

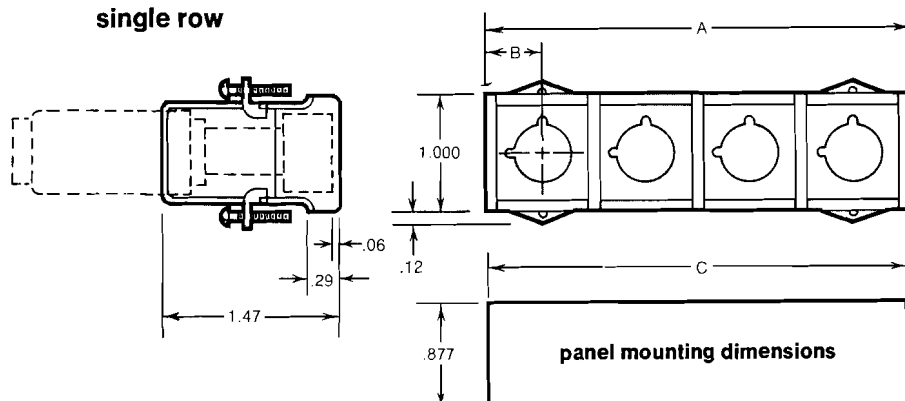
front panel mounting frames

single-light

Front-mounting frames feature handsome luster finish metal barriers that separate lens caps. In addition to improving panel appearance, these barriers prevent two lens caps from being depressed simultaneously. The frames fit panels up to 1/4 inch thick. The only hole required is the panel cutout. Drilling and tapping have been eliminated. Quick, easy mounting is accomplished by exclusive screw-clips which 'hook' into the sides of the frame. An attached screw applies firm holding pressure to the panel. The result is a solid, no-wiggle, no-slip attachment, all done with minimum of effort. This mounting method has another advantage, easy removal. Any assembly can be easily removed. The clip mounting method requires a minimum 1/4 inch clearance between assemblies. However, that amount is usually retained for panel strength alone.

When ordered with switchlights, frames are shipped completely assembled. You simply insert them into the cutout hole and tighten the screws.

single row

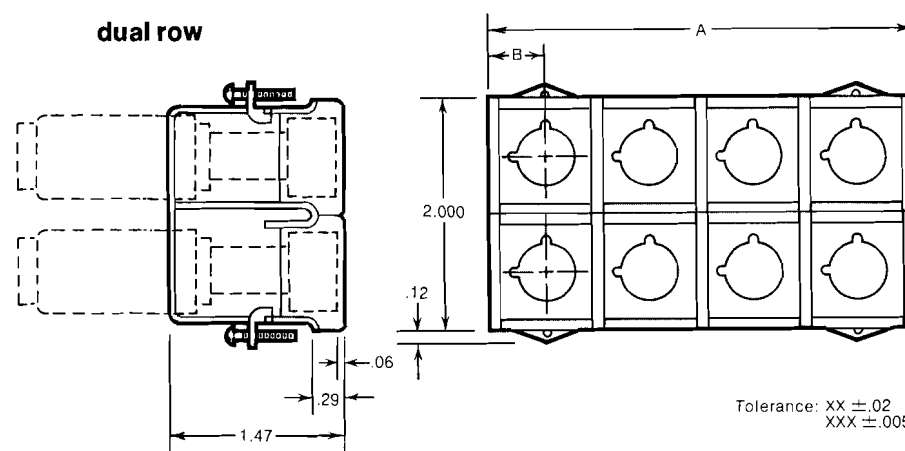


single-light
switches require
standard
modification

F1 if interlocked
F3 if independent

dimensions				
$\frac{7}{8}$ " centers G167 single G177 dual (1" between rows)		number of single row stations (double for dual row)	1" centers G168 single G178 dual (1" between rows)	
B = 0.488			B = 0.550	
variable lengths			variable lengths	
A	C		A	C
0.976	0.991	1	1.100	1.115
1.851	1.866	2	2.100	2.115
2.726	2.741	3	3.100	3.115
3.601	3.616	4	4.100	4.115
4.476	4.491	5	5.100	5.115
5.351	5.366	6	6.100	6.115
6.226	6.241	7	7.100	7.115
7.101	7.116	8	8.100	8.115
7.976	7.991	9	9.100	9.115
8.851	8.866	10	10.100	10.115
9.726	9.741	11	11.100	11.115
10.601	10.616	12	12.100	12.115
11.476	11.491	13	13.100	13.115
12.351	12.366	14	14.100	14.115
13.226	13.241	15	15.100	15.115
→ C120 → C141			C121 C160	← ←
compatible lens caps shown above.				

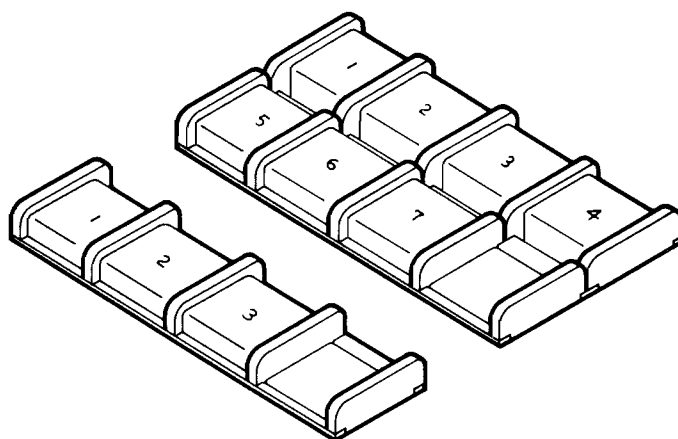
dual row



the hidden "L" electrical master release

When an "L" action electrical master release gangswitch is manufactured, the master release solenoid occupies *one* station location. A cover plate is installed at the solenoid station. So, if 10 switch stations are required, order the 11 station frame to allow for the solenoid.

A 'manual operate' capability may be included on "L" action by adding the modification "F8." This mod replaces the cover plate with a lens cap to match the others in the group and modifies the solenoid plunger to accept the lens caps.



standard types of tracking action	independent (no mechanical linkage). uses any switch except S490.					
	momentary interlocking. uses only momentary switches.					
ordering code digit 7	independent locking and interlocking. uses only alternate-remain-in switches.					
	locking and interlocking. uses only momentary switches.					
	locking and interlocking, mechanical master release. uses only momentary switches.					
	locking and interlocking, electrical master release. uses only momentary switches.					
A	B	C	D	K	L	
●						One or more stations may be depressed at any time.
	●					Each station, when depressed, returns to UP.
	●	●	●	●	●	Only one station can be depressed at a time.
		●	●	●	●	Each station locks down when depressed (except master release).
			●	●	●	Any other station, when depressed, automatically releases a previously locked-down station.
				●		A master station, when depressed, restores any station to UP (manually operated master release).
					●	A momentary energized solenoid restores any station to UP (local or remote control master release).

how to order gangswitch assemblies

When each station of the assembly uses an identical switch, the part number may be generated as shown.

Each gangswitch assembly is specified in three-parts, namely, the switch, the lens and the frame/stations/track.

ordering example

S220 22 F1 (reference page 23)

C120 OA YY (reference page 13)

G167 10 D

————— "D" tracking action
 ————— Ten stations
 ————— See front panel mounting frame chart (page 28).
 G167 identifies a single-light, single row frame.

When the switch types are mixed within the assembly or a special track action is required, a sketch should be made describing the assembly. A gangswitch worksheet, available from your Clare Group Sales Engineer, simplifies gangswitch ordering.

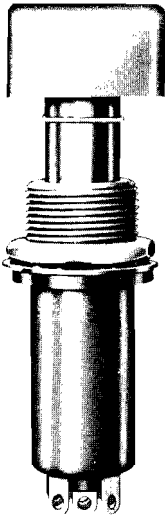
digits 1 2 3 4 5 6 7 8 9

1 <input type="checkbox"/>	All gangswitches begin with the prefix "G."
2 <input type="checkbox"/>	For Single-Light lens frame depth, use 1 For Multi-Light lens frame depth, use 2
3 <input type="checkbox"/>	For Rear Mounting single row, use 1 dual row, use 2 For Front Mounting single row, use 6 dual row, use 7
4 <input type="checkbox"/>	For 3/4 inch } station-to-station } 6 For 7/8 inch } center spacing } 7 For 1 inch } within a row } 8
5 <input type="checkbox"/>	For total number of stations, use 01 thru #.
6 <input type="checkbox"/>	
7 <input type="checkbox"/>	For tracking action, see Track Table for codes.
8 <input type="checkbox"/>	
9 <input type="checkbox"/>	Reserved for modifications.

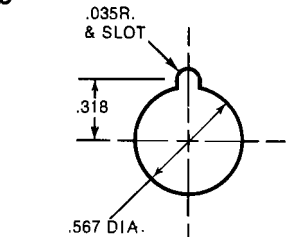
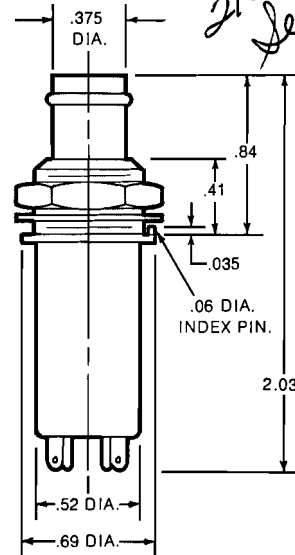
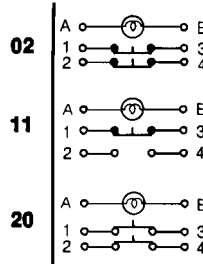
dual circuit switch

dual wiping series S180

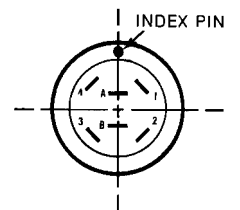
momentary, **S180** 2100
 alternate, **S181** 2200
 alternate, **S182** 2300
 (remain in)



ordering code
 (digits 5 and 6)

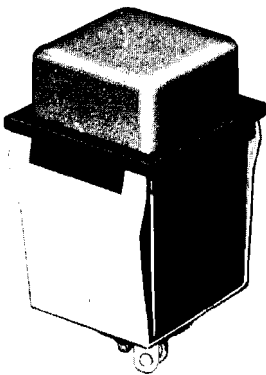


panel mounting dimensions



terminal arrangement

snap-in switch assembly



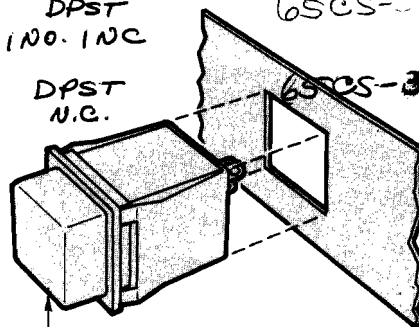
dual wiping series S490

65CS-328
 ordering code
 (digits 5 and 6)

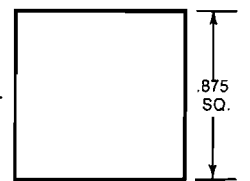
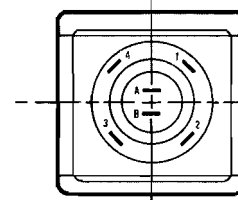
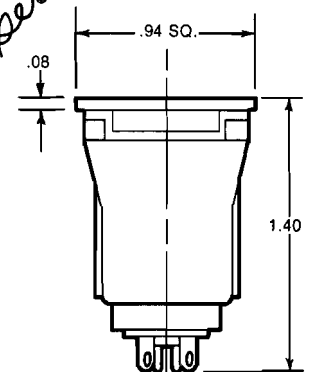
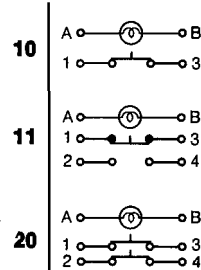
S&ST N.O.

DPST
 1 NO. 1 NC

DPST
 N.C.



3/4" square lens cap



panel mounting dimensions

Tolerance: XX $\pm .02$
 XXX $\pm .005$

Series S180 is a DPST dual-wiping action switchlight with an independent lamp circuit. Wiping action is ideal for logic level circuitry where low contact bounce (100 microsecond nominal) is required. S180 is a two pole version of S220, in a smaller case. It is a rugged switch (designed to meet MIL-S-22885) and is life/load rated for use in power circuits. (See Life/Load Curve, page 15.)

options

Series S180 is available in any one of the three arrangements of a DP switch (see schematics). The three circuit variations are available with the choice of three actions: momentary, alternate and alternate (remain in). A sub-panel mount switch, S180 can be mounted in Single and Multi-Lite interlocked gangswitch frames (pages 28 thru 33).

standard modifications

To meet most custom switch design requirements, Clare-Pendar offers many modifications to Series S180. Each variation from the standard series is coded by a two-digit suffix. The more frequently used modifications are explained in detail on pages 22-23. All modifications are shown in the Modification Grid on inside back cover.

S180 specifications

electrical

CONTACT RATING (at 28 VDC or 125 VAC).....	2 amp resistive 0.5 amp inductive
CONTACT BOUNCE	100 microsecond nominal
CONTACT RESISTANCE	0.015 ohm initially 0.025 ohm after life
DIELECTRIC STRENGTH	1000 VRMS
INSULATION RESISTANCE	1000 megohm at 500 VDC
LIFE (at rated load)	100,000 cycles

mechanical

WEIGHT	15 ± 2 gm.
PLUNGER TRAVEL	0.187 ± 0.02 in.
LENS RETENTION	4 ± 1 lb.
OPERATING FORCE	24 ± 8 oz.
HARDWARE SUPPLIED	Hex nut (3/16-32) and lockwasher.

environmental—Operative after exposure to MIL-STD-202 tests.

Description	Method	Condition
*Salt spray, 48 hours at 5% solution.....	101	A
*Moisture Resistance, full 240 hour test.....	106	240 hr.
Thermal Shock, -55°C to +85°C.....	107	A
Vibration, 10 to 500 Hz at 10 G.....	204	A
Mechanical Shock, 50 G, half sine, 11 ms.....	213	A

*When D4 or D5 modification is incorporated.

Series S490 is an economical dual wiping action switchlight with an independent lamp circuit. It is 'right at home' in logic level circuits and in moderate power applications. Its convenient snap-in mounting feature and attractive bezel place it in constant demand where economy and quality are required in high-volume production applications. It is not adaptable to gangswitch assembly.

options

Series S490 is available in one SP and two DP versions with momentary action (see schematics).

NOTE: S490 accepts the C120 or C141 lens cap with a C5 modification (see page 12).

standard modifications

Gold contacts/terminals and internally switched lamp circuit (lamp ON only when depressed) are the modifications available for S490. Modifications are explained on pages 22-23, and are also listed in the Modification Grid on inside back cover.

S490 specifications

electrical

CONTACT RATING (at 28 VDC or 125 VAC).....	1 amp resistive 0.25 amp inductive
CONTACT BOUNCE	100 microsecond nominal
CONTACT RESISTANCE	0.015 ohm initially 0.025 ohm after life
DIELECTRIC STRENGTH	1000 VRMS
INSULATION RESISTANCE	1000 megohm at 500 VDC
LIFE (at rated load)	100,000 cycles

mechanical

WEIGHT	15 ± 2 gm.
PLUNGER TRAVEL	0.10 ± 0.02 in.
LENS RETENTION	4 ± 1 lb.
OPERATING FORCE	24 ± 8 oz.

environmental—Operative after exposure to MIL-STD-202 tests.

Description	Method	Condition
Thermal Shock, -55°C to +85°C.....	107	A
Vibration, 10 to 500 Hz at 10 G.....	204	A
Mechanical Shock, 50 G, half sine, 11 ms.....	213	A

5 modification grid

	A	B	C	D	E	F	G	H	J	K	
1	NOT USED	S570 only. Smaller caseneck (15/32-32). Mating lens cap requires C2 mod. Not used with F1, F2, F3.	Round style RFI screen. Not used with C3.	Epoxy seal on base. Not used with any other D mod.	(spare)	Single-light interlocked gangswitch mounting. Not used with any other F mod, D3, D5.	(spare)	No index pin on lens base insert.	N mod gangswitch frame for F4 switches.	Not to be used	1
2	NOT USED	Slotted caseneck with indexing washer.	Required mod on lens cap. Mates with any S570 B1. Not used with C3, C4, C5, E4, E7, J9.	"O" ring on plunger. Not used with any other D mod, G1, G2.	Solenoid change to a 12V coil.	Multi-light interlocked gangswitch mounting. Not used with any other F mod, D3, D5.	16 ± 8 oz operating pressure. Not used with D2 through D5.	Special side fingernail grooves. FG	Allow use of C120, C121, C5, or J9 lenses on I835 or on I837.	Castillated S840 support lid 301-136.	2
3	NOT USED	S600 only. Larger caseneck (5/8-24). Not used with F1, F2, F3.	Multi-light T1 lamp adapter. Not used with any other C mod.	Rubber boot on plunger. Not used with any other D mod, F1, F2, G2 or multi-light.	Gold plated contacts and terminals. GP	Single or multi-light interlocked gang switch mounting. Not used with any other F mod, D3, D5.	24 ± 8 operating pressure. Use with S570 only.	Lighted S840 switch or keytop.	Keytop matte finish.	Gold over nickel plate terminals & shorting bar. S180, S220, S490.	3
4	NOT USED	Adapters A123 A129/retaining clip for panels up to .187" thick. Not used on A122.	Threaded lens base insert with indexing ball. Works with mods F1, F2 on mating part. Not used with B1, C2, C3, C5, E7, J9.	"O" ring plus epoxy sealed base. Not used with any other D mod, G2.	Switched lamp circuit. Not used with C2, C5, C120, C121, J9 lenses or alternate action switches.	Round spanner nut. Not used with any other F mod.	C982 shorter keytop mounting pedestal.	Barriers on mounting adapters A122, A131, A132 & Monoform.	1 Form C sliding contacts, S410, S411 and S412 only.	Mounting hardware not supplied on standard switchlights; i.e., S180.	4
5	NOT USED	Not to be used	Short lens base insert. Mates with S490 switch (no index pin).	Rubber boot on plunger plus epoxy sealed base. Not used with any other D mod, F1, F2, G2 or multi-light.	S220 only. Make before break contacts. CA	Nylon hex nut for stud mounting of S830.	Underwriters' Laboratory version of S180 or S490. UL	Assemble gangframes with 263 adapters (4 lite circuitry) G218, G216, G178, G267, G268.	(spare)	S840 blocking ring for castillated cover (309087).	5
6	NOT USED	S830 adapter accepts octagon base keytop (.448" across flats)	Single light T1 lamp adapter (671209-B2). Not used with C1, C3, or any multi-light.	(spare)	Amp 110 faston terminals.	S830 without mounting stud.	Satin chrome barriers on gangswitch.	End barriers for G167, G168, G177, G178, G267, G268.	Bezel on switch case to fit K0-keytop (S840).	PCB terminal on S180 with blue dap base, term. milled flush to base. Not used with C9.	6
7	NOT USED	S830 adapter accepts rectangular base keytop (.448" x .70").	(spare)	C982 keytop .020 deep dish contour.	Switched lamp circuit on C120 or C121 lens.	(spare)	Black barriers, black frames on gangswitch.	Jewelled keytop, lighted C982 only.	Lighted top-loaded S820.	Fingernail slot requirement for "lens cap only" orders. Slot per spec B-104.	7
8	NOT USED	S830 adapter accepts "spade type" slotted base keytop (.052" x .192").	(spare)	Keytop homing dimple(s)	S820 longer terminal length (.040"). Accepts Amp 'termipoint' connector.	"L" action only. Allows manual operation of remote release. Solenoid cover plate is replaced with lens cap.	No fingernail grooves in lens.	S820 with diode.	Required lens mod to mate with S190.	U.L. marking required on U.L. approved devices.	8
9	NOT USED	S830 adapter accepts all C-P cross (+) type slotted keytops.	Printed circuit board terminals on S180 or S220 only. Not used with K6. (Base-Ryton)	Modify keytops to fit standard switches.	11" angle plunger on S820, S830, S840, S860 or S830 11" angle adapter.	A477 only. Deletes flex lead for use with C175 or C275 lens cap.	Fingernail grooves on all four sides of lens.	.200" cross plunger.	Short lens base insert (same as C5 but has index pin).	Internally threaded plunger and/or threaded lens insert—standard switchlights (no indexing).	9
	A	B	C	D	E	F	G	H	J	K	

* D4 or D5 mod increases operating force by 8 oz.

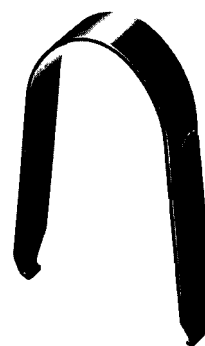
accessories

spanner wrench



For applications with F1 through F4 modifications, a spanner wrench is recommended. Order tool P/N T-101.

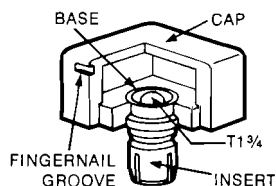
relamping tool



For easier lens removal and relamping, here is a convenient aid — lens tongs P/N T-200.

single-light

Single-Light lens caps are available for all switchlights and indicators. "Single-Light" means that each lens cap accommodates one T1-3/4 size lamp. The lamp is quickly replaced from the front of the panel. Fingernail grooves are included on each cap, around the circumference of round types and on opposing sides of four-sided types. All Single-Lights are 0.44 inch high. This allows any combination of shapes and sizes to provide a uniform, attractive display system. Numerous standard display modes are available as listed below with each style. Special types are available, or may be developed to meet unusual requirements. How to order: See page 13.



surface legend style

Surface legend lens caps are available in square, round or rectangular designs. The caps feature reliable three piece molded construction. The specified legend engraving (see page 13) is filled on the exterior surface of the lens cap. Select from a wide variety of shapes and colors, and four display modes: A, B, C or D (see pages 8 and 9).

square

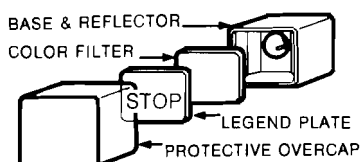
size	<i>L161</i> L61 .50"	<i>L162</i> L62 .63"	<i>L163</i> L63 .75"	<i>L164</i> L64 1.0"
cutout	.52	.65	.77	1.02
part number	C156	C148	C141	C143

round

size	<i>L121</i> .50"	<i>L122</i> .63"	<i>L123</i> .75"	1.0"
cutout	.52	.65	.77	1.02
part number	C136	C139	C131	C133

rectangular

size	<i>L169</i> L69 .50"x.75"	<i>L165</i> L65 .75"x.88"	<i>L167</i> L67 .75"x1.52"
cutout	.52x.77	.77x.90	.77x1.54
part number	C171	C160	C178



clear overcap style (Changeable Legend)

This technique provides flexibility of both legend and appearance. The legend may be changed by removing the clear plastic overcap and lifting out the film or engraved legend plate. An opaque base and internal reflector channel light to the lens face and provide even distribution. These

lenses are ideal for applications where the engraved message is not final or must be convertible. Select from four display modes: A, B, E and F (see pages 8 and 9).

size	.75" Square	.75"x.88" Rectangular	
cutout	.77	.77x.90	
part number	C120	C121	

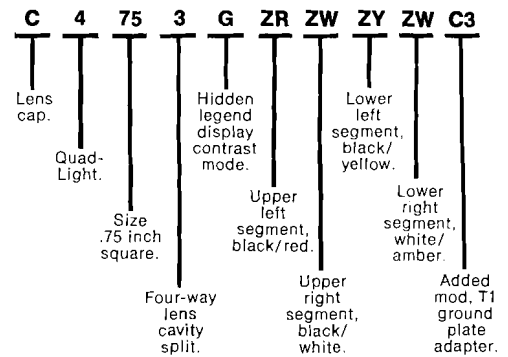
how to order lens caps

digits

1	2	3	4	5	6	7	8	—as required—
---	---	---	---	---	---	---	---	---------------

		1	<input type="checkbox"/>	All lens caps begin with the prefix "C".				
		2	<input type="checkbox"/>	Number of lamps { Single-Lights and Uni-Lights, use 1 Dual-Lights, use 2. Quad-Lights, use 4.				
		3	<input type="checkbox"/>	Identifies the configuration and dimensions.				
		4	<input type="checkbox"/>					
		5	<input type="checkbox"/>	Lens cavity split { Quad-Light, see chart, page 11. All others are full display, use ϕ .				
		6	<input type="checkbox"/>	Display contrast mode, choose one from pages 8 & 9.				
C1 or C2 full display	C4 upper left	7	<input type="checkbox"/>	Identifies the <i>unlighted</i> color of the lens background. Identifies the <i>lighted</i> color of the lens or legend. Note: This information is interrelated with display contrast mode and is contained on pages 8/9.				
		8	<input type="checkbox"/>					
	upper right	9	<input type="checkbox"/>	} Same as <table border="1"><tr><td>7</td><td><input type="checkbox"/></td></tr><tr><td>8</td><td><input type="checkbox"/></td></tr></table> but for other segments of Quad-Light. (Digits 9 thru 14 are not used on C1 or C2 types.)	7	<input type="checkbox"/>	8	<input type="checkbox"/>
		7	<input type="checkbox"/>					
	8	<input type="checkbox"/>						
	10	<input type="checkbox"/>						
	lower left	11	<input type="checkbox"/>					
		12	<input type="checkbox"/>					
	lower right	13	<input type="checkbox"/>					
		14	<input type="checkbox"/>					
		<input type="checkbox"/>	<input type="checkbox"/>	Added modes, use as many digits as required. See page 12.				

example:



engrave as follows:

- Upper left **UP**
Upper right **DN**
Lower left **+**
Lower right **-**
- Condensed block .130 high.
- Legend orientation method J.

legend information

Precision engraving is provided to order. The following engraving table shows the maximum number of characters, per single-centered line, that may be engraved on a lens cap for a given stroke/height. Popular, eye appealing character sizes are shown in the shaded areas. (Double lines may be arranged upon

request.) To order, after selecting your lens cap:

- Print or type legend message (observe quantity limits).
- State the height and block style desired.
- State the legend orientation method desired.

engraving table

	stroke	regular block												condensed block							
		.073	.093	.120	.125	.130	.160	.180	.187	.203	.203	.250	.250	.100	.125	.130	.160	.180	.187	.203	.250
round	.50	6	4	4	4	3	3	2	2	2	2	1	1	4	4	4	3	3	3	2	2
	.63	7	5	4	4	4	3	3	2	2	2	1	1	6	6	6	4	3	3	3	2
	.75	10	6	5	5	5	4	3	3	3	3	3	3	7	7	7	5	5	4	4	4
	1.00	13	9	7	7	6	5	4	4	4	4	3	3	11	11	10	8	6	6	6	4
square or rectangular	.50	6	4	3	3	3	2	2	2	2	2	1	1	5	5	4	4	3	3	3	2
	.63	8	6	5	5	4	4	3	3	3	3	2	2	6	6	6	5	4	4	4	3
	.75	9	7	5	5	5	4	3	3	3	3	2	2	8	8	7	6	4	4	4	3
	.88	11	8	6	6	6	5	5	4	3	3	3	3	9	9	8	7	6	5	5	4
multi-light	1.00	13	9	8	8	7	6	5	5	4	3	3	3	10	10	10	9	8	7	6	4
	1.52	21	14	12	12	11	9	8	8	7	5	5	5	16	16	15	13	11	10	10	8
	.75	8	6	5	5	5	4	3	3	3	3	2	2	6	6	6	6	4	4	4	3
quad-light quarter segments	.88	9	7	6	6	6	5	5	4	3	3	3	3	8	8	8	7	6	5	5	4
	.75	(Available on Special Order)												2	2	2	2	2	1	1	1
	.88													3	3	3	2	2	1	1	1

legend orientation

Legends are oriented by means of a pin on the lens base insert. The pin mates with a notch on the switch plunger; the plunger notch is in-line with the switch case mounting pin.

NOTE: When switches are furnished with mounting frames, panels or adapters, the index pin location is selected for manufacturer's convenience unless otherwise specified.

