

Technical Publication
SSR-1

Effective January 1997

ELECTRICALLY OPERATED SELECTOR SWITCH RELAY

**A Multi-contact Auxiliary Relay with
2 to 8 Positions
FOR POWER INDUSTRY APPLICATIONS**



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ELECTROSWITCH
Weymouth, Massachusetts

ABSTRACT

The series 24SSR Selector Switch Relay is a new series of auxiliary relays which combine electrical and manual operation in a single unit for multiposition applications. The series 24SSR is qualified to ESC-Std-1000 and conforms to the requirements of ANSI/IEEE C37.90-1989.

INTRODUCTION

Series 24 devices have been developed by Electro Switch over the last twenty years to satisfy a variety of power industry applications. To date these devices have included:

<u>TYPE</u>	<u>USE</u>
24	Manually operated instrument and control switches
LOR	High-speed electric-trip, manual-reset lock-out relays
LOR/ER	Electric reset (or manual-reset), electric-trip lock-out relays
CSR	Electrically-operated control switch relays for manual and remote control of circuit breakers.
LSR	Latching-switch relay (manual and electric operation)

The use of these auxiliary relays has enabled the combining of relay functions with a traditional rotary switch. This eliminates unwanted redundancy and includes a manual override feature and visual indicators. It also enables the traditional control switches to be operated by automatic methods with timers or computers -- or enables their use in supervisory control schemes.

Auxiliary relays of these types have been for specific two or three position applications. Multiposition applications could not be handled electrically. The series 24SSR Selector Switch Relay has been developed to satisfy this need. The series 24SSR is basically a stepping switch that can be used in any 2 to 8 position application. This enables the use of re-

corders or telephone lines to monitor phase voltages and currents from remote locations -- or select a variety of valves -- or different schemes of breakers -- or any other multiposition application where simple or complicated contacting is used.



Fig. 1. Typical Series 24 Instrument and Control Switch

The series 24SSR looks like and operates like the traditional multiposition switches presently used in power industry applications. It mounts on the same panels with no rework and provides the same versatility and combinations of contacting. It only needs the addition of a control circuit to enable its use electrically by supervisory control methods or remotely by a variety of means.

This technical publication describes the series 24SSR Selector Switch Relay. Several typical operating schemes are illustrated, contacting arrangements are shown, and the qualification test program is outlined. The rotary solenoid drive mechanism is also shown.

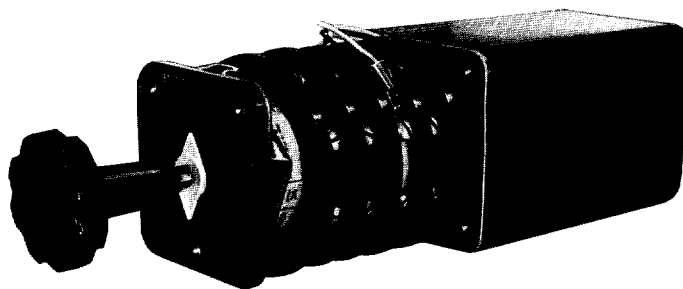


Fig 2. Series 24 SSR Selector Switch Relay

General Release - January 3, 1982
 Revised & Updated - August 1, 1985
 Revised & Updated - May 1, 1987
 Revised & Updated - January 1, 1992
 Revised & Updated - April 1, 1994
 Revised & Updated - January 1, 1997

BASIC CIRCUIT OPERATION

Three basic circuits have been developed to satisfy a variety of power industry applications:

Circuit A - Single-step, direct control -- alternate operations of two normally-open (NO) contacts cause the SSR to step one position at a time counterclockwise (CCW) to any of its eight positions.

Circuit B - Single-step, direct control, with seal-in -- operation of a single NO contact causes the SSR to step one position CCW; the NO contact must open before it is possible to activate the circuit for the next operation.

Circuit D - Free stepping with low level control -- positive homing circuits seeks out (or homes in on) the circuit (or position) that has the low level command signal -- up to seven different positions (or signals).

The controls of the series 24SSR for electric operation requires no special wiring. It requires only the NO contacts shown on the different circuits to command the device to the required position. The burden data outlined on page 5 should be used as a guide in selecting the NO control contacts. The standard station control bus voltage is used on all four circuits. The circuits are shown in the following three figures.

Circuit A - Single step, direct control

This circuit shown on Fig. 3 causes the series 24SSR to step one position at a time CCW to any of its eight positions by alternately operating of S_1 and S_2 .

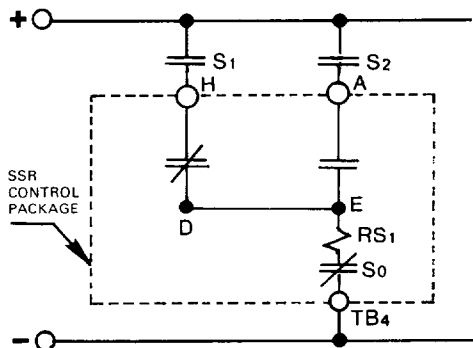


Fig. 3. SSR Control Circuit A - Single step, direct control (shown in position associated with control contact S_1)

Operation of the control contact (S_1) establishes a circuit through contact H-D through the rotary solenoid (RS_1) and the interrupter contact (S_0). The rotary solenoid steps one position, S_0 opens and breaks the circuit, contact H-D opens locking the circuit open, RS_1 resets itself reclosing S_0 , and contact A-E closes setting up the circuit for the next command. S_1 may remain closed indefinitely or opened after this sequence is completed (about 50 milliseconds). The next step is accomplished by S_2 in the same manner.

S_1 and S_2 may not be closed at the same time or free stepping will occur. S_1 and S_2 will carry the full burden current of the rotary solenoid. The interrupter contact (S_0) breaks the load.

Circuit B - Single step, direct control with seal-in

Fig. 4 shows this circuit. Operation of the control contact (S_1) causes the series 24SSR to step one position CCW.

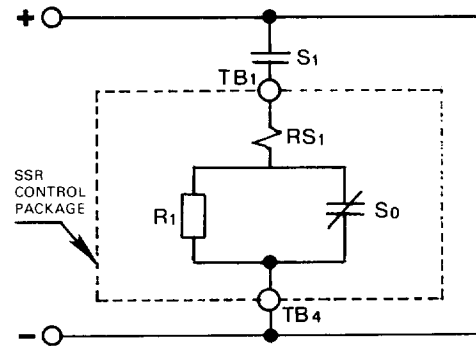


Fig. 4. SSR Control Circuit B - Single step, direct control with seal-in

When the control contact (S_1) operates, a circuit is made through the rotary solenoid (RS_1) and the interrupter contact (S_0), and the SSR steps one position. This causes S_0 to open but keeping RS_1 activated with the dropping resistor (R_1). This seals-in the SSR so that no more action is possible as long as S_1 is closed. S_1 may be kept closed up to 1 second. When S_1 opens, the seal-in circuit is broken, RS_1 resets itself, and S_0 closes setting the circuit up for the next operation. Additional operations of S_1 will cause additional steps of the SSR -- eight different positions per revolution and then continuing along for successive rotations.

S_1 will carry the full burden of the rotary solenoid. The interrupter contact (S_0) interrupts the load. S_1 will break the load of the hold-in resistor (R_1) circuit which is approximately 1 amperes or less depending on the operating voltage. S_1 should remain closed from 100 milliseconds minimum to 1 second maximum. For longer seal-in times, consult factory.

Circuit D - Free stepping with low level control

The positive homing circuit shown on Fig. 5 seeks out (or homes in on) the circuit that has a command signal. Closing any contact S1 to S8 (for 100 milliseconds to 1 second) using a low level contact (less than 1 ampere) causes the SSR to step CCW to that commanded position.

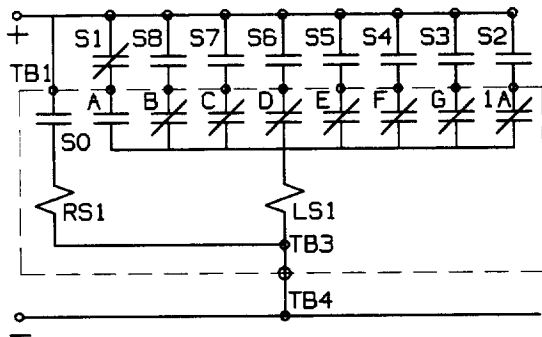


Fig. 5. SSR Control Circuit D - Free stepping with low level control (shown in the position associated with S₁).

When S₁, S₂ etc. is closed, using a low level signal, the linear solenoid (LS₁) will activate. This closes the interrupter contact (S₀) impressing the line voltage on the rotary solenoid (RS₁). RS₁ freely steps until the control deck contact (A to G), associated with the command contact, opens, indicating that the SSR has reached the command position.

This opens the LS₁ circuit and holds the interrupter contact (S₀) open, removing the line voltage from RS₁ and the rotary switch action stops. The SSR stays completely de-energized whether the command signal stays on or not. The interrupter contact (S₀) opens each time the SSR steps allowing RS₁ to reset, thereby closing S₀ and setting up the circuit for the next step.

BASIC SWITCH/RELAY CONTACTS

The SSR Selector Switch Relay contacts operate on the original, reliable principle of knife switches -- double-sided, double-wiping, spring wiper blades closing on both sides of a terminal. To provide a closed contact, two terminals are bridged or

shunted. Fig. 6. shows this contacting arrangement.

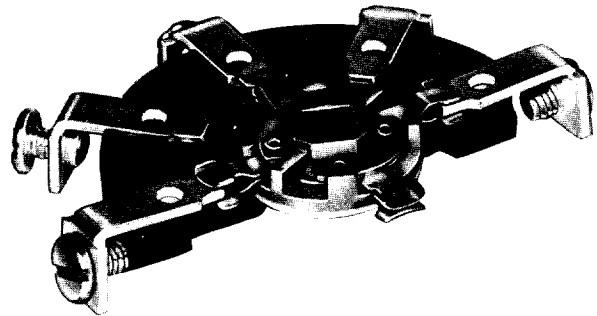


Fig. 6. Double-sided, double wiping knife-type contact configuration

Contact Materials

The wiper blades are made from a phosphor-bronze alloy that combines superior spring qualities with good electrical conductivity. This material and blade design has been proven by extensive laboratory testing as well as more than thirty years of field use and experience. Initially used in rugged naval ship applications, it is also used in industrial applications such as railroad locomotives and earth moving equipment. It has been used for more than years in power industry applications, as well.

The blade assembly is shock-proof and virtually bounce-proof. This makes it ideal for high speed, quick-make, quick-break devices like the SSR.

The blades are formed, assembled, and riveted nearly closed. The gap is machine adjusted to provide a uniform high pressure. The gap does not change with time

and use. Normal use tends to improve the contact surfaces due to the rubbing action. This provides a burnishing as well as cleaning action.

The contact surface conductivity is enhanced by a silver overlay stripe that lasts the life of the unit. This ensures a good contact even in those cases where the SSR is not operated for long periods of time.

The terminals are made of electrically and environmentally compatible copper material with a silver overlay stripe at the contact area plus an overall silver plate to ensure a lastingly good contact surface for customer wiring purposes. Similarly, the terminal screws are made from silver-plated brass.

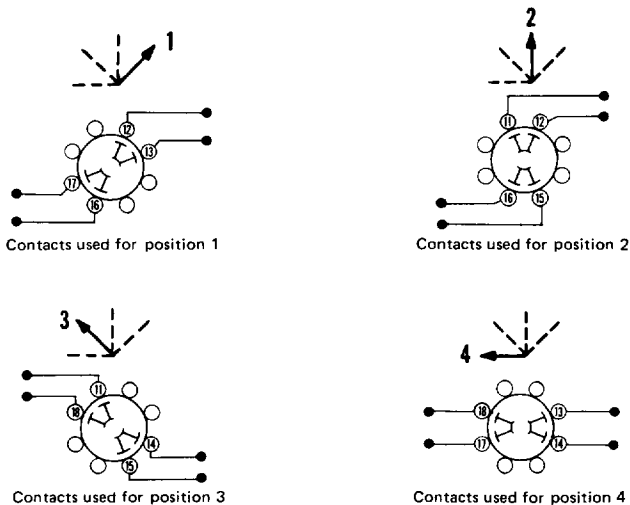
Contact Deck Arrangements and Contact Charts

The blade and terminal configuration enable the use of multicontacts in the same deck, and simple stacking procedures enable the faabrication of up to ten decks in one switch.

For three and four position applications, two standard contact configurations are available. Fig. 7. shows a contact arrangement where two contacts of a like kind may be used in each deck. As an example, two contacts that are NC in position 1 may be in deck 1, two contacts that are NC in position 2 may be in deck 2, etc. Deck 1 is shown. Terminal numbers repeat for multi-deck switches. The first number indicates the deck number.

For the illustration shown a typical deck is used to show contact choice for popular position arrangements. Position 2 contact choices should not be used in the same deck as position 1 choices because of the overlap of terminals.

Other combinations can be made by a careful choice, avoiding using the same terminal number for two contacts.



NOTE: the action is counterclockwise (CCW) and repeats after the fourth position (so one rotation is positions 1-2-3-4-1-2-3-4)

Fig. 7. Basic Two Contact Deck Layout

A typical application using the two contact-per-deck design is illustrated in a contact chart arrangement in Figure 8.

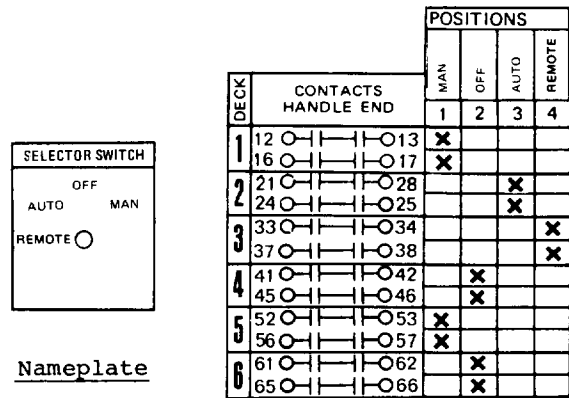
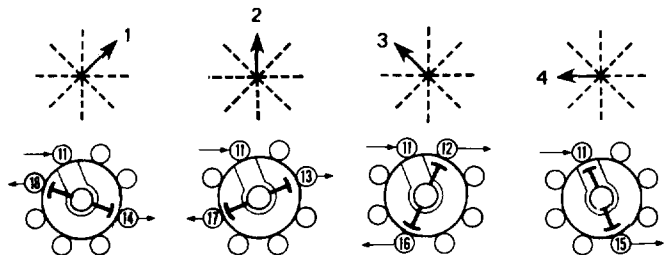


Fig. 8. Typical Contact Chart Using Two Independent Contacts Per-Deck Design

For three and four position applications a selector switch contact arrangement is also available. This arrangement is the same as the two-to-eight position selector arrangement that follows, except, it provides two actions per rotation reducing the travel after the fourth position back to the first position. This arrangement also allows two connections per position from one common. It provides one separate circuit per deck with a selection of up to four taps. This contacting arrangement is shown on Fig. 9.



NOTE: the action is counterclockwise (CCW) and repeats after the fourth position (so one rotation is 1-2-3-4-1-2-3-4). There are two outputs in position 1, 2, and 3; one output in position 4

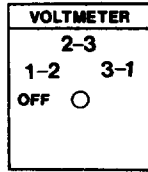
Fig. 9. Basic 4 Position Contact Deck Layout

A voltmeter or ammeter selector switch are typical applications using the 4 position contact layout. A typical voltmeter selector switch circuit is shown on Fig. 10.

The previous two contact arrangements are generally used for three and four position applications. They can also be used for two position applications, but the series 24LSR Latching Switch Relay is probably more appropriate.

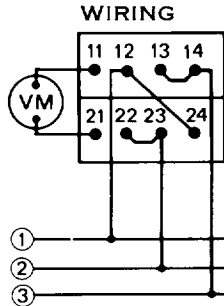
For applications using more than four positions, the standard tap selector circuit illustrated in Fig. 11 is used. This is similar to the 4-position layout except with more positions and no repeating positions.

VOLTMETER
TRANSFER SWITCH
3-phase, phase-to-phase
Double-pole triple-throw
Handle: Round, knurled



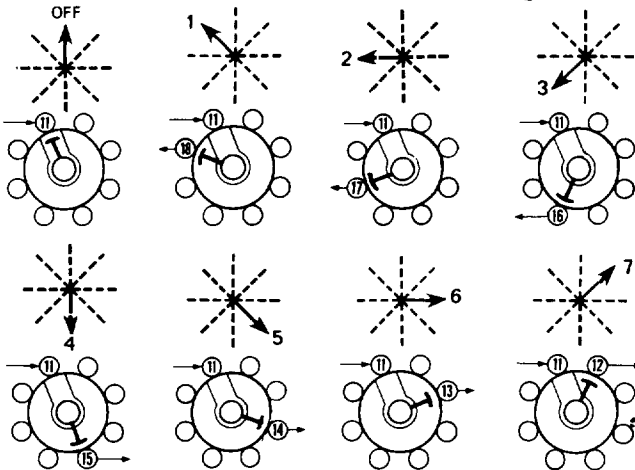
CONTACTING

DECK	CONTACTS	POS.			
		OFF	1-2	2-3	3-1
1	11				
	12		X		
	13			X	
2	21				
	22		X		
	23			X	
	14				X
	24				X
					X



NOTE: This circuit performs identically with the manual operated series 24 Catalog No. 2404C

Fig. 10. Typical Contact Chart Using 4 Position Contact Deck Layout



NOTE: the action is counterclockwise (CCW)

Fig. 11. Typical Tap-Switch Contact Deck Layout

A contact chart layout of the tap-switch arrangement is shown on Figure 12. Up to 10 decks of this arrangement is available.

DECK	CONTACTS HANDLE END	POSITIONS							
		OFF	1	2	3	4	5	6	7
1	11								
	12								X
	13								X
	14						X		
	15					X			
	16				X				
	17			X					
	18	X							

Fig. 12. Contact Chart Using Tap-Switch Contact Design

The series 24SSR Selector Switch Relay can be supplied for all the contact arrangements of the standard series 24 Instrument and Control Switches detailed in Technical Publication 24-1. Two position arrangements can better be handled by the series 24LSR Latching Switch Relay detailed in Technical Publication LSR-1. Circuit Breaker Control Switches are better handled by the series 24CSR Control Switch Relay shown in Technical Publication CSR-1.

Additionally, the design flexibility enables the user to specify literally millions of contacting arrangements using the standard design and stocked parts to exactly satisfy his switching needs. A "DESIGN GUIDE" is included on page 12 to aid the user in specifying these needs.

BASIC OPERATING CHARACTERISTICS

The SSR Selector Switch Relay utilizes the field proven series 24 switch as its base. The same design is used in other auxiliary relay products as well as the LOR, CSR, and LSR as previously described.

The contact ratings and circuit data are similar to these other devices. Complete ratings data follows:

Operating Voltage

The SSR Selector Switch Relay is a direct current auxiliary relay, and as such, may be energized as explained previously at the maximum design voltage without exceeding 50°C temperature rise (55°C ambient), using class 105 insulation and the applied thermocouple method of temperature determination.

The standard coil sizes are, as follows:

TABLE I
Coil Voltage Data

COIL	NOMINAL VOLTAGE	VOLTAGE RANGE
C	48VDC	41-56VDC
D	125VDC	106-140VDC
E	250VDC	210-275VDC

Coil Burden Data

The SSR operating rotary solenoid coil burden data is outlined in Table II.

TABLE II
Coil Burden Data

COIL	COIL CIRCUIT VOLTS	COIL CIRCUIT DC OHMS @25°C	BURDEN (AMPS) AT RATED VOLTAGE
C	48VDC	3.59	13.3
D	125VDC	23.69	5.2
E	250VDC	93.67	2.6

As previously described, the control bus needs to supply the burden of Table II but the circuit interruption is done with the SSR control circuitry. Refer to individual control circuit information for burden time demand requirements. Further data on burden of the other circuit components is in the Appendix.

Response Time

The SSR Selector Switch Relay will operate reliably over the full voltage range. All operating times are measured with voltages suddenly applied and removed. Operating time values are measured with relay "cold" -- coil at room ambient (20-25°) before measurement is made. The SSR units respond and operate in less than 100 milliseconds (approximately 50mSec.).

Contact Ratings

The SSR Selector Switch Relay has been tested to many different circuit conditions.

The interrupting ratings are based on 10,000 operations of life, using suddenly applied and removed rated voltage, with no extensive burning of contacts. Inductive ratings are based on tests using standard inductance L/R=0.04 for DC and cos0=0.4 for AC. The Interrupting Rating column headed "double-contacts" means two contacts in series. Short time, and continuous ratings are based on temperature rise in contact members and supporting parts not exceeding 50°C above ambient.

Allowable Variation From Rated Voltage

The relay contacts are not sensitive to normal variations in voltage. The interrupting capacity is important as indicated in Tables II and III. Variations of plus and minus 20% in rated voltage need not be considered as long as the interrupting current is not exceeded.

TABLE III

Contact Ratings

CONTACT CIRCUIT VOLTS	INTERRUPTING RATING (AMPS)				SHORT TIME RATING (AMPS)*	CONTINUOUS RATING (AMPS)
	RESISTIVE		INDUCTIVE			
	SINGLE CONTACT	DOUBLE CONTACT	SINGLE CONTACT	DOUBLE CONTACT		
125VDC	3	5	1	3	60	30
250VDC	1	3	1	1	60	30
120VAC	20	20	15	15	60	30
240VAC	15	15	5	5	60	30
480VAC	10	10	5	5	60	30
600VAC	6	6	5	5	60	30

*Short time current is for one minute

SERIES 24SSR SELECTOR SWITCH RELAYS

HOW TO ORDER

1. Select desired control circuit from pages 2 to 3.
2. Select switch contacting from pages 3 to 5; or from Technical Bulletin 24-1; or complete contacting chart on page 12; or advise factory of the contacting required in any convenient manner.
3. Select or advise control voltage.
4. Choose appropriate catalog number below (or advise the above data and a catalog number will be assigned).

CATALOG NUMBERS

PANEL MOUNT - CIRCUIT A SINGLE STEP, DIRECT CONTROL

DECKS	2 CONTACTS PER DECK COIL VOLTAGE			TAP-SWITCH 2 TO 4 POSITIONS COIL VOLTAGE			TAP-SWITCH 2 TO 8 POSITIONS COIL VOLTAGE		
	48VDC	125VDC	250VDC	48VDC	125VDC	250VDC	48VDC	125VDC	250VDC
1	94201CA	94201DA	94201FA	94801CA	94801DA	94801FA	94301CA	94301DA	94301FA
2	94202CA	94202DA	94202FA	94802CA	94802DA	94802FA	94302CA	94302DA	94302FA
3	94203CA	94203DA	94203FA	94803CA	94803DA	94803FA	94303CA	94303DA	94303FA
4	94204CA	94204DA	94204FA	94804CA	94804DA	94804FA	94304CA	94304DA	94304FA
5	94205CA	94205DA	94205FA	94805CA	94805DA	94805FA	94305CA	94305DA	94305FA
6	94206CA	94206DA	94206FA	94806CA	94806DA	94806FA	94306CA	94306DA	94306FA
7	94207CA	94207DA	94207FA	94807CA	94807DA	94807FA	94307CA	94307DA	94307FA
8	94208CA	94208DA	94208FA	94808CA	94808DA	94808FA	94308CA	94308DA	94308FA
9	94209CA	94209DA	94209FA	94809CA	94809DA	94809FA	94309CA	94309DA	94309FA
10	94210CA	94210DA	94210FA	94810CA	94810DA	94810FA	94310CA	94310DA	94310FA

PANEL MOUNT - CIRCUIT B SINGLE STEP, DIRECT CONTROL WITH SEAL-IN

DECKS	2 CONTACTS PER DECK COIL VOLTAGE			TAP-SWITCH 2 TO 4 POSITIONS COIL VOLTAGE			TAP-SWITCH 2 TO 8 POSITIONS COIL VOLTAGE		
	48VDC	125VDC	250VDC	48VDC	125VDC	250VDC	48VDC	125VDC	250VDC
1	94201CB	94201DB	94201FB	94801CB	94801DB	94801FB	94301CB	94301DB	94301FB
2	94202CB	94202DB	94202FB	94802CB	94802DB	94802FB	94302CB	94302DB	94302FB
3	94203CB	94203DB	94203FB	94803CB	94803DB	94803FB	94303CB	94303DB	94303FB
4	94204CB	94204DB	94204FB	94804CB	94804DB	94804FB	94304CB	94304DB	94304FB
5	94205CB	94205DB	94205FB	94805CB	94805DB	94805FB	94305CB	94305DB	94305FB
6	94206CB	94206DB	94206FB	94806CB	94806DB	94806FB	94306CB	94306DB	94306FB
7	94207CB	94207DB	94207FB	94807CB	94807DB	94807FB	94307CB	94307DB	94307FB
8	94208CB	94208DB	94208FB	94808CB	94808DB	94808FB	94308CB	94308DB	94308FB
9	94209CB	94209DB	94209FB	94809CB	94809DB	94809FB	94309CB	94309DB	94309FB
10	94210CB	94210DB	94210FB	94810CB	94810DB	94810FB	94310CB	94310DB	94310FB

PANEL MOUNT - CIRCUIT D FREE STEPPING WITH LOW LEVEL CONTROL

DECKS	2 CONTACTS PER DECK COIL VOLTAGE			TAP-SWITCH 2 TO 4 POSITIONS COIL VOLTAGE			TAP-SWITCH 2 TO 8 POSITIONS COIL VOLTAGE		
	48VDC	125VDC	250VDC	48VDC	125VDC	250VDC	48VDC	125VDC	250VDC
1	94201CD	94201DD	94201FD	94801CD	94801DD	94801FD	94301CD	94301DD	94301FD
2	94202CD	94202DD	94202FD	94802CD	94802DD	94802FD	94302CD	94302DD	94302FD
3	94203CD	94203DD	94203FD	94803CD	94803DD	94803FD	94303CD	94303DD	94303FD
4	94204CD	94204DD	94204FD	94804CD	94804DD	94804FD	94304CD	94304DD	94304FD
5	94205CD	94205DD	94205FD	94805CD	94805DD	94805FD	94305CD	94305DD	94305FD
6	94206CD	94206DD	94206FD	94806CD	94806DD	94806FD	94306CD	94306DD	94306FD
7	94207CD	94207DD	94207FD	94807CD	94807DD	94807FD	94307CD	94307DD	94307FD
8	94208CD	94208DD	94208FD	94808CD	94808DD	94808FD	94308CD	94308DD	94308FD
9	94209CD	94209DD	94209FD	94809CD	94809DD	94809FD	94309CD	94309DD	94309FD
10	94210CD	94210DD	94210FD	94810CD	94810DD	94810FD	94310CD	94310DD	94310FD

SHELF MOUNT - CIRCUIT A SINGLE STEP, DIRECT CONTROL

DECKS	2 CONTACTS PER DECK COIL VOLTAGE			TAP-SWITCH 2 TO 4 POSITIONS COIL VOLTAGE			TAP-SWITCH 2 TO 8 POSITIONS COIL VOLTAGE		
	48VDC	125VDC	250VDC	48VDC	125VDC	250VDC	48VDC	125VDC	250VDC
1	94201CM	94201DM	94201FM	94801CM	94801DM	94801FM	94301CM	94301DM	94301FM
2	94202CM	94202DM	94202FM	94802CM	94802DM	94802FM	94302CM	94302DM	94302FM
3	94203CM	94203DM	94203FM	94803CM	94803DM	94803FM	94303CM	94303DM	94303FM
4	94204CM	94204DM	94204FM	94804CM	94804DM	94804FM	94304CM	94304DM	94304FM
5	94205CM	94205DM	94205FM	94805CM	94805DM	94805FM	94305CM	94305DM	94305FM
6	94206CM	94206DM	94206FM	94806CM	94806DM	94806FM	94306CM	94306DM	94306FM
7	94207CM	94207DM	94207FM	94807CM	94807DM	94807FM	94307CM	94307DM	94307FM
8	94208CM	94208DM	94208FM	94808CM	94808DM	94808FM	94308CM	94308DM	94308FM
9	94209CM	94209DM	94209FM	94809CM	94809DM	94809FM	94309CM	94309DM	94309FM
10	94210CM	94210DM	94210FM	94810CM	94810DM	94810FM	94310CM	94310DM	94310FM

SHELF MOUNT - CIRCUIT B SINGLE STEP, DIRECT CONTROL WITH SEAL-IN

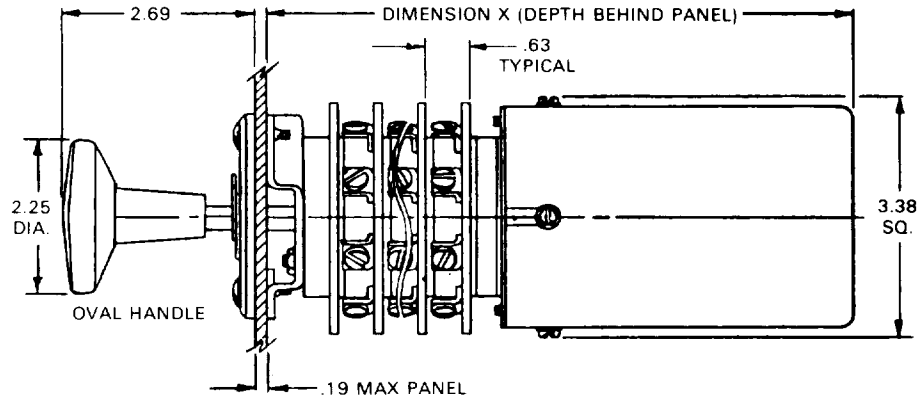
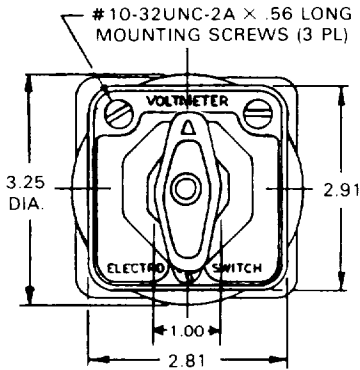
DECKS	2 CONTACTS PER DECK COIL VOLTAGE			TAP-SWITCH 2 TO 4 POSITIONS COIL VOLTAGE			TAP-SWITCH 2 TO 8 POSITIONS COIL VOLTAGE		
	48VDC	125VDC	250VDC	48VDC	125VDC	250VDC	48VDC	125VDC	250VDC
1	94201CN	94201DN	94201FN	94801CN	94801DN	94801FN	94301CN	94301DN	94301FN
2	94202CN	94202DN	94202FN	94802CN	94802DN	94802FN	94302CN	94302DN	94302FN
3	94203CN	94203DN	94203FN	94803CN	94803DN	94803FN	94303CN	94303DN	94303FN
4	94204CN	94204DN	94204FN	94804CN	94804DN	94804FN	94304CN	94304DN	94304FN
5	94205CN	94205DN	94205FN	94805CN	94805DN	94805FN	94305CN	94305DN	94305FN
6	94206CN	94206DN	94206FN	94806CN	94806DN	94806FN	94306CN	94306DN	94306FN
7	94207CN	94207DN	94207FN	94807CN	94807DN	94807FN	94307CN	94307DN	94307FN
8	94208CN	94208DN	94208FN	94808CN	94808DN	94808FN	94308CN	94308DN	94308FN
9	94209CN	94209DN	94209FN	94809CN	94809DN	94809FN	94309CN	94309DN	94309FN
10	94210CN	94210DN	94210FN	94810CN	94810DN	94810FN	94310CN	94310DN	94310FN

SHELF MOUNT - CIRCUIT D FREE STEPPING WITH LOW LEVEL CONTROL

DECKS	2 CONTACTS PER DECK COIL VOLTAGE			TAP-SWITCH 2 TO 4 POSITIONS COIL VOLTAGE			TAP-SWITCH 2 TO 8 POSITIONS COIL VOLTAGE		
	48VDC	125VDC	250VDC	48VDC	125VDC	250VDC	48VDC	125VDC	250VDC
1	94201CR	94201DR	94201FR	94801CR	94801DR	94801FR	94301CR	94301DR	94301FR
2	94202CR	94202DR	94202FR	94802CR	94802DR	94802FR	94302CR	94302DR	94302FR
3	94203CR	94203DR	94203FR	94803CR	94803DR	94803FR	94303CR	94303DR	94303FR
4	94204CR	94204DR	94204FR	94804CR	94804DR	94804FR	94304CR	94304DR	94304FR
5	94205CR	94205DR	94205FR	94805CR	94805DR	94805FR	94305CR	94305DR	94305FR
6	94206CR	94206DR	94206FR	94806CR	94806DR	94806FR	94306CR	94306DR	94306FR
7	94207CR	94207DR	94207FR	94807CR	94807DR	94807FR	94307CR	94307DR	94307FR
8	94208CR	94208DR	94208FR	94808CR	94808DR	94808FR	94308CR	94308DR	94308FR
9	94209CR	94209DR	94209FR	94809CR	94809DR	94809FR	94309CR	94309DR	94309FR
10	94210CR	94210DR	94210FR	94810CR	94810DR	94810FR	94310CR	94310DR	94310FR



PANEL MOUNT VERSION



*NUMBER OF DECKS	DIMENSION X
3	8.97
5	10.22
8	12.09
10	13.34

* EXCLUSIVE OF CONTROL DECK.

INTERRUPTING RATINGS:

UND. LAB. INC. RECOGNIZED COMPONENTS*

20A-120VAC
 15A-240VAC
 6A-600VAC
 3A-125VDC
 1A-250VDC

CSA CERTIFIED*

20A-600VAC (res)
 15A-600VAC (ind)
 2A-125VDC
 2HP-240/480VAC

OTHER RATINGS:

Momentary Current (thermal)

3 SEC-200A

30 SEC- 75A

60 SEC- 60A

Overload (50 operations)

95A-120VAC

65A-240VAC

35A-600VAC

Making ability for
Circuit Breaker Coils

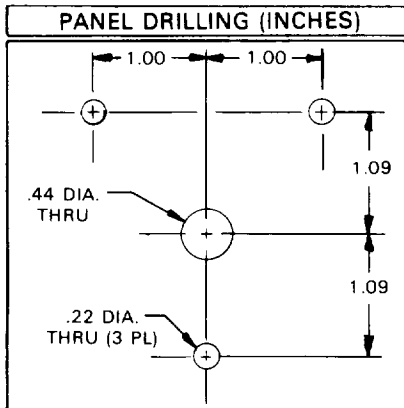
95A-125VDC

Dielectric Strength - 2200VRMS

Insulation Resistance - 100 megohms

Contact Resistance - 10 milliohms

*UL & CSA on switching portion only



OTHER TECHNICAL DATA

Bulletin SSR-1

Tested to ESC-STD-1000 (non class 1E)

Contacting & catalog numbers on separate sheet

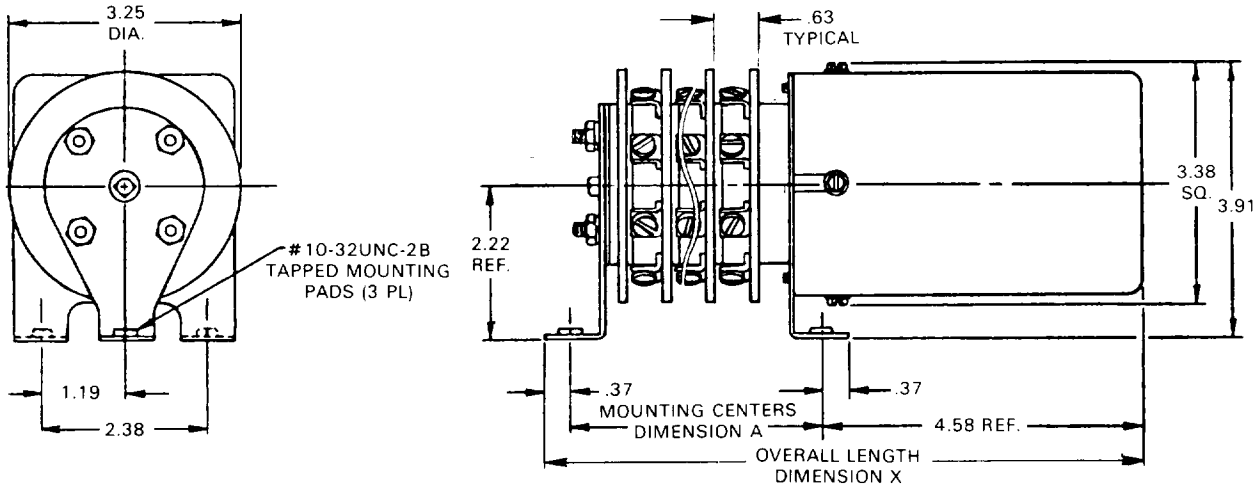
Control circuit wiring diagrams are shown on 280STD-1A

REVISIONS:

MADE BY: IRU	DATE: 10/26/81	DWG. NO: 280STD-1	REV
APPR. BY: AM	DATE: 10/26/81	SHEET 1 OF 1	



SHELF MOUNT VERSION



INTERRUPTING RATINGS:

UND. LAB. INC.
RECOGNIZED COMPONENTS*

- 20A-120VAC
- 15A-240VAC
- 6A-600VAC
- 3A-125VDC
- 1A-250VDC

CSA CERTIFIED*

- 20A-600VAC (res)
- 15A-600VAC (ind)
- 2A-125VDC
- 2HP-240/480VAC

OTHER RATINGS:

Momentary Current (thermal)

- 3 SEC-200A
- 30 SEC- 75A
- 60 SEC- 60A

Overload (50 operations)

- 95A-120VAC
- 65A-240VAC
- 35A-600VAC

Making ability for
Circuit Breaker Coils

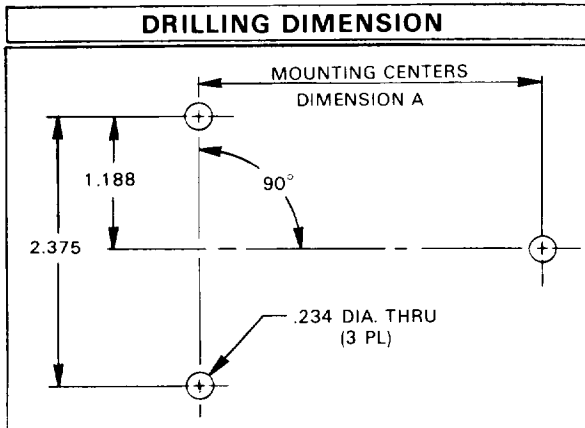
- 95A-125VDC

Dielectric Strength - 2200VRMS
Insulation Resistance - 100 megohms
Contact Resistance - 10 milliohms

*NUMBER OF DECKS	DIMENSION A	DIMENSION X
3	4.134	9.08
5	5.384	10.33
8	7.259	12.21
10	8.509	13.46

* EXCLUSIVE OF CONTROL DECK.

*UL & CSA on switching portion only



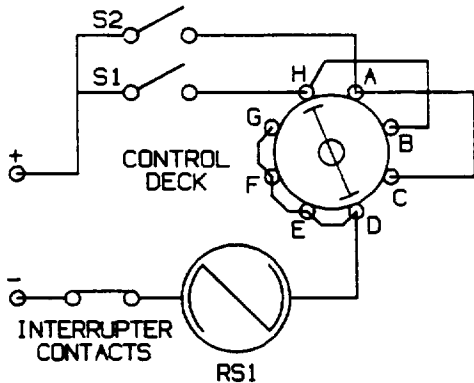
OTHER TECHNICAL DATA

Bulletin SSR-1
Tested to ESC-STD-1000 (non class 1E)
Contacting & catalog numbers on separate sheet
Control circuit wiring diagrams are shown on 280STD-1A

REVISIONS:

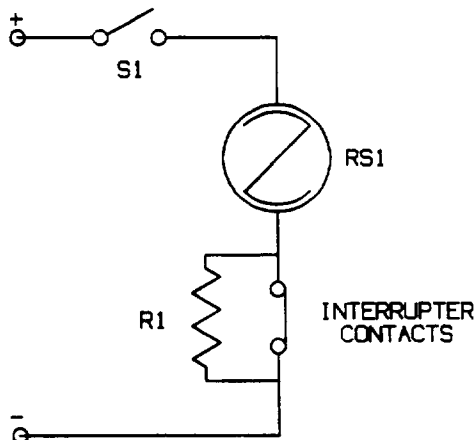
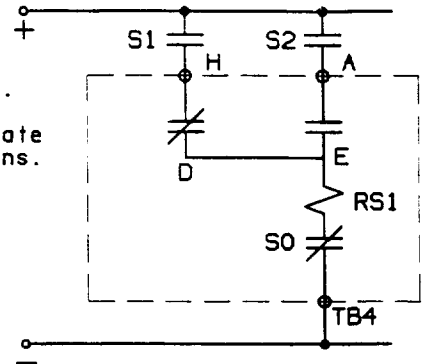
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APPR. BY: AM	DATE: 10/26/81

DWG. NO: 280STD-2	REV
SHEET 1 OF 1	



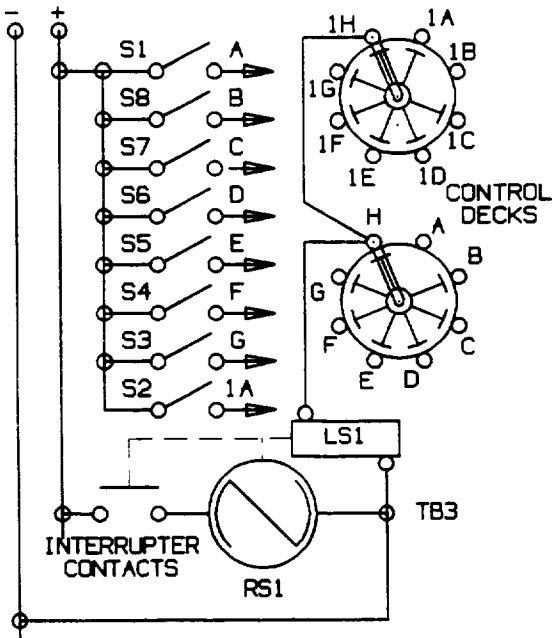
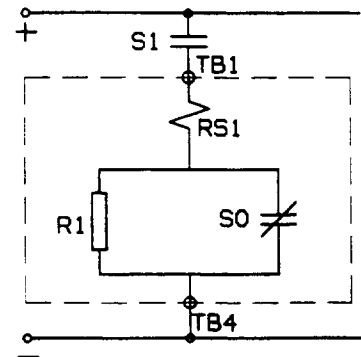
CIRCUIT A

Direct control, single step. Alternate operations of S1 and S2 cause the SSR to rotate CCW to any of its 8 positions.



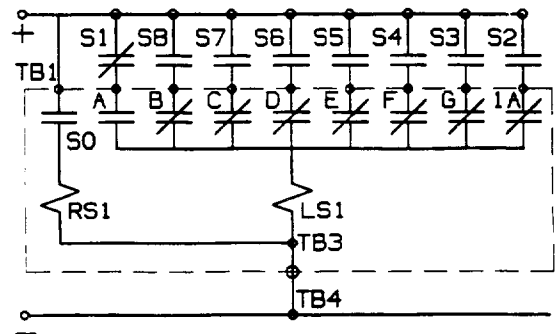
CIRCUIT B

Direct control, single step with seal-in. Operation of S1 causes the SSR to rotate CCW one position. S1 must open before the next step is possible.



CIRCUIT D

Free stepping with low level control (shown in position 1). Closing any contact S1 to S8 using a low level signal causes the SSR to step CCW to the commanded position by positively homing in (seeking out) the circuit that has a signal.



REVISIONS:

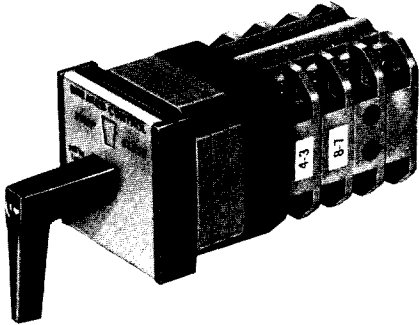
MADE BY: I. R. U.	DATE: 10/26/81
APPR BY: A. M.	DATE: 10/26/81

CONTROL CIRCUIT WIRING DIAGRAMS

DWG. NO:	
SHEET	1 OF 1

REV **0**

Technical Publication MIN-1

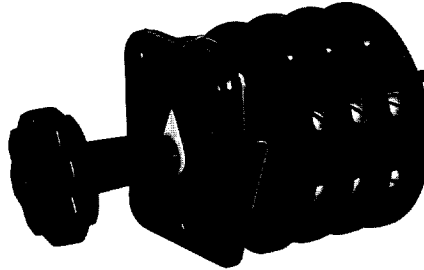


SERIES 20

MINIATURE INSTRUMENT & CONTROL SWITCH

20A-600VAC
1 to 12 decks 2 to 24 contacts

Technical Publication 24-1



SERIES 24

STANDARD INSTRUMENT & CONTROL SWITCH

20A-120VAC 6A-600VAC
1 to 10 decks 2 to 20 contacts

Series 20 & 40 DIGEST

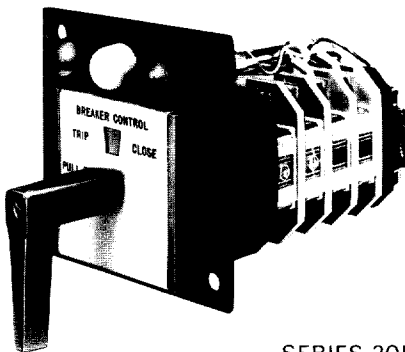


SERIES 40

CAM-ACTUATED INSTRUMENT & CONTROL SWITCH

32A-600VAC
1 to 12 decks 2 to 24 contacts

Technical Publication MIN-1



SERIES 20P

LIGHTED INSTRUMENT & CONTROL SWITCH

20A-600VAC
1 to 12 decks 2 to 24 contacts

POWER INDUSTRY PRODUCTS

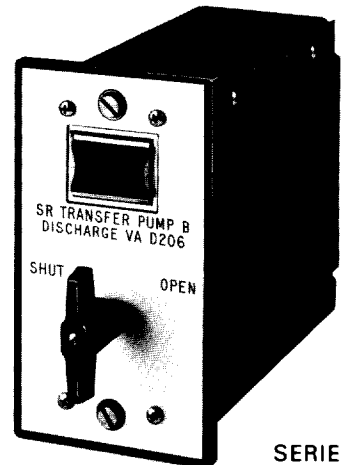
are qualified by laboratory testing to the following standards:

- ANSI/IEEE 323-1984 (Environment)
- ANSI/IEEE Std 344-1987 (Seismic)
- ANSI/IEEE C37.90-1989 (General)
- ANSI/IEEE C37.98-1987 (Seismic)

We also conform to:

- NRC 10CFR21
- NRC 10CFR50, Append. B
- ANSI/ASME NQA-1-1986

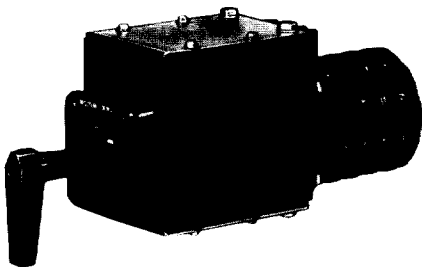
Technical Publication MOD-1



SERIES 20

PLUG-IN MODULE INSTRUMENT & CONTROL SWITCH

Technical Publication LSR-1



SERIES 24 LSR

LATCHING SWITCH RELAY

2 to 20 contacts
30 msec transfer time

Technical Publication LOR-1

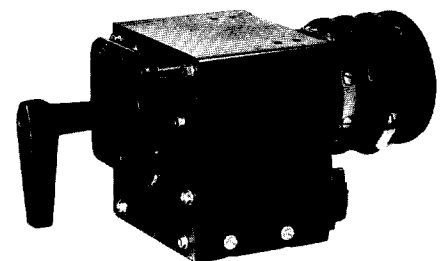


SERIES 24 LOR & LOR/ER

**HIGH SPEED TRIP
MANUAL & ELECTRIC RESET
LOCK-OUT RELAYS**

up to 40 contacts
8 msec transfer time

Technical Publication CSR-1



SERIES 24 CSR

CONTROL SWITCH RELAY

Replaces manual
instrument & control switches
2 to 20 contacts
20A-120VAC