$  plus  $25T1$  ( $SPR1S = G+25T1+W$ ) for the first reclose. If breaker trips again, Breaker 1 recloses with delay  $3OI1$ . With a successful reclose of Breaker 1, Breaker 2 recloses using sync-check.

### **Breaker 1 Out of Service**

If Breaker 1 is open for more than 60 seconds ( $52PU1$  delay 3600 cycles), Breaker 1 is deemed out of service ( $52BT1$ ). All of the Breaker 1 reclosing functions are then performed by Breaker 2, but are supervised by Breaker 1 being out of service.

Breaker 2 recloses for dead line/hot bus condition ( $Y = B*H = 52BT1* 27L4*59B3$ ), hot line/dead bus condition ( $X = B*D*ST = 52BT1*27B3*59L4$ ) with delay  $SOI2$  for the first reclose, or sync-check ( $Z = B*C = 52BT1*25T2$ ). Breaker 2 recloses with delay  $3OI2$  for the second reclose.

### **Drive To Lockout (DTL)**

For nonreclosing conditions, use input  $DTL$ . For example, if we have a local breaker failure or bus lockout trip, assert  $DTL$  to drive the SEL-279H-2 Relay to the lockout state.

### **Manual or Supervisory Close**

To close the breaker manually, assert input  $IN5$  ( $CL1$ ). If any of the  $MC1S$  conditions are true, ( $MC1S = 25T1+W+G$ ) Relay Word bit  $CLS1$  asserts, closing the assigned programmable output contact and closing Breaker 1.

**Note:**  $OUT1$  closes Breaker 1.  $OUT2$  closes Breaker 2.

## Individual Example Settings Description

### SET Command:

VSRC	= 4	Select four voltage elements, V1, V2, V3, and V4
LNM	= 1	Single-phase LINE voltage connected to relay
BSM	= 1	Single-phase BUS voltage connected to relay
BKRC	= 0	Two breaker control with independent reclose logic
27B,27L,59B,59L		Line and Bus voltage settings
25DV,25D,25D1		Sync-check difference voltage, PRI delay, SEC delay settings
SOI1,SOI2	= 30	First reclose open interval timers, Breaker 1 and 2
3OI1,3OI2	= 1800	Second reclose open interval timers, Breaker 1 and 2
79RS	= 600	Reset time delay
M79SH	= 011	Controls Relay Word bit 79SH
52PU1	= 3600	Breaker 1 out-of-service pickup delay
52PU2	= 3600	Breaker 2 out-of-service pickup delay
52DO1	= 60	Breaker 1 out-of-service dropout delay
52DO2	= 60	Breaker 2 out-of-service dropout delay
TZPU	= 0	Pickup Delay for Relay Word Bit ZT
TZDO	= 0	Dropout Delay for Relay Word Bit ZT

### SELogic Control Equation Description (LOGIC Command)

A(12367)	= 27B	Dead Bus condition, Breaker 1
B(12367)	= 52BT1	Breaker 1 out-of-service
C(12367)	= 25T2	Breaker 2 sync-check delay
D(12367)	= 27B3	Dead Bus condition, Breaker 2
E(12367)	= 59L	Hot Line condition, Breaker 1
S(12367)	= 59L4	Hot Line condition, Breaker 2
L(12367)	=	
G(12346)	= 27L*59B	Dead Line/Hot Bus, Breaker 1
H(12346)	= 27L4*59B3	Dead Line/Hot Bus, Breaker 2
I(12346)	= 25T2*52A1	Allows Breaker 2 to sync-check close when Breaker 1 is closed
M(12346)	=	
W(45)	= A*E	27B*59L: Dead Bus/Hot Line, Breaker 1
X(45)	= B*D*ST	52BT1*27B3*59L4: Dead Bus/Hot Line, Breaker 2 with Breaker 1 out of service
Y(45)	= B*H	52BT1*27L4*59B3: Dead Line/Hot Bus, Breaker 2 with Breaker 1 out of service
Z(45)	= B*C	52BT1*25T2: Sync-check, Breaker 2 with Breaker 1 out of service
SPR1S(123456)	=	
SPR1C(123456)	= G+25T1+W	Supervise Breaker 1 first reclose output, when conditions are true, SPC1 = 1 after SOI1 time-out.
3PR1S(123456)	=	
3PR1C(123456)	= G+25T1+W	Supervise Breaker 1 second reclose output, when conditions are true, 3PC1 = 1 after 3OI1 time-out.
SPR2S(123456)	=	

SPR2C(123456)	= I+Y+X+ZT	Supervise Breaker 2 first reclose output, when conditions are true, SPC2 = 1 after SOI2 time-out.
3PR2S(123456)	=	
3PR2C(123456)	= I+Y+X+ZT	Supervise Breaker 2 second reclose output, when conditions are true, 3PC2 = 1 after 3OI2 time-out.
RLTCH(123456)	=	
SLTCH(123456)	=	
RC(123456)	=	
RS(123456)	=	
MC1S(123456)	= 25T1+W+G	Supervise manual close, Breaker 1
MC2S(123456)	= 25T2+X+Y	Supervise manual close, Breaker 2
ER(123456)	= CLS1+CLS2+SPR1	Trigger event report when conditions are true
OUT1(123456)	= CLS1	Close output contact to Breaker 1 close circuit
OUT2(123456)	= CLS2	Close output contact to Breaker 2 close circuit
OUT3(123456)	= 79SH	Close output 3 contact (second reclose)
OUT4(123456)		

### INPUT Command

IN1 = 52A1 Breaker 1 normally open AUX switch  
 IN2 = 52A2 Breaker 2 normally open AUX switch  
 IN5 = CL1 Breaker 1 manual/supervisory close input  
 IN6 = CL2 Breaker 2 manual/supervisory close input

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SEL Application Guide 97-01

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