Table of Contents:

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GM NAMEPLATE

INTAQ KEYPANEL
SELECTION AND SPECIFICATION GUIDE

This booklet contains drawings and specifications for standard momentary switch, short and medium travel keypanel constructions, and includes examples of a wide variety of designs in a "1x3" switch format. Included with each construction are its advantages, limitations, design options and suitability to various usage situations. There is also a checklist of information we need in order to provide a thorough price quotation.

How to use this guide

The panel construction that best meets your needs may be exactly like one detailed in this booklet, depending on your individual requirements.

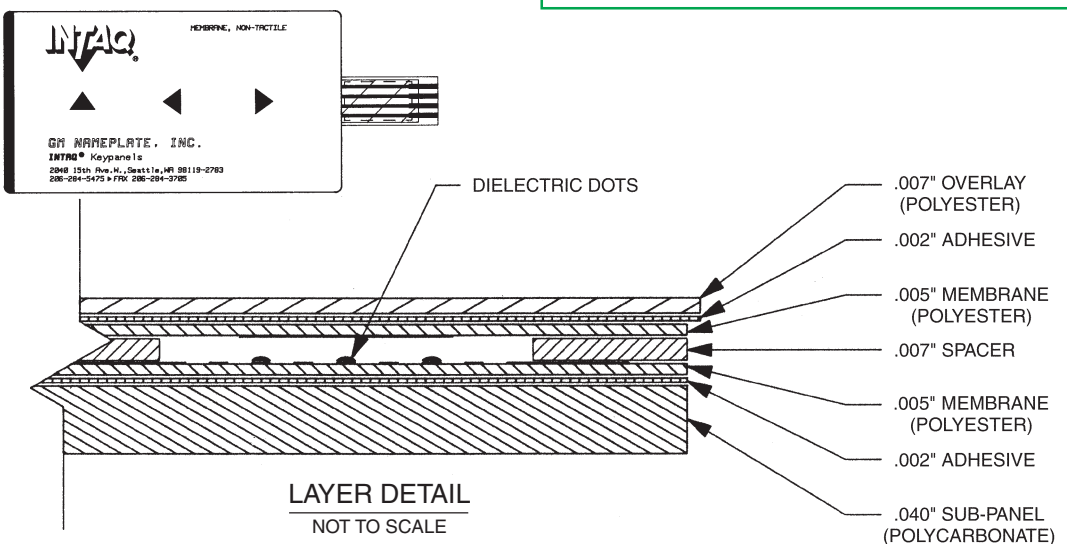
- Consider the guide a starting point. Choose a general construction with features that best fit your needs.
- Use the construction specifications for the basic design.
- Use our expertise. Consult your GM Nameplate INTAQ keypanel applications engineer to help you choose the optimum construction for your particular requirements.

Samples of many of these 1x3 switch designs are available for your evaluation. Contact your field sales representative, or contact your GM Nameplate INTAQ Keypanel applications engineer at 206-284-5475 for samples or more information.

NON-TACTILE MEMBRANE

GM part number 1x3.001:
Featuring non-tactile switch,
no emboss

A flat, non-tactile keypanel is normally the lowest cost membrane construction. It is an extremely reliable, long lasting switch option. It is sealed, easily cleaned and field replaceable.



Layer detail drawing not to scale. Thickness of layers can vary depending upon individual construction details.

ADVANTAGES:

- Low unit cost
- Low tooling cost
- Sealed
- Long life
- Low profile
- Easy to clean
- Chemical and abrasion resistant

LIMITATIONS:

- No physical or visual tactile feedback

OPTIONS:

- Embossed overlay (border emboss is recommended)
- ESD/EMI shielding
- Display windows
- Backlighting
- Rigid sub-panel
- PCB bottom circuit (doubles as rigid sub-panel)
- Multiple overlay versions, single switch design
- Re-legendable overlay

SPECIFICATIONS:

ELECTRICAL
Closed Circuit Resistance:
<100 Ohms
Operating Voltage: 30 VDC
Operating Current: 100mA
Switch Power: 1 Watt

MECHANICAL
Projected Life Cycle:
5 Million actuations **
Actuation Force: 5 oz.
Key Travel: .007"

TO QUOTE, WE NEED TO KNOW:

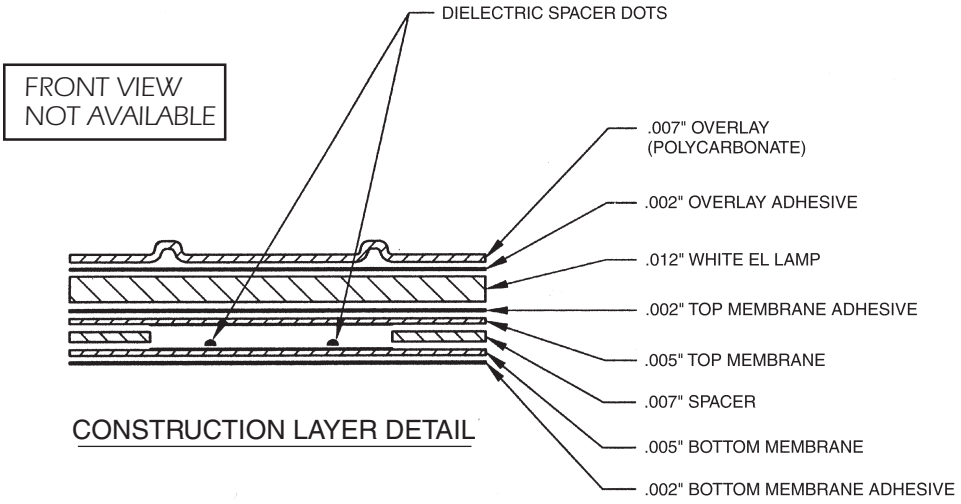
- ❑ Number of switches and encoding (XY or common bus)
- ❑ Non-standard mechanical, electrical or environmental specifications
- ❑ Panel size
- ❑ Length and location of membrane tail
- ❑ Shielding requirements
- ❑ Overlay features and other design options
- ❑ Quantities to quote
- ❑ Mounting method
- ❑ Interconnection requirements

* See Warranty Statement page 2.
** Life cycle may increase or decrease depending on final design, application and environment.

EL BACKLIT NON-TACTILE MEMBRANE

GM part number 1x3.023:
Featuring non-tactile switch, border embossed overlay, and EL backlighting

This standard non-tactile membrane switch construction is teamed with an Electro-luminescent lamp for backlighting. EL lamps can also be used independent of a switch construction; for example, to light an overlay.



Layer detail drawing not to scale. Thickness of layers can vary depending upon individual construction details.

ADVANTAGES:

- Backlit switch pad
- Low profile
- Easy to clean
- Chemical and abrasion resistant

LIMITATIONS:

- No physical or visual tactile feedback
- Light source not field replaceable
- AC power source needed

OPTIONS:

- Embossed overlay (border emboss is recommended)
- ESD/EMI shielding
- Display windows
- Rigid sub-panel
- Multiple overlay versions, single switch design
- Replaceable overlay

SPECIFICATIONS:

ELECTRICAL
Closed Circuit Resistance:
<100 Ohms
Operating Voltage: 30 VDC
Operating Current: 100mA
Switch Power: 1 Watt

MECHANICAL
Projected Life Cycle:
5 Million actuations **
Actuation Force: Variable
Key Travel: .007"

TO QUOTE, WE NEED TO KNOW:

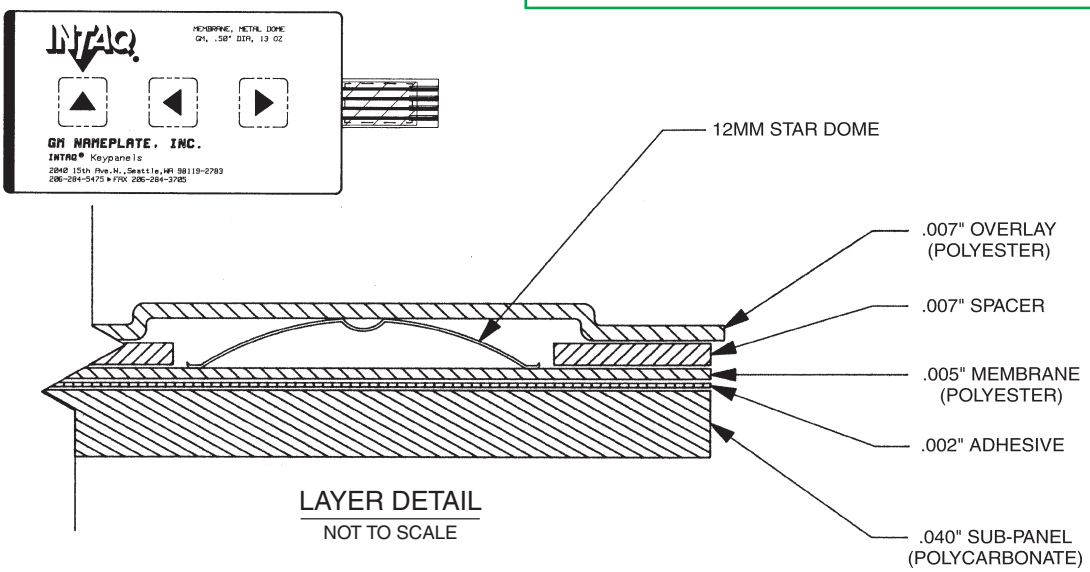
- ❑ Number of switches, and encoding (XY or common bus)
- ❑ Non-standard mechanical, electrical and environmental specifications
- ❑ Panel size
- ❑ Length and location of membrane tail
- ❑ Shielding requirements
- ❑ Backlit areas of panel
- ❑ Overlay features and other design options
- ❑ Quantities to quote
- ❑ Mounting method
- ❑ Interconnection requirements

* See Warranty Statement page 2.
** Life cycle may increase or decrease depending on final design, application and environment.

TACTILE MEMBRANE

GM part number 1x3.002:
Featuring metal star dome
and full keypad emboss

This is a very popular construction combining the advantage of tactile feedback - achieved with a snap-action metal dome - with a simple, low profile construction. Easily cleaned and field replaceable.



Layer detail drawing not to scale. Thickness of layers can vary depending upon individual construction details.

ADVANTAGES:

- Tactile response
- Sealed
- Easy to clean
- Chemical and abrasion resistant
- Low profile
- Low cost (depending on the number of switches)
- Long to moderate life (depending on type of dome used)

LIMITATIONS:

- Limited backlighting options

OPTIONS:

- Embossed overlay
- Display windows
- Backlighting
- Multiple overlay versions, single switch design
- Re-legendable overlay
- Rigid subpanel
- ESD/EMI shielding
- Rigid bottom circuit (PCB) which doubles as subpanel.

SPECIFICATIONS:

ELECTRICAL
Closed Circuit Resistance:
<100 Ohms
Operating Voltage: 30 VDC
Operating Current: 100mA
Switch Power: 1 Watt

MECHANICAL
Projected Life Cycle:
5 Million actuations **
Actuation Force: 12 oz.
Key Travel: .022"

TO QUOTE, WE NEED TO KNOW:

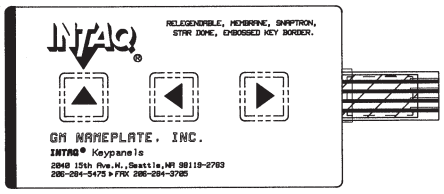
- ❑ Number of switches and encoding (XY or common bus)
- ❑ Type of dome or actuation force required (if known)
- ❑ Non-standard mechanical, electrical or environmental specifications
- ❑ Panel size
- ❑ Length and location of membrane tail
- ❑ Shielding required
- ❑ Overlay features and other design options
- ❑ Quantities to quote
- ❑ Mounting method
- ❑ Interconnection requirements

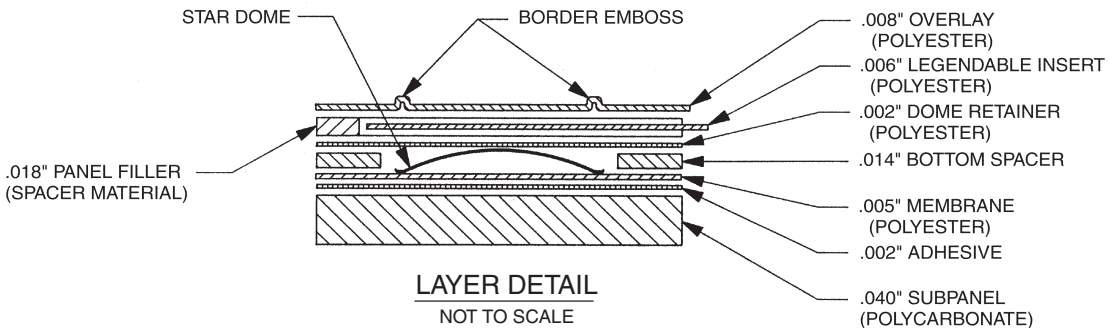
* See Warranty Statement page 2.
** Life cycle may increase or decrease depending on final design, application and environment.

TACTILE RELEGENDABLE MEMBRANE

GM part number 1x3.015:
Featuring metal star dome, relegendable insert and printed key border

The re-legendable option allows the same overlay to be used when changes in graphics are necessary. Variable graphics are printed on a separate piece, which slides into a pocket between the switch and overlay.





Layer detail drawing not to scale. Thickness of layers can vary depending upon individual construction details.

ADVANTAGES:

- Re-legendable overlay reduces total cost when graphics are variable
- Low profile
- Tactile response
- Sealed
- Easy to clean
- Chemical and abrasion resistant

LIMITATIONS:

- Life varies depending on dome used
- Some graphic design limitations

OPTIONS:

- Tactile or non-tactile feedback
- Printed or embossed key border
- EMI/ESD shielding
- Display windows
- Backlighting

SPECIFICATIONS:

ELECTRICAL
Closed Circuit Resistance: <100 Ohms
Operating Voltage: 30 VDC
Operating Current: 100mA
Switch Power: 1 Watt

MECHANICAL
Projected Life Cycle: 5 Million actuations **
Actuation Force: 13 oz.
Key Travel: .024"

TO QUOTE, WE NEED TO KNOW:

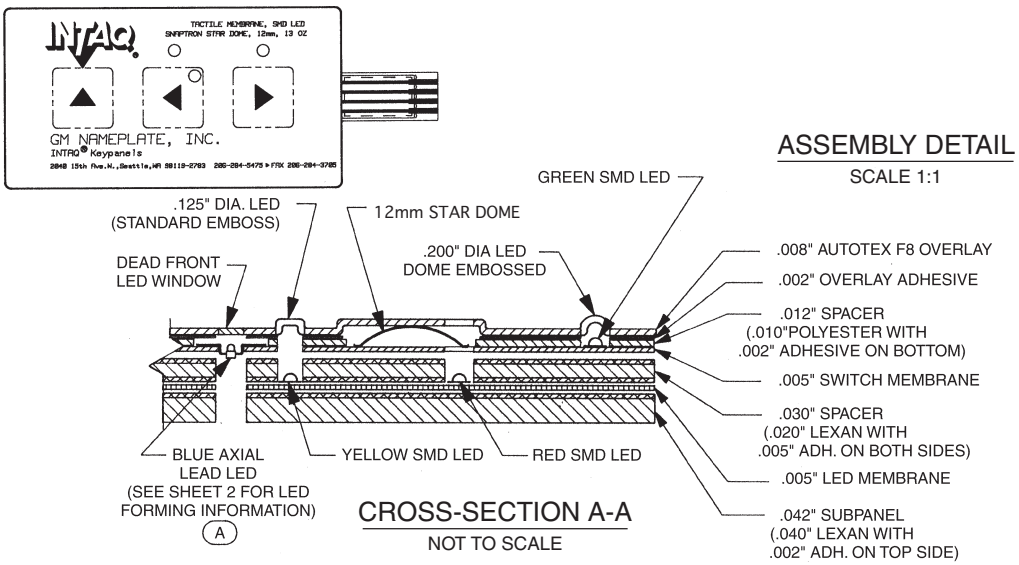
- ❑ Number of inserts
- ❑ Color specifications per insert
- ❑ Number of switches, and encoding (XY or common bus)
- ❑ Type of dome
- ❑ Non-standard mechanical, electrical and environmental specifications
- ❑ Panel size
- ❑ Length and location of membrane tail
- ❑ Shielding requirements
- ❑ Overlay features and other design options
- ❑ Quantities to quote
- ❑ Mounting method
- ❑ Interconnection requirements

* See Warranty Statement page 2.
** Life cycle may increase or decrease depending on final design, application and environment.

TACTILE MEMBRANE WITH EMBEDDED LEDS

GM part number 1x3.021:
Featuring metal star dome, axial leaded LEDs and full keypad embossing

This tactile feedback construction incorporates surface mounted LEDs, which can reduce the total number of boards required. Available with membrane or PCB interface.



Layer detail drawing not to scale. Thickness of layers can vary depending upon individual construction details.

ADVANTAGES:

- LEDs are embedded in the flex circuit, which can reduce total number of boards required and/or allows more room on the PCB
- Accomplishes simultaneous back-lighting and sealing
- Tactile response
- Sealed
- Easy to clean
- Chemical and abrasion resistant

LIMITATIONS:

- LEDs require a rigid backing (subpanel or PCB)
- Switch life varies depending on the dome used

OPTIONS:

- Multicolored LEDs
- Membrane or PCB interface
- Surface mount LEDs
- Border or full embossed keypads (full emboss recommended)
- Display windows
- Multiple overlay versions on a single board design
- Re-legendable overlays
- EMI/ESD shielding

SPECIFICATIONS:

ELECTRICAL

Closed Circuit Resistance: <100 Ohms
Operating Voltage: 30 VDC
Operating Current: 100mA
Switch Power: 1 Watt

MECHANICAL

Projected Life Cycle: 5 Million actuations **
Actuation Force: 13 oz.
Key Travel: .024"

TO QUOTE, WE NEED TO KNOW:

- ❑ Number of LEDs
- ❑ LED colors
- ❑ Power requirements
- ❑ Superbright or standard LED
- ❑ Number of switches and encoding (XY or common bus)
- ❑ Type of dome
- ❑ Non-standard mechanical, electrical and environmental specifications
- ❑ Panel size
- ❑ Length and location of membrane tail
- ❑ Shielding requirements
- ❑ Overlay features and other design options
- ❑ Quantities to quote
- ❑ Mounting method
- ❑ Interconnection requirements

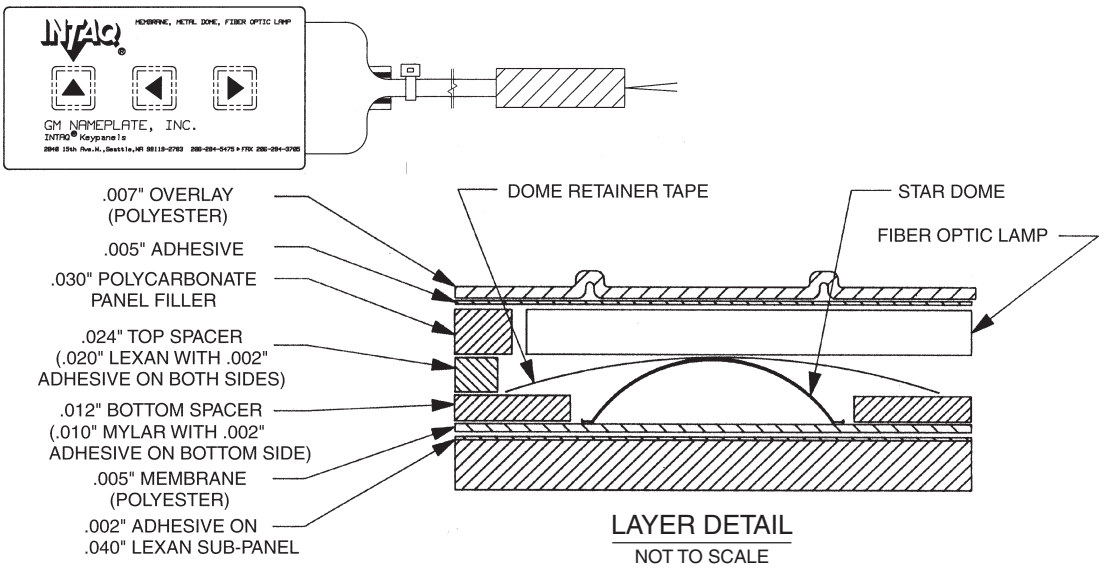
* See Warranty Statement page 2.

** Life cycle may increase or decrease depending on final design, application and environment.

BACKLIT TACTILE MEMBRANE

GM part number 1x3.009:
Featuring metal star domes, fiber optic lamp and border embossing

This standard, tactile metal dome membrane switch construction is teamed with a fiber optic lamp for back lighting. Fiber optics can also be used independent of a switch construction; for example, to light an overlay.



Layer detail drawing not to scale. Thickness of layers can vary depending upon individual construction details.

ADVANTAGES:

- Tactile response
- Sealed
- Low profile
- Chemical and abrasion resistant
- Easy to clean
- Brighter than EL lamp
- No AC power source needed
- Withstands harsh environments
- Light sources field replaceable
- Light colors easily changeable

LIMITATIONS:

- Life varies depending on dome chosen
- Long tail, bulky fiber-optic lamp
- Best for panel without interior holes

OPTIONS:

- Replaceable, changeable light sources
- Tactile or non-tactile feedback
- Membrane or PCB construction
- Embossed overlay
- Re-legendable overlay
- Multiple overlays, single switch design
- Rigid subpanel
- PCB bottom switch (doubles as rigid subpanel)
- EMI/ESD shielding

SPECIFICATIONS:

ELECTRICAL
Closed Circuit Resistance:
<100 Ohms
Operating Voltage: 30 VDC
Operating Current: 100mA
Switch Power: 1 Watt

MECHANICAL
Projected Life Cycle:
5 Million actuations **
Actuation Force: 13 oz.
Key Travel: .024"

TO QUOTE, WE NEED TO KNOW:

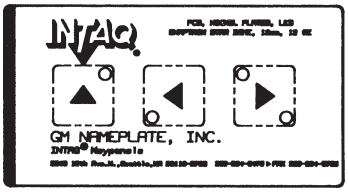
- ❑ Number of lit areas
- ❑ Maximum tail length for fiber optic lamp
- ❑ Light colors
- ❑ Light source type (incandescent or LED)
- ❑ Type of construction
- ❑ Number of switches and encoding (XY or common bus)
- ❑ Type of dome or actuation force desired
- ❑ Non-standard mechanical, electrical and environmental specifications
- ❑ Panel size
- ❑ Length and location of membrane tail
- ❑ Shielding
- ❑ Overlay features and other design options
- ❑ Quantities to quote
- ❑ Mounting method
- ❑ Interconnection requirements

* See Warranty Statement page 2.
** Life cycle may increase or decrease depending on final design, application and environment.

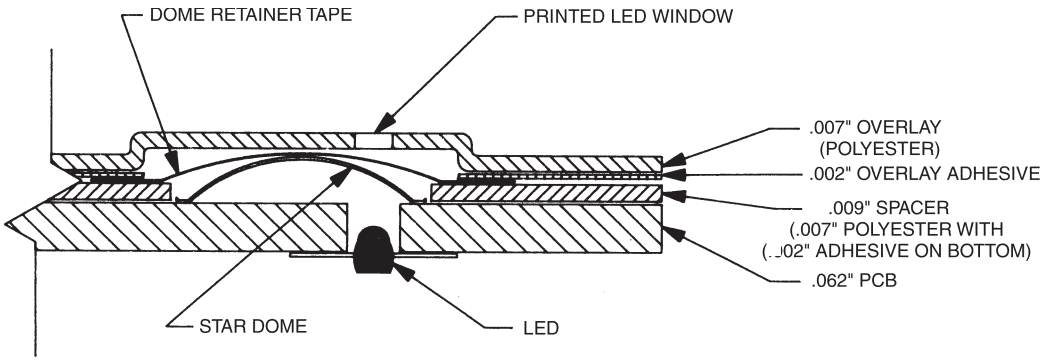
TACTILE PCB KEYPANEL

GM part number 1x3.017:
Featuring metal star dome, LEDs and full keypad emboss

In this sturdy, tactile feedback construction, LEDs are mounted in the PCB. The PCB can also be used to mount other components, and doubles as a rigid backing for the assembly.



LAYER DETAIL
NOT TO SCALE



Layer detail drawing not to scale. Thickness of layers can vary depending upon individual construction details.

ADVANTAGES:

- Field serviceable
- Sturdy construction
- Can use a wide variety of LEDs
- Can also mount other components on the same PCB
- PCB doubles as rigid back
- Higher power rating than membrane construction
- Wide variety of connector options
- Low profile
- Easy to clean
- Sealed
- Chemical and abrasion resistant
- Tactile response

LIMITATIONS:

- At higher volumes, less economical than membrane construction
- All components must be mounted on one side (back) of the PCB

OPTIONS:

- Graphic overlay or elastomer keypanel
- Tactile and non-tactile feedback
- Embossed or flat overlay
- Backlighting
- Display windows
- Mounted components
- Re-legendable overlay

SPECIFICATIONS:

ELECTRICAL
Closed Circuit Resistance:
<20 Ohms
Operating Voltage: 50 VDC
Operating Current: 100mA
Switch Power: 1 Watt
MECHANICAL
Projected Life Cycle:
5 Million actuations **
Actuation Force: 13 oz.
Key Travel: .024"

TO QUOTE, WE NEED TO KNOW:

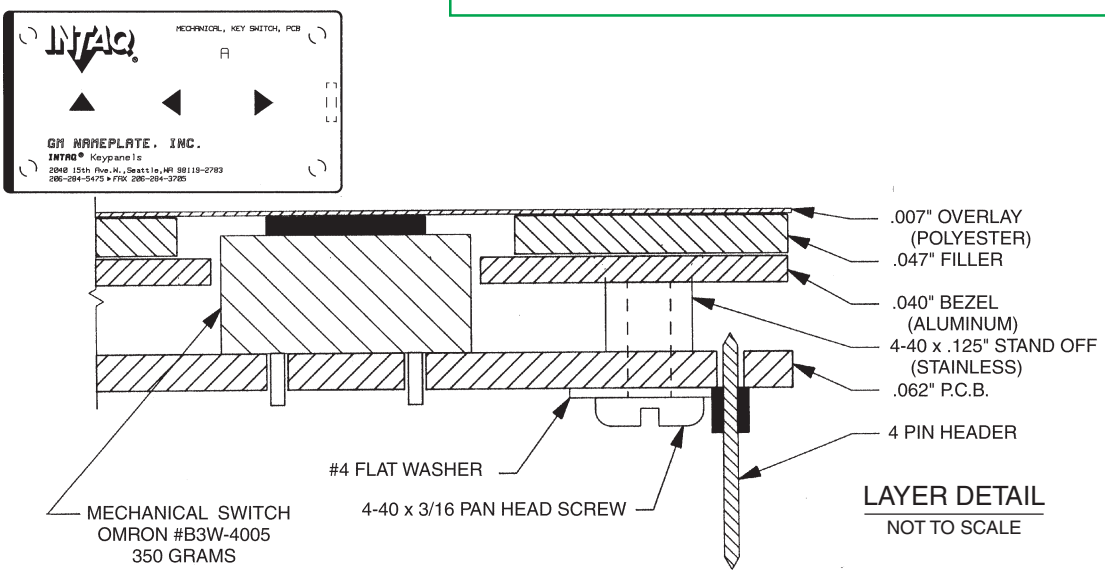
- ❑ Component part list
- ❑ Board specifications
- ❑ Type of dome or actuation force desired
- ❑ Number of switches and encoding (XY or common bus)
- ❑ Non-standard mechanical, electrical and environmental specifications
- ❑ Panel size
- ❑ Shielding requirements
- ❑ Overlay features and other design options
- ❑ Quantities to quote
- ❑ Interconnection requirements

* See Warranty Statement page 2.
** Life cycle may increase or decrease depending on final design, application and environment.

MECHANICAL SWITCH KEYPANEL

GM part number 1x3.010:
Featuring Omron 12 oz. switch mounted on a PCB

This construction simulates the look and feel of a tactile membrane switch, with great design versatility; one PCB design can be used for several overlay and switch configurations. Very economical where only a small number of switches are needed.



Layer detail drawing not to scale. Thickness of layers can vary depending upon individual construction details.

ADVANTAGES:

- Field serviceable (switches can be replaced individually)
- Easy to clean
- Chemical and abrasion resistant
- Tactile response
- Easily re-legendable
- Modular design capability (can use various overlays, on one board; different switch locations for different overlays)

LIMITATIONS:

- Higher profile than membrane or PCB switch
- Higher cost when there are many switches, since they are hand assembled
- Shorter life cycle (but individual switches are field replaceable)

OPTIONS:

- Embossed overlays
- Display windows
- EMI/ESD shielding
- Multiple overlay versions over a single switch design
- Re-legendable overlays

SPECIFICATIONS:

ELECTRICAL
Closed Circuit Resistance:
<100 Ohms
Operating Voltage: 24 VDC
Operating Current: 50mA
Switch Power: 1 Watt

MECHANICAL
Projected Life Cycle:
1 Million actuations **
Actuation Force: 12 oz.
Key Travel: .012"

TO QUOTE, WE NEED TO KNOW:

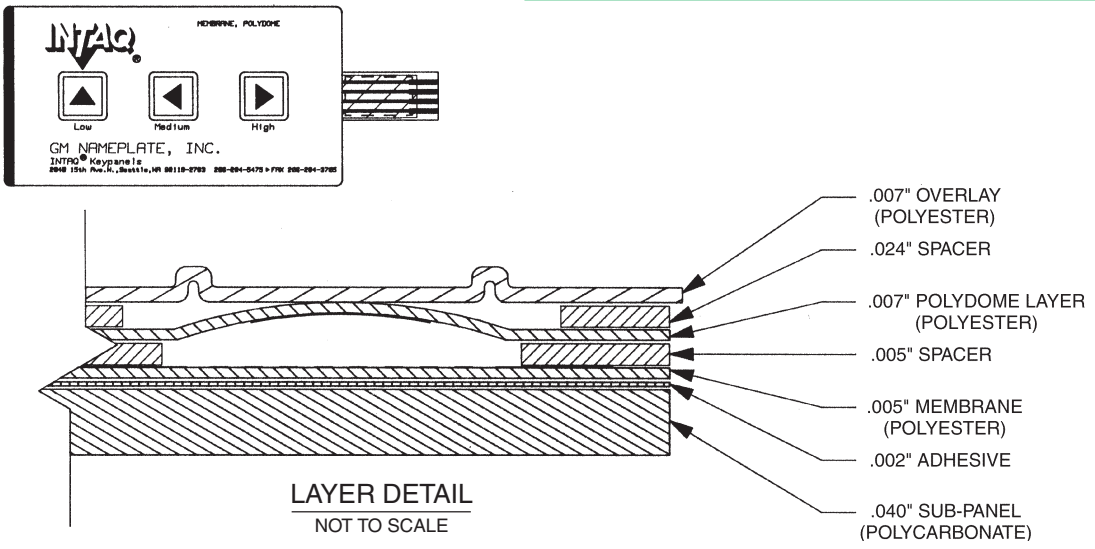
- ❑ Number of switches and encoding (XY or common bus)
- ❑ Non-standard mechanical, electrical and environmental specifications
- ❑ Panel size
- ❑ Minimum and/or maximum thickness of assembly
- ❑ Preferred switch (if known)
- ❑ Shielding requirements
- ❑ Overlay features and other design options
- ❑ Quantities to quote
- ❑ Mounting method
- ❑ Interconnection requirements

* See Warranty Statement page 2.
** Life cycle may increase or decrease depending on final design, application and environment.

TACTILE MEMBRANE

GM part number 1x3.003:
Featuring polydome tactile feedback and border embossed overlay

A flat, sealed construction that derives its tactile feedback from a layer of polyester "domes". An economical option for panels with many switches when tactile feedback is desired.



Layer detail drawing not to scale. Thickness of layers can vary depending upon individual construction details.

ADVANTAGES:

- More economical than metal domes on panels with many switches
- Easy to clean
- Chemical and abrasion resistant
- Sealed
- Low profile
- Tactile response
- Wide variety of actuation forces available
- More backlighting options available than with metal domes

LIMITATIONS:

- Shorter switch life
- Operates in narrower temperature range compared to metal dome tactile construction

OPTIONS:

- Embossed overlay
- EMI/ESD shielding
- Display windows
- Rigid sub-panel
- Rigid bottom circuit (PCB) which doubles as subpanel
- Backlighting
- Switch lighting
- Multiple overlay versions, single switch design
- Re-legendable overlays

SPECIFICATIONS:

ELECTRICAL
Closed Circuit Resistance:
<100 Ohms
Operating Voltage: 30 VDC
Operating Current: 100mA
Switch Power: 1 Watt

MECHANICAL
Projected Life Cycle:
1 Million actuations **
Actuation Force: 4, 8, 12 oz.
Key Travel: .025"

TO QUOTE, WE NEED TO KNOW:

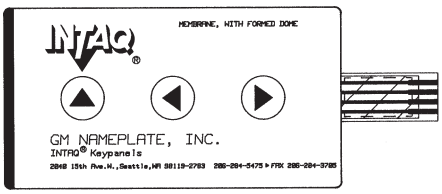
- ❑ Number of switches and encoding (XY or common bus)
- ❑ Actuation force required (if known)
- ❑ Non-standard mechanical, electrical or environmental specifications
- ❑ Panel size
- ❑ Length and location of membrane tail
- ❑ Shielding required
- ❑ Overlay features and other design options
- ❑ Quantities to quote
- ❑ Mounting method
- ❑ Interconnection requirements

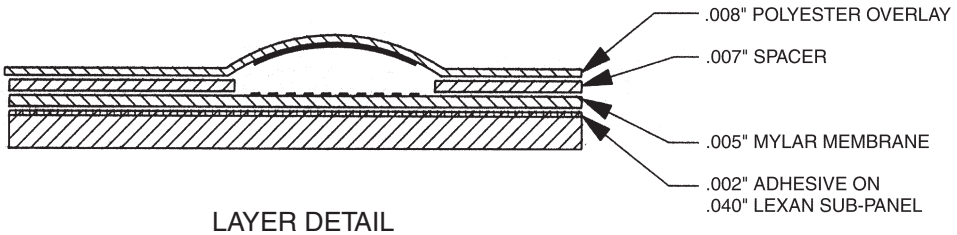
* See Warranty Statement page 2.
** Life cycle may increase or decrease depending on final design, application and environment.

TACTILE MEMBRANE

GM part number 1x3.011:
Featuring key border and dome embossed into the overlay

This is a low cost construction ideally suited to shorter life applications. Tactile feedback is achieved through domes embossed directly in the polyester overlay.





LAYER DETAIL
NOT TO SCALE

Layer detail drawing not to scale. Thickness of layers can vary depending upon individual construction details.

ADVANTAGES:

- Economical
- Very low profile
- Tactile response
- Easy to clean
- Sealed
- Chemical and abrasion resistant

LIMITATIONS:

- Limited backlighting capabilities
- Shorter switch life
- Tactile response changes with temperature and age

OPTIONS:

- Border emboss around key
- Display windows
- Rigid subpanel
- EMI/ESD shielding

SPECIFICATIONS:

ELECTRICAL
Closed Circuit Resistance: <100 Ohms
Operating Voltage: 30 VDC
Operating Current: 100mA
Switch Power: 1 Watt

MECHANICAL
Projected Life Cycle: 250,000 actuations **
Actuation Force: 8 oz.
Key Travel: .025"

TO QUOTE, WE NEED TO KNOW:

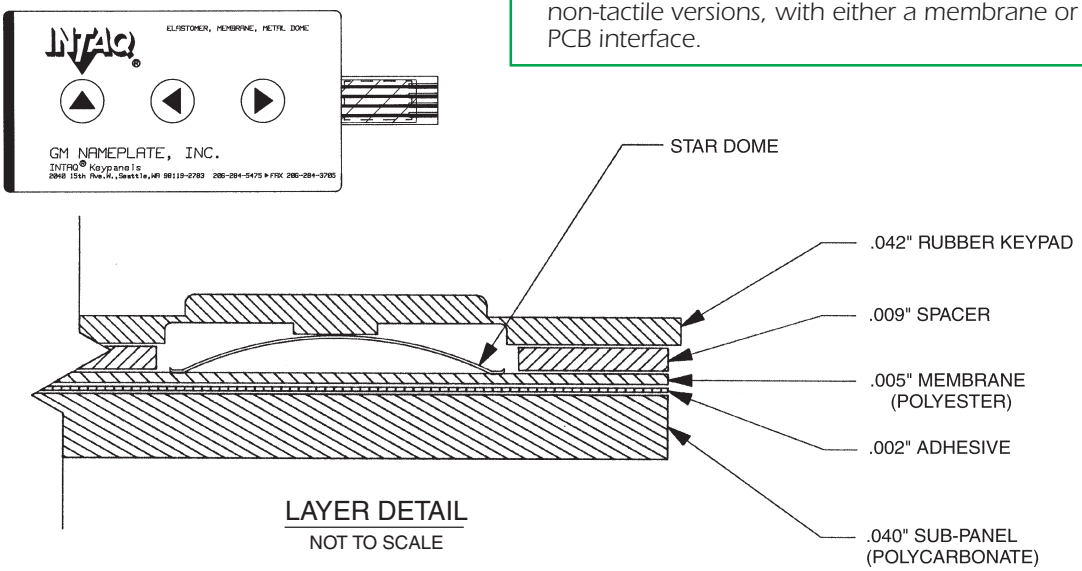
- ❑ Number of switches, and encoding (XY or common bus)
- ❑ Non-standard mechanical, electrical and environmental specifications
- ❑ Panel size
- ❑ Length and location of membrane tail
- ❑ Shielding requirements
- ❑ Overlay features and other design options
- ❑ Switch life desired
- ❑ Quantities to quote
- ❑ Mounting method
- ❑ Interconnection requirements

* See Warranty Statement page 2.
** Life cycle may increase or decrease depending on final design, application and environment.

TACTILE MEMBRANE WITH ELASTOMER OVERLAY

GM part number 1x3.012:
Featuring metal star dome

This construction affords the look and feel of a standard rubber keypad/bezel combination at a lower tooling cost. It is a completely sealed construction available in both tactile and non-tactile versions, with either a membrane or PCB interface.



Layer detail drawing not to scale. Thickness of layers can vary depending upon individual construction details.

ADVANTAGES:

- Low profile
- Positive snap
- No key wobble
- Variable actuation force within a single panel design
- Long life
- Easy to clean
- Sealed
- Snap-in assembly

LIMITATIONS:

- Some printing restrictions associated with key height and durometer specified
- Requires perimeter bezel
- Legend life (on key) is lower

OPTIONS:

- Various domes for tactile feedback desired
- Non-tactile feedback
- Rigid subpanel (recommended)
- PCB or membrane interface
- Molded or printed legends
- EMI/ESD shielding

SPECIFICATIONS:

ELECTRICAL
Closed Circuit Resistance:
<100 Ohms
Operating Voltage: 30 VDC
Operating Current: 100mA
Switch Power: 1 Watt

MECHANICAL
Projected Life Cycle:
1 Million actuations **
Actuation Force: 13 oz.
Key Travel: .024"

TO QUOTE, WE NEED TO KNOW:

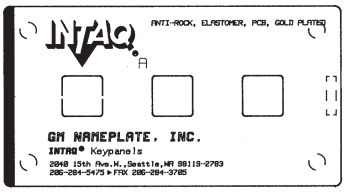
- ❑ Number of switches and encoding (XY or common bus)
- ❑ Maximum thickness allowable
- ❑ Height of key above overlay
- ❑ Non-standard mechanical, electrical and environmental specifications
- ❑ Panel size
- ❑ Number of molded colors
- ❑ Number of legend colors
- ❑ Shielding requirements
- ❑ Overlay features and other design options
- ❑ Quantities to quote
- ❑ Mounting method
- ❑ Length and location of membrane tail
- ❑ Interconnection requirements

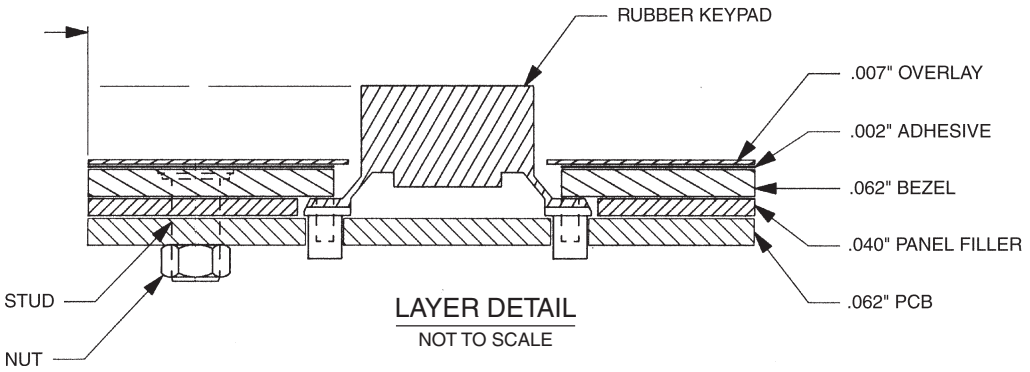
* See Warranty Statement page 2.
** Life cycle may increase or decrease depending on final design, application and environment.

ELASTOMER KEYPANEL

GM part number 1x3.008:
Featuring gold plated PCB switch

Short travel keystroke and positive tactile feel make this construction a good choice for key data entry functions. Wide variety of design options.





Layer detail drawing not to scale. Thickness of layers can vary depending upon individual construction details.

ADVANTAGES:

- Tactile response
- Simulates full travel assembly
- Sealed

LIMITATIONS:

- Larger elongated keys can wobble
- Higher profile than flat travel panel

OPTIONS:

- Backlighting
- Display windows
- Multicolor rubber
- Durometer variance
- Membrane or PCB interface
- EMI/ESD shielding
- Re-legendable overlay

SPECIFICATIONS:

ELECTRICAL
Closed Circuit Resistance:
<200 Ohms
Operating Voltage: 25 VDC
Operating Current: 100mA
Switch Power: 1 Watt

MECHANICAL
Projected Life Cycle:
1 Million actuations **
Actuation Force: 4 oz.
Key Travel: .040"

TO QUOTE, WE NEED TO KNOW:

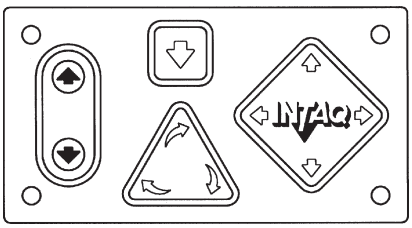
- ❑ Number of switches and encoding (XY or common bus)
- ❑ Maximum thickness allowable
- ❑ Height of key above overlay
- ❑ Number of keys
- ❑ Non-standard mechanical, electrical and environmental specifications
- ❑ Panel size
- ❑ Number of molded colors
- ❑ Number of legend colors
- ❑ Shielding requirements
- ❑ Overlay features and other design options
- ❑ Quantities to quote
- ❑ Mounting method
- ❑ Interconnection requirements

* See Warranty Statement page 2.
** Life cycle may increase or decrease depending on final design, application and environment.

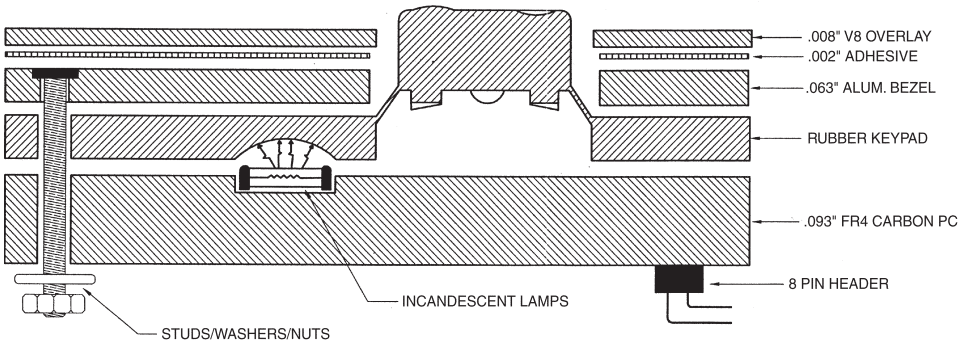
LASER ETCHED ROCKER STYLE ELASTOMER KEYPAD

GM part number 1x3.022:
Featuring laser etched backlit keys on carbon PCB.

The backlit keys may be lit using incandescent SMD bulbs or LEDs. As an alternative instead of a graphic overlay on an aluminum bezel, you may also laser etch all of the graphics on the top rubber layer for a unique look.



LAYER DETAIL
NOT TO SCALE



Layer detail drawing not to scale. Thickness of layers can vary depending upon individual construction details.

ADVANTAGES:

- Backlit keys
- True white light produced from SMO incandescent bulbs
- Wide design versatility
- Multi-function keys
- Incandescent lamps
- 1.875 VDC @ 57mA

LIMITATIONS:

- Thicker assembly

OPTIONS:

- Backlighting
- Tactile and non-tactile
- PCB or membrane circuit layer
- Display windows
- Wide range of durometer keys

SPECIFICATIONS:

ELECTRICAL
Closed Circuit Resistance:
<200 Ohms
Operating Voltage:
up to 25 VDC
Operating Current: 100mA
Switch Power: 1 Watt

MECHANICAL
Projected Life Cycle:
1 Million actuations **
Actuation Force: 150+/-35 grams
Snap Ratio: >.35
Key Travel: .040"

TO QUOTE, WE NEED TO KNOW:

- ❑ Number of switches and encoding (XY or common bus)
- ❑ Non-standard mechanical, electrical and environmental specifications
- ❑ Panel size
- ❑ Interconnection requirements
- ❑ Number of molded colors
- ❑ Height of key above overlay
- ❑ Maximum thickness allowable
- ❑ Type of backlighting
- ❑ Overlay features and other design options
- ❑ Quantities to quote
- ❑ Shielding requirements
- ❑ Number of legend colors

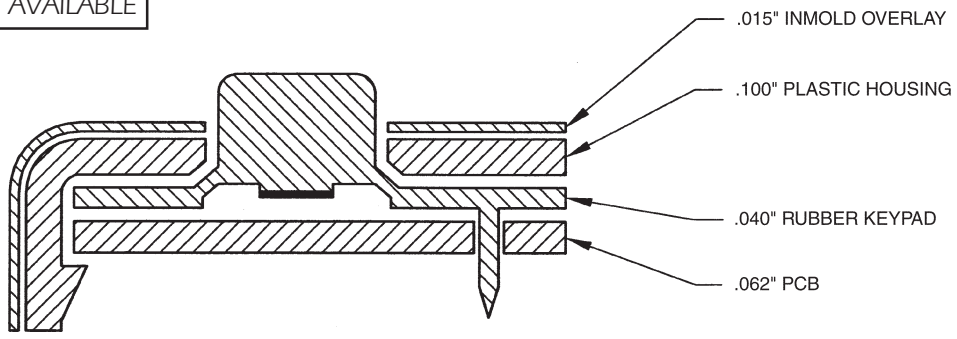
* See Warranty Statement page 2.
** Life cycle may increase or decrease depending on final design, application and environment.

TACTILE ELASTOMER KEYPAD WITH INSERT MOLD DECORATED BEZEL

GM part number 1x3.024:
Featuring tactile rubber keypad, plastic bezel with insert molded graphics and PCB

The insert molded graphics on the bezel make this a great choice for rugged environments. The elastomer keypad allows for variety in key design.

FRONT VIEW
NOT AVAILABLE



LAYER DETAIL
NOT TO SCALE

Layer detail drawing not to scale. Thickness of layers can vary depending upon individual construction details.

ADVANTAGES:

- Tactile response
- Simulates full travel assembly
- Sealed
- Abrasion resistant graphics on plastic bezel

LIMITATIONS:

- Larger elongated keys can wobble
- Higher profile than flat travel panel
- Higher cost

OPTIONS:

- Backlighting
- Display windows
- Multicolor rubber
- Durometer variance
- Membrane or PCB interface
- EMI/ESD shielding
- Insert molded or pad printed graphics on plastic case

SPECIFICATIONS:

ELECTRICAL
Closed Circuit Resistance:
<200 Ohms
Operating Voltage: 25 VDC
Operating Current: 100mA
Switch Power: 1 Watt

MECHANICAL
Projected Life Cycle:
1 Million actuations **
Actuation Force: Variable
Key Travel: .040"

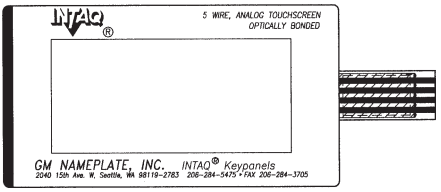
TO QUOTE, WE NEED TO KNOW:

- ❑ Number of switches and encoding (XY or common bus)
- ❑ Maximum thickness allowable
- ❑ Height of key above bezel
- ❑ Number of keys
- ❑ Non-standard mechanical electrical and environmental specifications
- ❑ Panel size
- ❑ Number of molded colors (for keypad)
- ❑ Number of legend colors
- ❑ Shielding requirements
- ❑ Bezel graphic features and other design options
- ❑ Quantities to quote
- ❑ Interconnection requirements

* See Warranty Statement page 2.
** Life cycle may increase or decrease depending on final design, application and environment.

5-WIRE OPTICALLY BONDED ANALOG TOUCH SCREEN

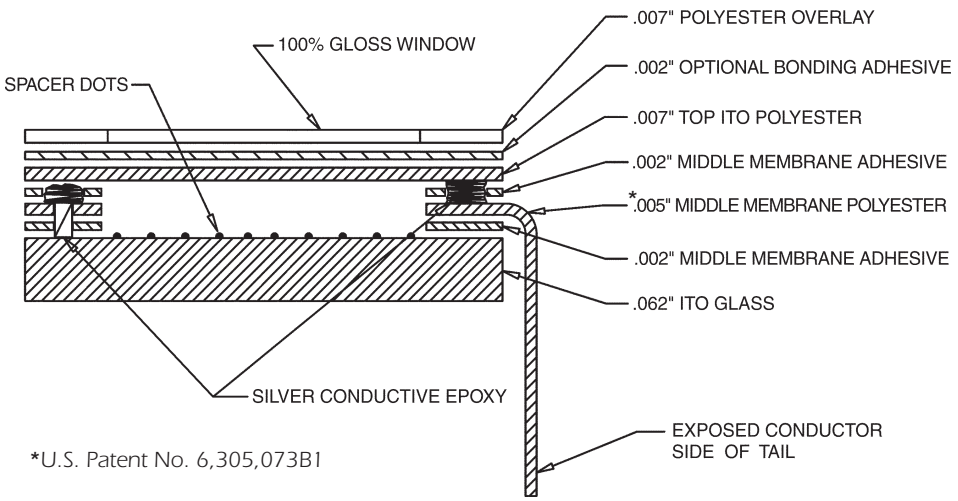
GM part number 1x3.018:
Featuring optically bonded graphic overlay



The front of the analog touch screen can have a graphic layer optically laminated to give it a finished look without hiding the touch screen behind a plastic housing. The rigid backer is glass, making it extremely scratch resistant and optically clear.

CONSTRUCTION LAYER DETAIL

NOT TO SCALE



*U.S. Patent No. 6,305,073B1

Layer detail drawing not to scale. Thickness of layers can vary depending upon individual construction details.

ADVANTAGES:

- Superior optical quality
- No need for plastic housing to hide perimeter circuitry
- Wide design versatility
- High cycle life
- Unlimited touch locations

LIMITATIONS:

- Part size

OPTIONS:

- Embedded in aluminum or plastic bezel
- Graphic layer bonded to front
- Custom graphics and colors
- Tinted window
- Gloss or anti-glare window
- Anti-newton ring coating

SPECIFICATIONS:

ELECTRICAL

Closed Circuit Resistance:
<50-600 Ohms/sq
Operating Voltage: 5 VDC
Operating Current: 100mA
Switch Power: 1 Watt

MECHANICAL

Projected Life Cycle:
30 Million actuations **
Actuation Force: 100-500 grams

TO QUOTE, WE NEED TO KNOW:

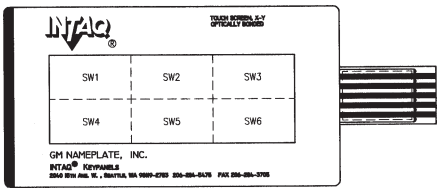
- ❑ Active area dimensions
- ❑ Non-standard mechanical, electrical and environmental specifications
- ❑ Viewing window dimensions
- ❑ Connector and location of membrane tail
- ❑ Number of colors and graphic features
- ❑ Quantities to quote
- ❑ 80 or 300 ohm/sq ITO
- ❑ Thickness
- ❑ Interconnection requirements

* See Warranty Statement page 2.
** Life cycle may increase or decrease depending on final design, application and environment.

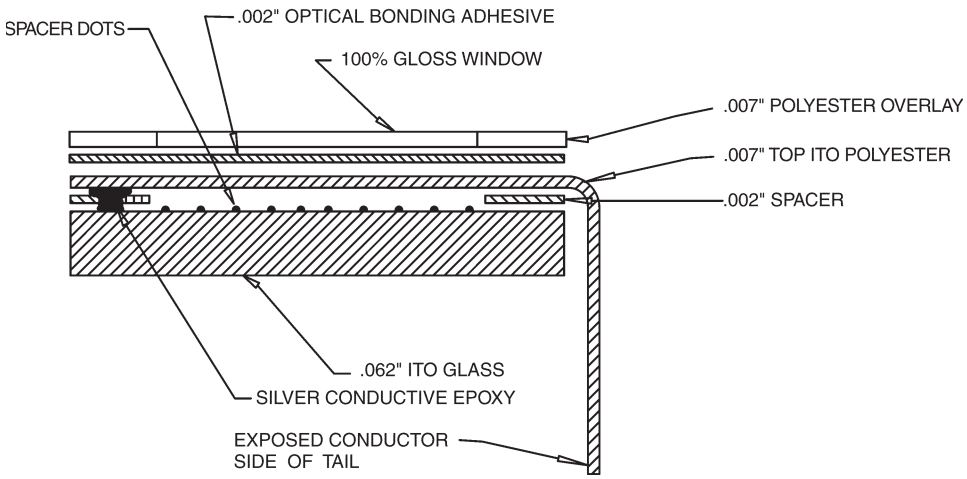
OPTICALLY BONDED MATRIX TOUCH SCREEN

GM part number 1x3.019:
Featuring optically bonded graphic overlay

The front of the matrix touch screen can have a graphic layer optically laminated to give it a finished look without hiding the touch screen behind a plastic housing. The rigid backer is glass, making it extremely scratch resistant and optically clear.



LAYER DETAIL
NOT TO SCALE



Layer detail drawing not to scale. Thickness of layers can vary depending upon individual construction details.

ADVANTAGES:

- Superior optical quality
- No need for plastic housing to hide perimeter circuitry
- Wide design versatility

LIMITATIONS:

- Fixed touch locations
- Minimun 1/4" cell width for finger activation

OPTIONS:

- Embedded in aluminum or plastic bezel
- Graphic layer bonded to front
- Custom graphics and colors
- Tinted window
- Gloss or anti-glare window
- Anti-newton ring coating

SPECIFICATIONS:

ELECTRICAL
Closed Circuit Resistance: 50-20K ohms
Operating Voltage: 5 VDC typ.
Operating Current: 100mA
Switch Power: 1 Watt

MECHANICAL
Projected Life Cycle: 3 Million actuations **
Actuation Force: 100-500 grams

TO QUOTE, WE NEED TO KNOW:

- ❑ Active area dimensions
- ❑ Non-standard mechanical, electrical and environmental specifications
- ❑ Viewing window dimensions
- ❑ Connector and location of membrane tail
- ❑ Number of colors and graphic features
- ❑ Number of switch cells
- ❑ Quantities to quote
- ❑ 80 or 300 ohm/sq ITO
- ❑ Thickness
- ❑ Interconnection requirements

* See Warranty Statement page 2.
** Life cycle may increase or decrease depending on final design, application and environment.

NOTES PAGE

GENERAL DESIGN CHECKLIST

The following is a general list of items that we consider to be critical to the final design of your panel. Not all need to be addressed before we quote, but the more items specified, the more definite and accurate the quote.

OVERLAY

- ❑ Material and thickness
- ❑ Opaque and transparent colors
- ❑ Hardcoats, textures
- ❑ Embossing style, height and location
- ❑ Dimensions
- ❑ Graphic features

MEMBRANE SWITCH

- ❑ Tail exit location/length
- ❑ Schematic (or specify "Intaq design")

PCB SWITCH

- ❑ Thickness
- ❑ Plating (if you will require a specific type)
- ❑ Special markings (UL, codes, dates etc.)
- ❑ Schematic (or specify "Intaq design")

ELASTOMER KEYPAD

- ❑ Dimensions
- ❑ Durometers
- ❑ Colors
- ❑ Copy and graphics
- ❑ Key travel/force
- ❑ Tactile feel/conductive pill or metal dome

COMPONENTS

- ❑ Connector/header
- ❑ Metal dome
- ❑ Displays
- ❑ Flex tail
- ❑ LEDs, ICs, resistors, capacitors, etc.

BACKLIGHTING

- ❑ Source (EL or fiber optic)
- ❑ Colors
- ❑ Dimensions
- ❑ Tail exit/length

SHIELDING

- ❑ Type (EMI, RFI, ESD)
- ❑ Grounding method
- ❑ Ground loop
- ❑ Ground plane (PCB)
- ❑ Printed grid, aluminum/mylar, screen mesh

PERIPHERAL PACKAGING

- ❑ Subpanel
- ❑ Bezel
- ❑ Materials, coatings

TOUCH SCREEN

- ❑ Backing thickness
- ❑ Matrix or Analog
- ❑ Resistance 80 or 300 ohm/sq.
- ❑ Viewing area
- ❑ Active area
- ❑ Graphic overlay
- ❑ Tail exit location/length
- ❑ Schematic (or specify "Intaq design")

NON-STANDARD SPECIFICATIONS

Mechanical

- ❑ Switch travel
- ❑ Operating life
- ❑ Panel thickness

Electrical

- ❑ Operating voltage, current, power
- ❑ Open/closed circuit resistance
- ❑ Contact disturbance time
- ❑ Capacitance
- ❑ Isolation

Environmental

- ❑ Operating and storage temperatures
- ❑ Vibration
- ❑ Shock
- ❑ Moisture/NEMA 4
- ❑ Ambient operating conditions

GENERAL DESIGN TIPS

- ❑ Try not to lock into a design too early. Allow GM Nameplate's INTAQ keypanel design team to help and advise on construction alternatives if possible.
- ❑ If the part has been previously produced, send a sample and relate any problem circumstances. It will help us build you a better part.
- ❑ Only specify non-standard specifications when the added reliability is truly necessary. "Over-designing" can increase the cost of the panel.
- ❑ Supply legible prints – it greatly reduces communication errors!

KEYPANEL DESIGN TIPS

- ❑ Leave as much room as possible from the edge of the keypad to any panel edge or cutout. In most cases, .250" is adequate for adhesion, but never closer than .100".
- ❑ Leave as much room as possible between keys. In most cases, .125" is adequate.
- ❑ Keep studs a minimum of .200" from cutouts or perimeter edges to prevent deformation of the aluminum.
- ❑ Do not design the flex tail exit in a way that causes undue stress and creasing of the flex tail. Allow for a generous bend or arc. Although our minimum recommended radius bend is .075" with a dielectric insulator, and .038" with a mylar insulator, it is wise to allow a greater radius if the design permits.
- ❑ On most panel designs, the tail cannot exit directly underneath a switch. Allow as much distance as possible between the nearest keypad and the tail exit. .250" is the usual minimum.
- ❑ Be specific when choosing PCB components, as generically alike components from different manufacturers vary greatly in price, which will affect the cost of your panel. Supply a components list – with part numbers and/or manufacturers specified – whenever possible.
- ❑ Up to approximately 15kv, ESD shielding is usually not necessary with GM's normal panel designs. From 15kv to 20kv, a ground loop is usually adequate. Above 20k, shielding is required. A ground loop (or ground plane on a PCB) adds no extra cost, but other types of shielding do. Evaluate your requirements carefully.
- ❑ Specify circuit-free areas at the minimum amount you require. Designing circuitry that is cramped into too small an area can increase cost.

OVERLAY/HOUSING

- ❑ Consider designing the case or housing to be a contrasting color to the overlay background rather than attempting to exactly match the overlay to the case. Differences in materials and textures affect the eye's ability to liken even the most perfectly matched pigments.
- ❑ The overlay often helps "hide" the layers of circuitry and components underneath. Dark background colors are best. Large areas of light color may require several passes of ink for opacity, each of which adds to the total cost of the panel.
- ❑ Try to avoid using Pantone Matching System (PMS) color callouts for critical colors matches. Specify a color system designed for use in plastics printing (Munsell, for example). Ideally, it is best to provide us with an actual color chip for any critical color.
- ❑ The number of colors on an overlay plays a major role in the price of a panel. Keep that in mind during the graphic design phase. At times, three or four colors can be designed to look like ten, at much lower cost. Greys are the most difficult to match, which can increase cost.
- ❑ Specify critical typestyles and sizes on your drawing. Small, very detailed copy will add to the cost of both art and printing. Supply crisp logo art if possible.
- ❑ There is no limit to the size or number of display windows you can design into a panel, but the larger a clear or transparent color window is, the more it affects panel cost.
- ❑ A glossy panel will show more irregularities and fingerprints. It is better to use a textured background. (Windows can be gloss or anti-glare finish.)
- ❑ A glossy window is very reflective and shows fingerprints and defects. A slightly matted, "anti-glare" or fully matted window surface is more easily read and stays cleaner-looking.
- ❑ We normally specify .015" as the preferred maximum height on a keypad emboss, although we can manufacture a higher emboss if necessary. Hold the minimum distance between embossed key edges to .125". Steer clear of debossing, which adds to the thickness and complexity of the panel.