

# Manual Switches

## Electronic Control Pushbutton

AML22 Series

### LED DISPLAY



Buttons with LED “window” ordered separately.  
LEDs are not replaceable.

### FEATURES

- Identical to AML21 switches, except furnished with high efficiency LED display.
- Rectangular LED's are flush with button surface, providing wide angle indication.
- Optional diode protection for LED's.
- 5 thru 24 VDC LED devices have an internal resistor to maintain current at nominal 20 mA.
- UL recognized, CSA certified.
- LED circuit independent of switch circuit.

|                     |              |
|---------------------|--------------|
| Electrical Data     | page 19      |
| Buttons             | pages 42, 43 |
| Lamps and LEDs      | page 58      |
| Accessories         | pages 56, 57 |
| Mounting Dimensions | pages 59, 62 |



\*AML22 Series: 1 pole and 2-pole only.

### AML22 ORDER GUIDE

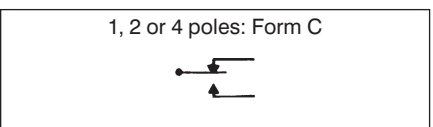
#### AML22 C

| Housing Type                                                                                                                                                            | Bezel Color       | LED Color/<br>Voltage                                                                                                                                                        | Terminal Type                                                                                                                                                                     | Circuitry Codes<br>(Each pole has double-throw) |                                                                                                              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|--------------------------------------------------------------------------------------------------------------|
| <b>Standard Bezel:</b><br>AML22C Square 1 LED<br>AML22H Square 1 High-Profile LED (For use with AML52-A buttons)<br><br><b>Full Guard Bezel:</b><br>AML22J Square 1 LED | <b>B</b><br>Black | <b>Red</b><br>B V*<br>C 5V<br>D 10V<br>E 15V<br>F 24V<br><b>Yellow</b><br>H V*<br>J 5V<br>K 10V<br>L 15V<br>M 24V<br><b>Green</b><br>R V*<br>S 5V<br>T 10V<br>W 15V<br>X 24V | <b>2</b><br>.110 × .020<br>(Solder or Quick-Connect)<br><br><b>3</b><br>.025 × .025<br>(Printed Ckt., or Push-On)<br><br><b>8</b><br>.110 × .020<br>With Diode Protection for LED | Silver Contacts                                 | Mom. Action<br>AA 1-Pole<br>AC 2-Pole<br>CC 4-Pole<br><br>Alt. Action<br>AB 1-Pole<br>AD 2-Pole<br>CD 4-Pole |
|                                                                                                                                                                         |                   |                                                                                                                                                                              |                                                                                                                                                                                   | Gold Contacts                                   | Mom. Action<br>BA 1-Pole<br>BC 2-Pole<br>DC 4-Pole<br><br>Alt. Action<br>BB 1-Pole<br>BD 2-Pole<br>DD 4-Pole |
|                                                                                                                                                                         |                   |                                                                                                                                                                              |                                                                                                                                                                                   | Gold-Plated Silver Contacts                     | Mom. Action<br>EA 1-Pole<br>EC 2-Pole<br><br>Alt. Action<br>EB 1-Pole<br>ED 2-Pole                           |

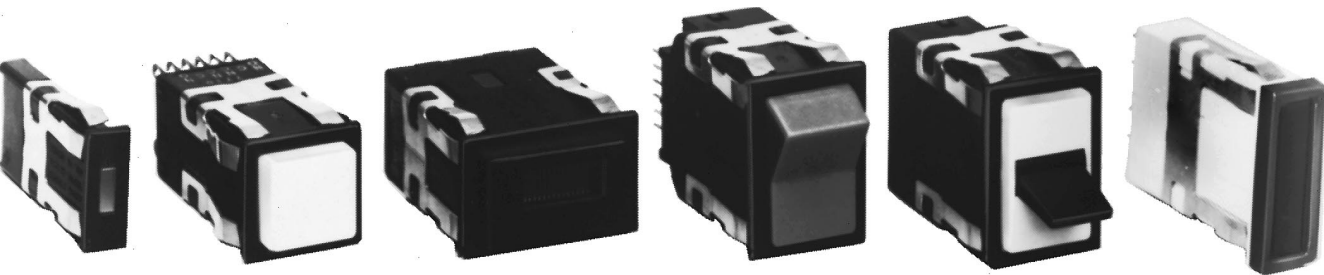
\* See LED information for devices without current limiting resistor, page 58.

Example: **AML22CBB2AA**  
Square pushbutton switch housing with one LED, black bezel; red LED (without resistor); .110 × .020 termination; momentary action, 1-pole, double-throw; silver contacts.

### CONTACT ARRANGEMENT



Manuals



IN FRONT OF THE PANEL

**Coordinated, attractive appearance.** AML features innovations designed by industrial designers to achieve the best balance of human factors and aesthetic appearance. Operator height, bezel size, and the compatibility of square and rectangular shapes blend with other components to harmonize your panel. There's no visual clutter to distract from man/machine communication.

This comprehensive line of lighted and unlighted manual controls features:

- Pushbuttons for high and intermediate frequency functions;
- Rocker and paddle switches, with 2 or 3 positions, for less frequent control functions;
- Plus lighted indicators and annunciators which complement AML's universal appeal.

Various controls can be matched with their functions to accommodate the most natural and efficient habit pattern reflex. Keylock operated switches can be used to assure "authorized personnel only" access.

**Display flexibility.** AML offers a choice of five legend sizes, four button heights, full or split section display, and illumination by incandescent lamps, LED's or neons. Colors are bright and uniform, providing a strong definition and good visibility. (Non-illuminated devices have the same attractive colors.)

Color display options include:

- Transmitted color — color can be distinguished whether lamp is On or Off.
- Dead front — display appears black, until illumination causes legend and color to appear.
- Projected color — white display is diffused with color when illuminated.

BEHIND THE PANEL

AML's simple, cost effective design provides many behind-panel benefits for the designer and installer/user.

**Simple to install.** They snap in from the panel front individually or in vertical or horizontal strips; or in subpanel mounted strips and matrices that can be pre-assembled and pre-wired to assure accurate alignment and efficient panel building.

**Electrical flexibility.** Solid state switches with Hall effect integrated circuits interface directly with microprocessors and other logic level devices. These IC's were first applied in MICRO SWITCH solid state keyboards. Today, many MICRO SWITCH products incorporate the Hall effect technology to meet a wide range of position sensing and manual control needs.

Electronic control switches with gold or silver contacts, and 1, 2, or 4 poles, will handle up to 3 amps. Including an encoded version which generates different binary coded outputs merely by changing cam-keyed buttons.

Power duty switches meet line disconnect application needs with 10-amp push-buttons and 15-amp paddle and rocker switches.

**Easy to wire.** All AML devices present single level termination. This means faster, easier, neater, and more economical wiring. And there is a choice of solder, quick-connect, push-on, and printed circuit termination.



MATING RECEPTACLES

The .110 x .020 quick-connect/solder terminal (types 2 and 8) is designed for use with receptacles that comply with the UL standard for insertion and withdrawal forces. Maximum insertion force is 12 lbs. max., withdrawal force is 14 lbs. These receptacles are supplied by: AMP Inc., Berg, Augat, Hollingsworth, MALCO, Zierick, and others. Refer to Thomas Register or the Yellow Pages for the location of your local supplier.

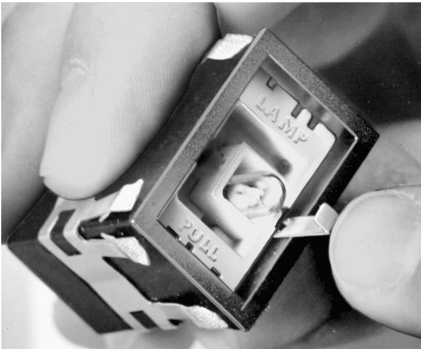
Manuals

FEATURES

- Complete selection of pushbutton, rocker and paddle (toggle type) switches accommodates different functions and promotes operator efficiency.
- Solid state, electronic, and power duty control.
- Full or split screen incandescent display switches and indicators provide vivid transmitted color, projected color (for neutral display when unlit), and dead front (hidden color).
- Wide-angle visibility LED and line voltage neon display switches and indicators.
- Annunciators back-lighted by LED's enable high density message display.
- Keylock switches available for controlled access applications.
- All AML terminations at the same shallow depth (1.7 in. /43,1 mm) for convenient wiring or PC board termination.
- Snap-in surface mount or sub-panel (hidden bezel) mount with mounting hardware.
- Pad printed legends with a clear polyurethane overcoat available in a choice of five standard sizes.
- Metric design for worldwide acceptance.
- UL recognized, CSA certification.
- Selected listings are certified by VDE and CE. (For compliance status, contact the 800 number.)

MICRO SWITCH AML Advanced Manual Line combines functional flexibility with electrical versatility to provide a broad range of options to choose from.

EASY TO RELAMP



Relamping of T-1-3/4 incandescent AML91 lamps is accomplished from the front of the panel without tools. (AML92 T-1-3/4 LEDs can be added in the same manner.)

FULL GUARD BEZEL OPTION



As an alternative to standard height bezels (.06 in./1,5 mm), pushbutton switches can be furnished with full guard bezels extending .19 in./5.0 mm from the mounting surface. In the free position, standard buttons are flush with full guard bezels.

The raised bezel guards against accidental operation by someone leaning against or dropping something on a control console.

High Intensity LEDs For Full-face AML Lighted Display  
AML92 Series



- Full-face illumination for high visibility lighted colors.
- Advanced illumination technology combines high-intensity LED in standard T-1-3/4 wedge base lamp package.
- Easy plug-in installation in AML lighted switches and indicators.
- Low operating temperature permits high density, continuous operation with minimal heat build-up.

AML92 Series LEDs have a quad chip assembled in a T-1-3/4 wedge base lamp package. They provide full-face illumination when used with lighted pushbutton, rocker and paddle switches, or indicators equipped with incandescent lamp sockets. For ordering information, refer to page 58.

AML CHARACTERISTICS

|                                                                                                | AML 10 Series                      | AML 20 Series                                                                  | AML 30 Series                                                                    | AML 40 Series                      |
|------------------------------------------------------------------------------------------------|------------------------------------|--------------------------------------------------------------------------------|----------------------------------------------------------------------------------|------------------------------------|
| <b>Electrical/Mechanical Life*</b><br>Pushbuttons–Momentary                                    | 1,000,000                          | 25,000 (silver)/<br>100,000 (gold)                                             | 25,000                                                                           | N/A<br>---                         |
| Pushbuttons–Alternate                                                                          | 25,000                             | 25,000                                                                         | 25,000                                                                           | ---                                |
| Rockers                                                                                        | 25,000                             | 25,000                                                                         | 25,000                                                                           | ---                                |
| Paddles                                                                                        | 25,000                             | 25,000                                                                         | 25,000                                                                           | ---                                |
| <b>Agency Ratings</b><br>(May not apply to every<br>series division)<br>UL<br>CSA<br>VDE<br>CE | File E53576<br>File LR4442<br>None | File E12252<br>File LR4442<br>File 0630/10.78+<br>Rating 1710<br>No. 4275.5788 | File E12252<br>File LR4442<br>File 0630/10.78+ +<br>Rating 1710<br>No. 4275.5788 | File E58932<br>File LR4442<br>None |

\*95% Survival  
+ Exception: Four-Pole AML's are not included in VDE Approval  
++ Exception: Only the 2-pole AML33 and AML34 are certified by VDE

AML ELECTRICAL DATA

● AML10 Series

| Electrical Characteristics        |                                                                                                  |                                        |                                                    |                                 |                                 | Absolute Maximum Rating ④                                |                                                                                      |                       |                                          |
|-----------------------------------|--------------------------------------------------------------------------------------------------|----------------------------------------|----------------------------------------------------|---------------------------------|---------------------------------|----------------------------------------------------------|--------------------------------------------------------------------------------------|-----------------------|------------------------------------------|
| Integrated<br>Circuit<br>Function | Supply<br>Current<br>(Max.)                                                                      | Output<br>Voltage<br>(Operated)        | Output<br>Leakage<br>Current<br>max.<br>(Released) | Switching Time<br>Max.          |                                 | Supply<br>Voltage<br>(V <sub>s</sub> )                   | Voltage<br>Externally<br>Applied to<br>Output                                        | Loads<br>to<br>Output | Storage<br>Temperature                   |
|                                   |                                                                                                  |                                        |                                                    | Rise<br>10% to<br>90%           | Fall<br>90% to<br>10%           |                                                          |                                                                                      |                       |                                          |
| 5 VDC<br>Sinking ①                | 3.5 mA<br>(Released)<br>6.5mA<br>(Operated —<br>no load)                                         | + .4 Volt<br>(Sinking<br>8 mA)         | 2.0 μA                                             | 1.0μsec<br>(Sinking<br>8 mA)    | 1.0μsec<br>(Sinking<br>8 mA)    | –.5 to +7.0<br>VDC<br>0° to +65°C<br>(+32° to<br>+149°F) | –.5 Volt min.<br>+15 Volts max.<br>(Off condition)                                   | 20 mA<br>(Sinking)    | –40°C to<br>+65°C<br>(–40° to<br>+149°F) |
| 6-16 VDC<br>Sinking ②             | 6.5 mA @<br>6 VDC.<br>10.0 mA @<br>16 VDC<br>(Plus load<br>current) ③                            | + .4 Volt<br>(Sinking<br>20mA<br>max.) | 20 μA                                              | 1.5μsec<br>(Sinking<br>20 mA)   | 0.5μsec<br>(Sinking<br>20 mA)   | –1.2 to +20<br>VDC                                       | +20 VDC max. in<br>Off condition only<br>–0.5 VDC min. in<br>Off or On<br>condition. | 40 mA                 | –40°C to<br>+65°C<br>(–40° to<br>+149°F) |
| 4.5-24 VDC<br>Sinking             | 5 V<br>7.0 mA<br>(Released)<br>24 V<br>9.0 mA<br>(Released)<br>14.0 mA<br>(Operated-<br>no load) | + .4 Volt<br>(Sinking<br>10 mA)        | 10 μA                                              | 1.5 μ sec<br>(Sinking<br>10 mA) | 0.5 μ sec<br>(Sinking<br>10 mA) | –30 to +30<br>VDC                                        | –0.5 Volt min. +24<br>Volts max. (Off<br>condition)                                  | 20 mA<br>(Sinking)    | –40–C to<br>+65°C (–40°<br>to +149°F)    |

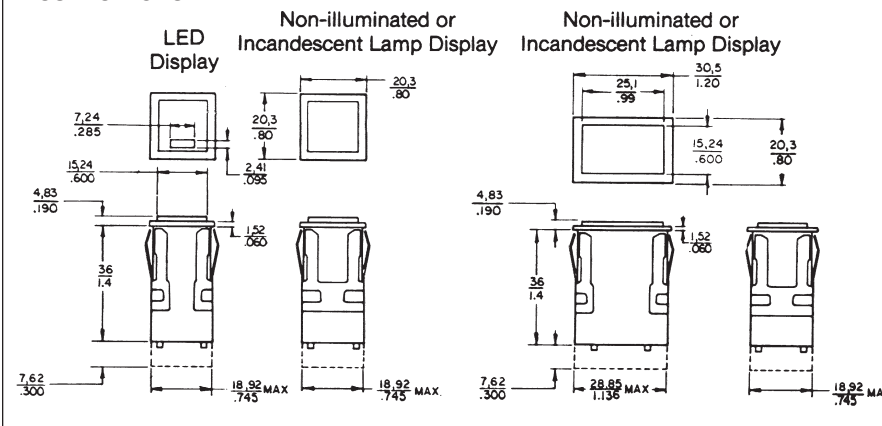
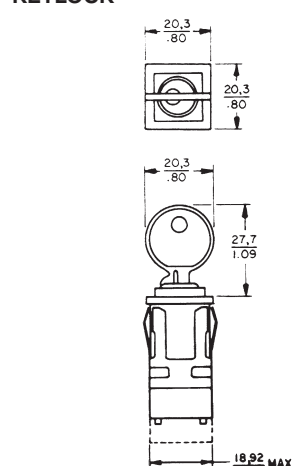
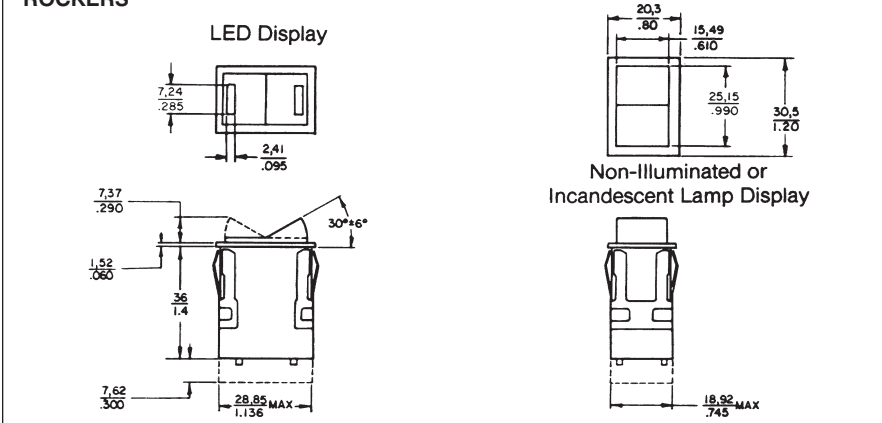
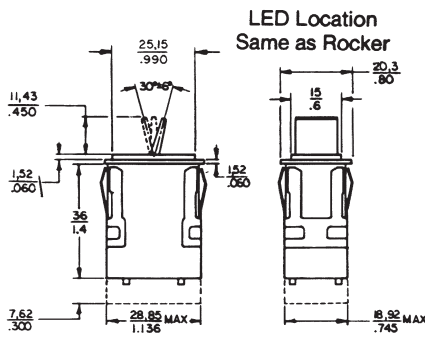
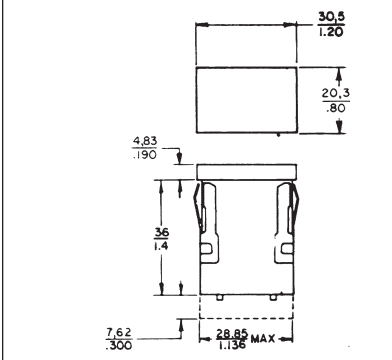
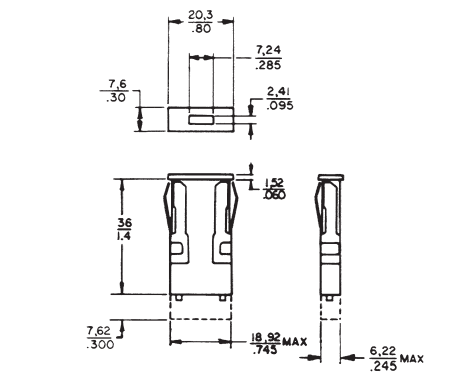
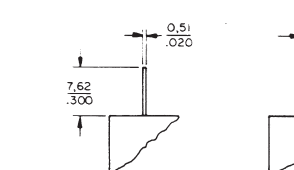
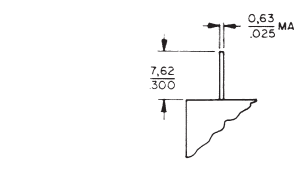
① Over temperature range of 0° to +55°C (+32° to +131°F) and supply voltage of 4.5 to 5.5 VDC.  
② Over temperature range of 0° to +55°C (+32° to +131°F) and supply voltage of 16 VDC.  
③ At 24°C. (+75°F)  
④ As with all solid state components, performance can be expected to deteriorate as rating limits are approached; however, they will not be damaged unless the limits are exceeded.

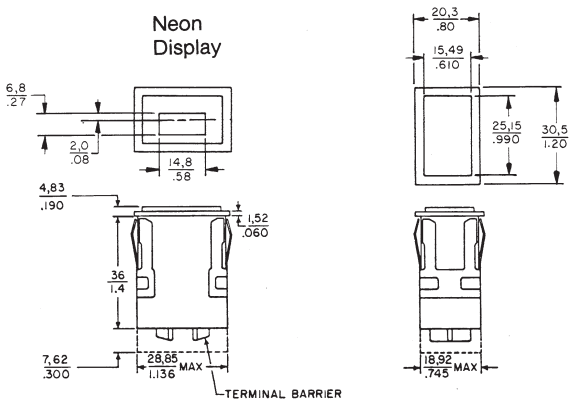
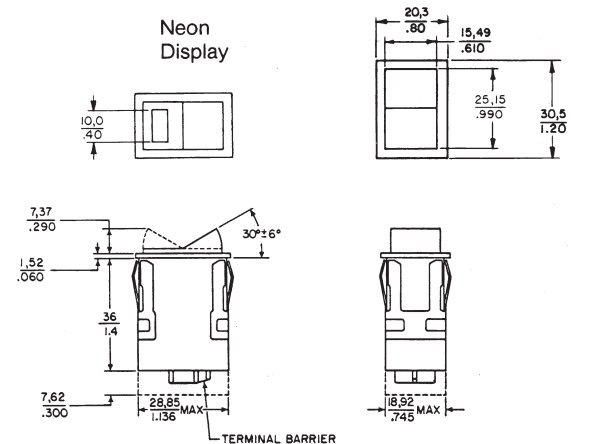
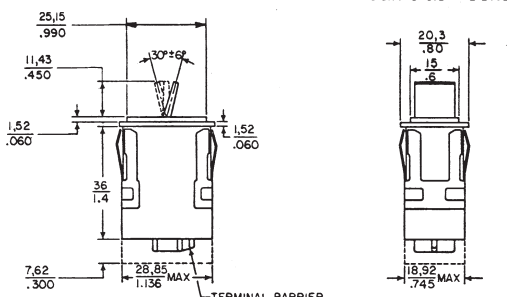
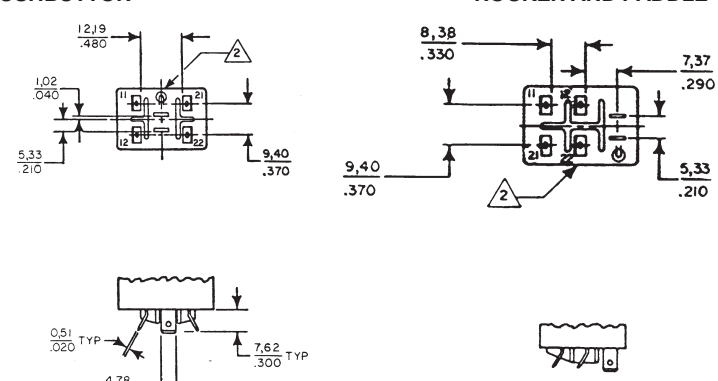
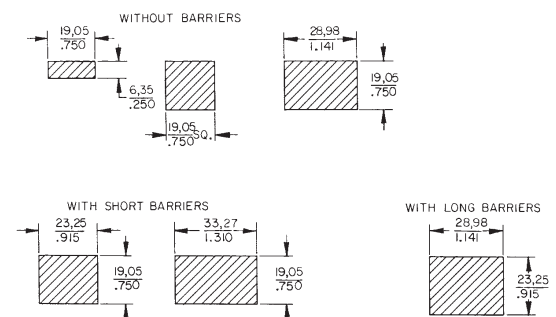
● AML20 Series

| Contacts                           | Voltage                      | Current                    | Load Type                                         |
|------------------------------------|------------------------------|----------------------------|---------------------------------------------------|
| Silver<br>or<br>Gold-plated Silver | 250 VAC<br>125 VAC<br>24 VDC | 2 Amps<br>3 Amps<br>2 Amps | 75% Power Factor<br>75% Power Factor<br>Resistive |
| Gold                               | 125 VAC/DC                   | 100 mA                     | Resistive                                         |

● AML30 Series

| Voltage | Current     |                    | Load Type        |
|---------|-------------|--------------------|------------------|
|         | Pushbuttons | Rockers or Paddles |                  |
| 125 VAC | 10 amps     | 15 amps            | 60% power factor |
| 250 VAC | 10 amps     | 15 amps            | 60% power factor |

|                                                                                                                                                                                                                                                                                                                                                                                                       |  |                                                                                                                                                                                                                                                                         |  |                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <div>AML11/12 and 21/22 SWITCHES<br/>AML41C/D and AML42C INDICATORS</div> <div>PUSHBUTTONS</div> <div><div><div>LED Display</div><div>Non-illuminated or Incandescent Lamp Display</div><div>Non-illuminated or Incandescent Lamp Display</div></div><div></div><div>For terminal locations, see page 61.</div></div> |  | <div>AML27 SWITCHES</div> <div>KEYLOCK</div> <div></div> <div>For terminal locations, see page 62.</div>                                                                              |  |                                                                                                                                                                                                                                                                                                                                                                                                              |
| <div>AML14/16 and AML24/26 SWITCHES</div> <div>ROCKERS</div> <div><div><div>LED Display</div><div>Non-Illuminated or Incandescent Lamp Display</div></div><div></div><div>For terminal locations, see page 61, 62.</div></div>                                                                                       |  | <div>AML13/15 and 23/25 SWITCHES</div> <div>PADDLES</div> <div><div><div>LED Location Same as Rocker</div><div></div></div><div>For terminal locations, see page 61, 62.</div></div> |  |                                                                                                                                                                                                                                                                                                                                                                                                              |
| <div>AML41 INDICATOR</div> <div>LENS STYLE</div> <div></div> <div>For terminal locations, see page 62.</div>                                                                                                                                                                                                        |  | <div>AML42 INDICATOR</div> <div>MINIATURE</div> <div></div>                                                                                                                          |  | <div>TERMINAL TYPES</div> <div><div><div></div><div>Solder or Quick Connect</div><div></div><div>Printed Circuit</div></div><div>Solder Hole will accept two #22 AWG Stranded Conductor (per NEMA publication DC-2 1976)</div></div> |

|                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                               |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <div><div>AML31/32 SWITCHES</div><div>PUSHBUTTON</div><div><div>Neon Display</div><div>Non-illuminated or Incandescent Lamp Display</div><div></div></div></div> | <div><div>AML34/36 SWITCHES</div><div>ROCKER</div><div><div>Neon Display</div><div>Non-illuminated or Incandescent Lamp Display</div><div></div></div></div>                                |
| <div><div>AML33/35 SWITCHES</div><div>PADDLE</div><div><div>Neon Location Same as Rocker</div><div></div></div></div>                                           | <div><div>TERMINAL LOCATIONS</div><div><div>PUSHBUTTON</div><div>ROCKER AND PADDLE</div><div></div></div></div>                                                                            |
|                                                                                                                                                                                                                                                  | <div><div>PANEL CUTOUT FOR SINGLE-STATION FRONT-OF-PANEL MOUNTING</div><div><div>WITHOUT BARRIERS</div><div>WITH SHORT BARRIERS</div><div>WITH LONG BARRIERS</div><div></div></div></div> |
| <div><div>NOTES</div><div>1 Dimensions are mm or mm/IN</div><div>2 Manufacturers logo on this side of housing</div><div>Solder Hole Will Accept One #14 AWG Stranded Conductor (Per NEMA Publication DC-2 1976)</div></div>                      | <div><div>PANEL PUNCH FOR AML SERIES</div><div>A panel punch is manufactured by Greenlee-Textron Tool Co., Rockford, IL (815-926-3011).</div></div>                                                                                                                           |

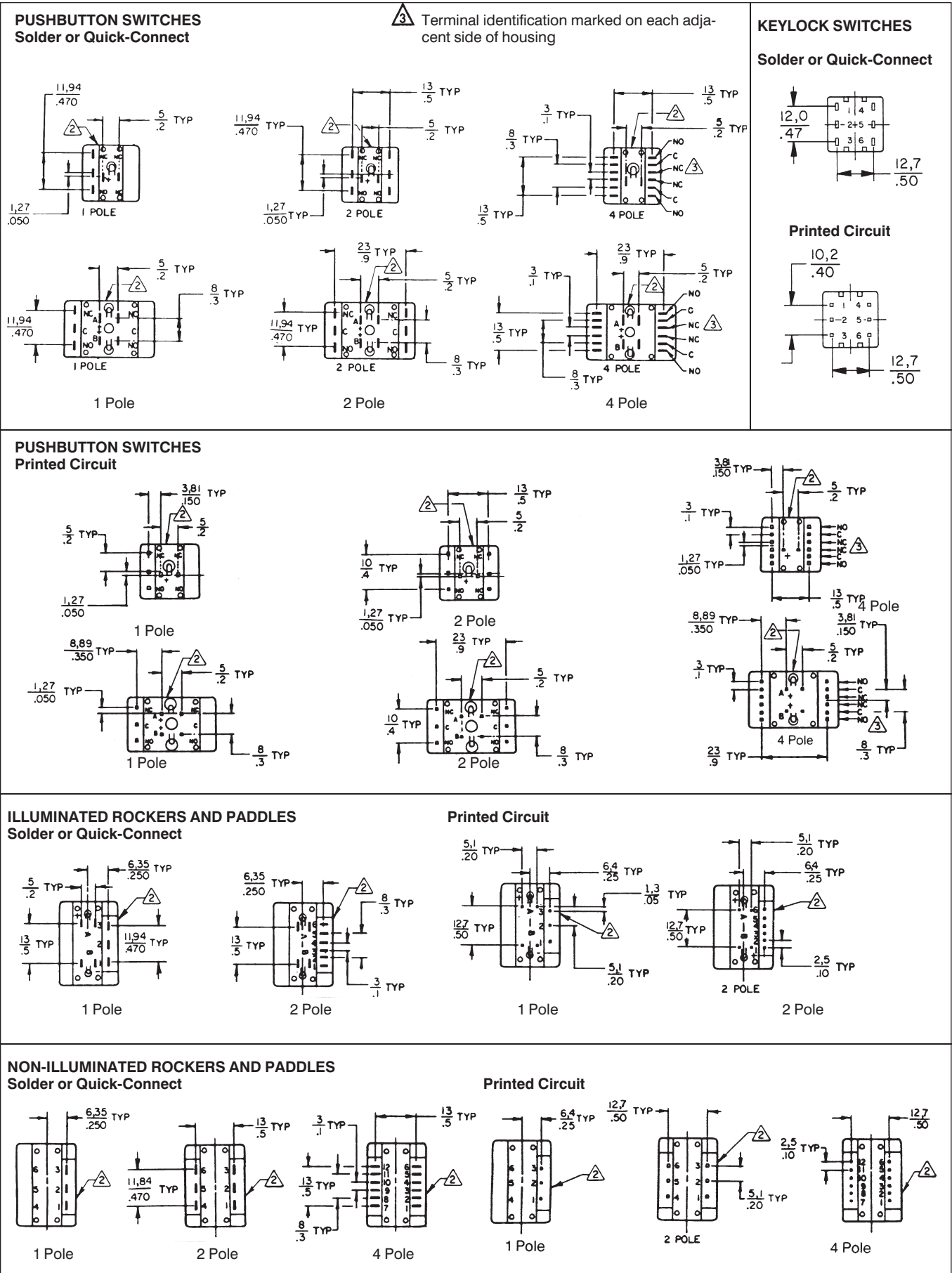


# Manual Switches

## Mounting Dimensions (For Reference Only)

AML Series

### TERMINAL LOCATIONS FOR AML20 SWITCHES



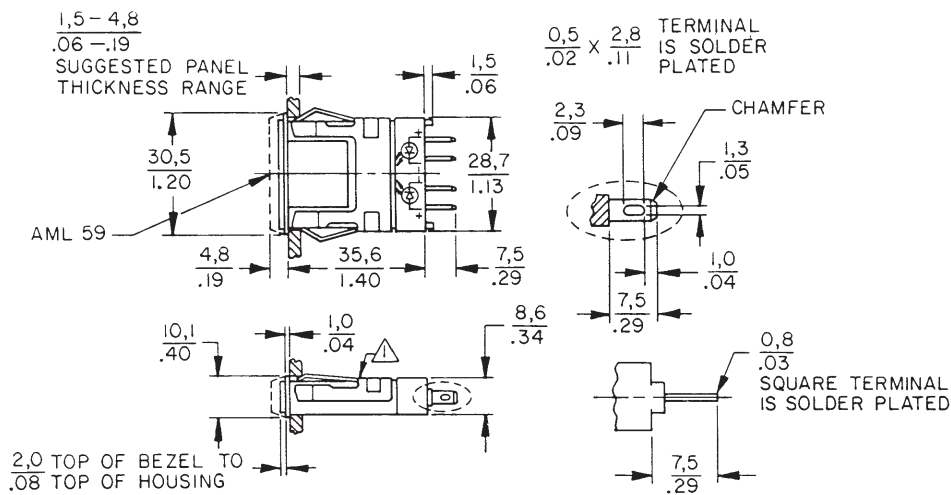
# Manual Switches

## Mounting Dimensions (For Reference Only)

AML Series

### ANNUNCIATORS

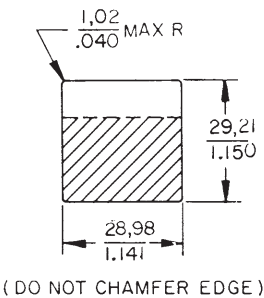
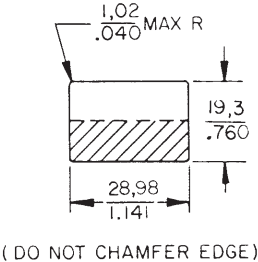
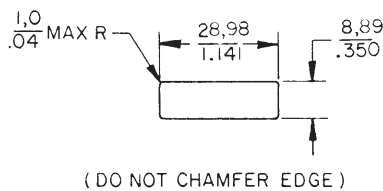
#### AML45 SERIES



PANEL CUTOUT

PANEL CUTOUT FOR MOUNTING TWO ANNUNCIATORS IN ONE CUTOUT (USING ONE 30PAI-AML)

PANEL CUTOUT FOR AML 45 ABUTTING AML SWITCH (USING ONE 30PAI-AML)



 Manufacturer's logo on this side of housing

For panel punch manufacturer, see page 60.

Manuals

Manual Switches

Mounting Dimensions (For Reference Only)

AML Series

MULTI-STATION FRONT-PANEL MOUNTING

Panel cutouts (See page 61 for panel punch manufacturer.)

| Square Switches & Indicators                                 | Rect. Switches & Indicators                                    | Annunciator                                                   |
|--------------------------------------------------------------|----------------------------------------------------------------|---------------------------------------------------------------|
| (.8) (No. of units) — .045*<br>(20,3) (No. of units) — 1,14* | (1.20) (No. of units) — .045*<br>(30,5) (No. of units) — 1,14* | (.40) (No. of units) — .045*<br>(10,1) (No. of units) — 1,14* |

For each barrier, add .053/1,35

\* Note: If barriers are used, do not subtract .045 in./1,14 mm from the panel cutout formula. (.045 in./1,14mm is the allowance for the width of the bezel.)

AML61 MULTI-STATION SUBPANEL MOUNTING

Panel cutouts for AML61

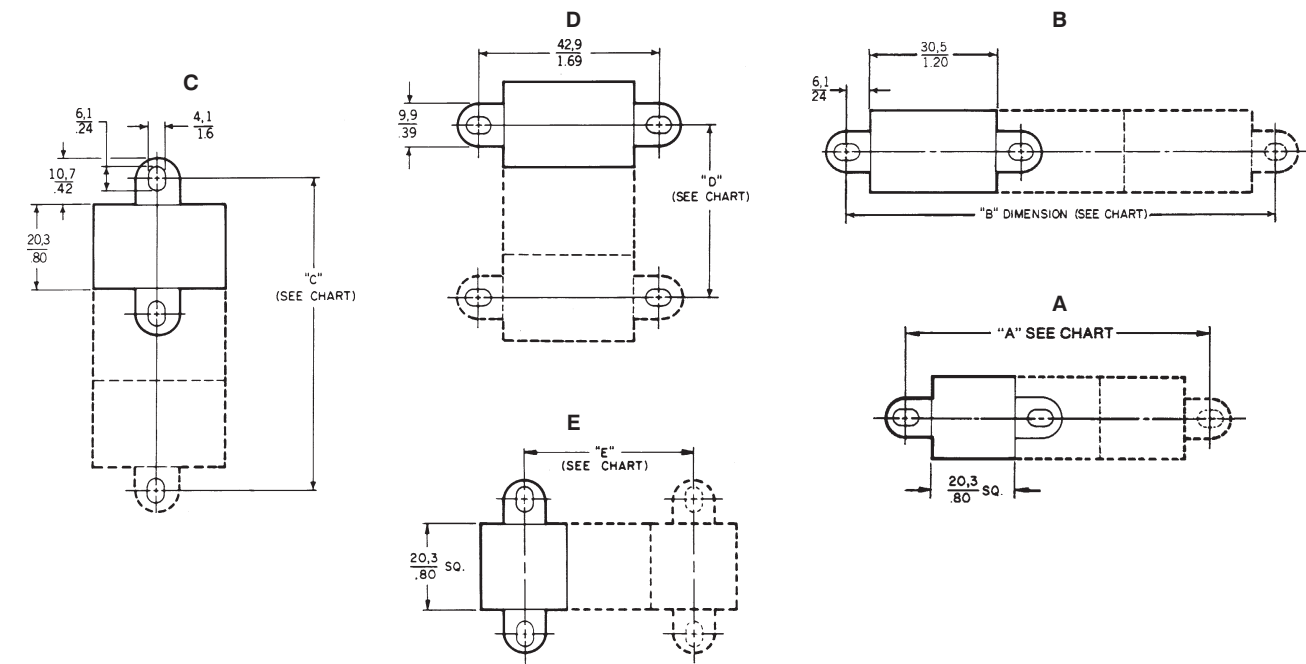
| Mounting Bracket Orientation | Width          | Length                |
|------------------------------|----------------|-----------------------|
| A*<br>in.<br>mm              | .810<br>20,57  | (.810)(No. of units)  |
| B<br>in.<br>mm               | .810<br>20,57  | (1.210)(No. of units) |
| C or D*<br>in.<br>mm         | 1.210<br>27,94 | (.810)(No. of units)  |

\* More than two cans with mounting brackets required for strips of more than 10 units.

AML61 MOUNTING CENTERS

| Mounting Bracket Orientation |           | Mounting Centers/Number of Cans        |                |                 |                 |                 |                 |                 |                  |                 |                 |                 |                  |
|------------------------------|-----------|----------------------------------------|----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|-----------------|-----------------|-----------------|------------------|
|                              |           | 1                                      | 2              | 3               | 4               | 5               | 6               | 7               | 8                | 9               | 10              | 11              | 12               |
| "A" or "C"                   | in.<br>mm | 1.285<br>32,64                         | 2.095<br>53,21 | 2.905<br>73,79  | 3.715<br>94,36  | 4.525<br>114,94 | 5.335<br>135,51 | 6.145<br>156,08 | 6.955<br>176,66  | 7.765<br>197,23 | 8.575<br>217,81 | 9.385<br>238,38 | 10.195<br>258,95 |
| "B"                          | in.<br>mm | 1.685<br>42,80                         | 2.895<br>73,53 | 4.105<br>104,27 | 5.315<br>135,00 | 6.525<br>165,74 | 7.735<br>196,48 | 8.945<br>227,20 | 10.155<br>257,94 |                 |                 |                 |                  |
| "D" or "E"                   | in.<br>mm | on C <sub>L</sub><br>on C <sub>L</sub> | .807<br>20,50  | 1.614<br>41,00  | 2.421<br>61,49  | 3.228<br>81,99  | 4.035<br>102,49 | 4.842<br>122,99 | 5.649<br>143,48  | 6.456<br>163,98 | 7.263<br>184,48 | 8.070<br>204,98 | 8.877<br>225,48  |

Tolerance = ±.015

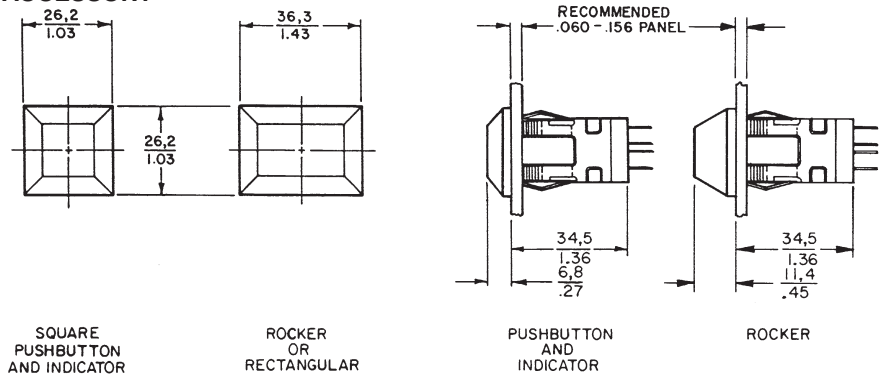


# Manual Switches

## Mounting Dimensions (For Reference Only)

AML Series

### AML75 PANEL SEAL ACCESSORY

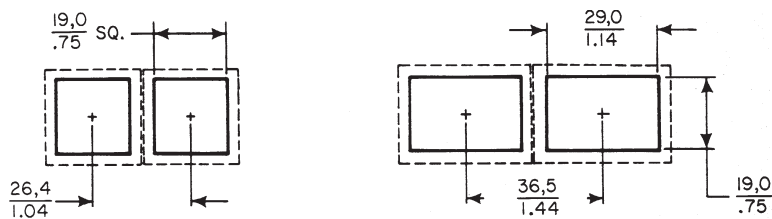


### Panel cutouts

Multiple panel sealed units should not be mounted together in a single elongated slot, since this would create an unsealed space between each unit.

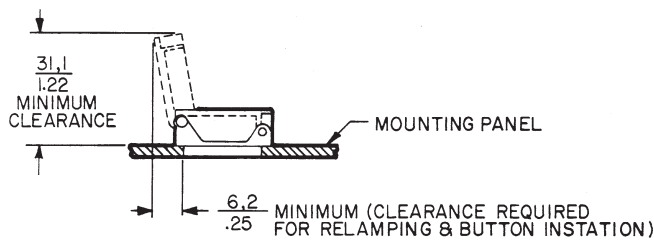
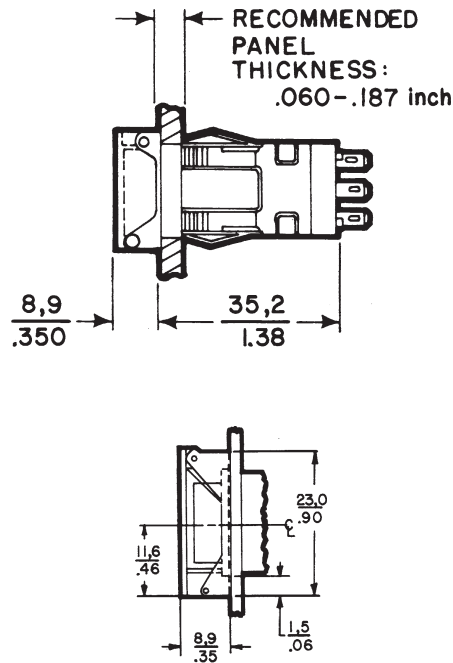
Side-by-side mounting can be achieved, per the center-to-center dimensions shown in the drawing. (Dotted lines indicate the seal bases which are abutting at front of panel.)

AML75 seals are not designed for use with the AML61 mounting system.

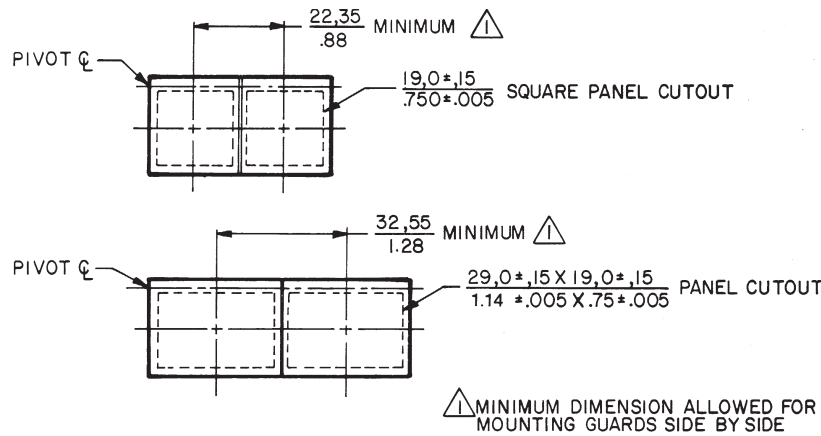


NOTE: Suggested cutout dimensions are based on an .125"/3,18 mm panel thickness. Individual preferences for inpanel fit may require measurement of assemblies before panels are cut.

### AML76 SWITCH GUARD ACCESSORY



### PANEL CUTOUTS



Manuals