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NEMA STANDARDS PUBLICATION

OS 2

NONMETALLIC OUTLET BOXES, DEVICE BOXES, COVERS, AND BOX SUPPORTS

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NEMA Standards Publication OS 2-1998

Nonmetallic Outlet Boxes, Device Boxes, Covers, and Box Supports

Published by

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Rosslyn, VA 22209

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Foreword

The purpose of this Standards Publication is to provide a guide for the types and sizes of nonmetallic boxes and supports which are in general use or suggested for future design, or both. The standards present dimensional data needed for the safety and convenience of interchangeability with associated equipment. All items, when properly installed and properly used, contribute to safety.

Properly manufactured boxes and covers are, however, only one factor in minimizing the hazards, which may be associated with the use of electricity. The reduction of hazards involves the joint efforts of various equipment manufacturers, the system designer, the installer, and the user. Information is provided herein to assist users and others in the proper selection of boxes and covers.

The manufacturer has limited or no control over the following factors, which are vital to a safe installation:

a. Environmental conditions
b. System design
c. Equipment selection and application
d. Installation
e. Operating practices
f. Maintenance

This publication is not intended to instruct the user of the boxes and covers with regard to these factors, except insofar as suitable equipment to meet needs can be recognized in this publication.

These standards are necessarily limited to defining the construction requirements for the products covered herein. The publication has been promulgated with a view towards reducing the hazard to persons and property when boxes and covers conforming with these standards are properly selected and installed in accordance with the National Electrical Code.

This Standards Publication has been reviewed with input obtained from independent testing laboratories and major consumer representatives.

The publication will be reviewed periodically by the Outlet and Switch Box Section of NEMA so that it will be kept up to date with advancing technology. Comments are welcomed and should be sent to:

Vice President, Engineering
National Electrical Manufacturers Association
1300 North 17th Street, Suite 1847
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This Standards Publication was developed by the Outlet and Switch Box Section. Section approval of the standard does not necessarily imply that all section members voted for its approval or participated in its development. At the time it was approved, the Outlet and Switch Box Section was composed of the following members:

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Appleton Electric Company – Chicago, IL
Arlington Industries, Inc. – Scranton, PA
Bridgeport Fittings, Inc. – Bridgeport, CT
CANTEX INC. – Mineral Wells, TX
Hubbell Incorporated – Bridgeport, CT
Lamson & Sessions – Cleveland, OH
O-Z/Gedney, A Unit of General Signal Corp. – Terryville, CT
Pass & Seymour/Legrand – Syracuse, NY
Raco, Inc. – South Bend, IN
Steel City – Memphis, TN
Thepitt Electrical Products/Crouse-Hinds – Meadow Lands, PA
Thomas & Betts Corporation – Memphis, TN
Valen Manufacturing Company – Cleveland, OH

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Section 1
GENERAL

1.1 SCOPE

This Standards Publication covers those general-purpose nonmetallic outlet boxes, device boxes, covers, and supports that are widely used by the consumer. These items (covered by UL 514C) are designed to facilitate the pulling of wires, to protect and facilitate wiring splices and taps, to provide a means of mounting and protecting wiring devices, and to provide a connection for nonmetallic sheathed cable, nonmetallic tubing (Loom), rigid nonmetallic conduit, and electrical nonmetallic tubing or other approved raceways.

Excluded from this Standards Publication are the following: "conduit bodies" and similar types of boxes; cabinets or cutout boxes; floor boxes; flush device plates; boxes, plates, and covers designed for use with surface metal raceway systems only; and boxes larger than 100 cubic inches (1638.706 cubic cm) in volume, except multiple gang device boxes.

1.2 NORMATIVE REFERENCES

The following publications are adopted in part, by reference in this publication, and are available from the organizations below.

National Fire Protection Association
Batterymarch Park
Quincy, MA 00269

NFPA 70-1996 National Electrical Code

Underwriters Laboratories, Inc.
333 Pfingsten Road
Northbrook, IL 60062

UL 514C Standard for Nonmetallic Outlet Boxes

1.3 DEFINITIONS

box (electrical): A box is a container without a cover, but with means for mounting a cover.

box support: A box support is a means for securing an outlet or device box to the building structure or finished surface. Supports can be an integral part of the box, attached to the box, or entirely separate.

bracket: A bracket is a means for securing an outlet box or device box in place in walls or ceilings, or to wall studs, building structures, or structural members.

cable box: A cable box is an outlet box (see outlet box).

clamp: A clamp is a part of or an accessory to a cable box to secure flexible nonmetallic tubing (Loom) or cable to the box.

device box: A device box is a box which is designed to receive and support switches, receptacles, and similar devices. The term "device box" includes the following specific types:

a. Single gang
b. Two gang
c. Three gang
d. Four gang

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floor box: A floor box is an outlet box specifically designed for flush installation in a floor.

flush-device cover plate: A flush-device cover plate is a cover, decorative or plain, designed to be fastened directly to a wiring device. It is intended to close a flush-device box and to cover the edges of the wall openings in which the box is located.

flush-mounted box: A flush-mounted box is so designed as to have a minimal front projection from the surface surrounding the box opening.

junction box: A junction box with a volume of 100 cu inches or less is considered an outlet box.

knockout: A knockout is a portion of the wall of a box that can be removed readily in order to provide an opening for the entry of tubing, conduit, or cable.

outlet box: An outlet box is a box used in an electrical wiring system for containing wire, taps, splices, or devices. It has provisions for the entry of conduit, tubing, or cable assemblies and for the attachment of a separate cover which is used to close the box or provide support for the devices or fixtures.

The function of an outlet box, when completely closed by a cover or part of a wiring device acting as a cover, is to guard live parts against outside incidental contact, to protect the surrounding environment from faults occurring within the outlet box, to permit inspection of the wiring system, and to provide a safe means for replacement of wiring devices. Normally, outlet boxes have provisions for the entrance of conductors through nonmetallic conduit, cable, or tubing. Outlet boxes also have a provision for fastening covers, which are separate or a part of a wiring device. The fastening means is not a hinge and provides for future removal. An outlet box also provides one or more of the following:

a. Support for fixture assemblies and lampholders
b. Access to the raceway system for which it is designed
c. Extension of existing raceway or wiring systems
d. Ground continuity within the raceway or via the wiring system for which it is designed
e. Utilization of accessories such as fixture studs, clamps, bar hangers, extension rings, and such

outlet box cover: An outlet box cover is a cover which is intended to close the face of a box. The cover can be blank or provided with means for support of a wiring device, light fixture pendant cord, etc. Covers have slots, holes, or a mounting provision for attaching to outlet boxes of the sizes and types for which they are designed.

single gang box: A single gang box is a box for mounting in walls and is no larger than a nominal size 2¼ inch x 4 inch.

surface-mounted box: A surface-mounted box is a box designed and intended to be mounted on a surface and to be exposed to sight rather than recessed in a wall, ceiling, or partition.

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Section 2
GENERAL STANDARDS

2.1 MATERIAL

2.1.1 Thermosetting Resins

Thermosetting resins are plastics which in their final state as finished articles are substantially infusible and insoluble. They are often liquids at some state of their manufacture or processing, which are cured by heat, catalysis, or other chemical means. After being fully cured, thermosets cannot be resoftened by heat.

2.1.1 Thermoplastic Resins

A thermoplastic resin is a plastic that repeatedly can be softened by heating and hardened by cooling through a temperature characteristic of the plastic, and in the softened state can be shaped by flow into articles by molding or extrusion.

2.2 CORROSION PROTECTION

All ferrous metal surfaces of brackets, ears, and adjustable bar hangers used in conjunction with a nonmetallic box shall be protected against corrosion by a zinc coating of 0.0005 inch average thickness or equivalent corrosion protection. The corrosion protection of any ferrous metal clamp, grounding plate, or strap, if the protective coating is of zinc, shall be not less that 0.00015 inch average thickness or of equivalent corrosion protection.

Exception: The cut edges, punched holes, and threaded surfaces of tapped holes of a part formed from galvanized stock do not need additional protection.

2.3 SCREWS

The most common screws used in conjunction with outlet boxes, device boxes, set-up boxes, and covers are shown in Table 2-1.

Table 2-1
SCREWS COMMONLY USED IN CONJUNCTION WITH OUTLET BOXES, DEVICE BOXES, SET-UP BOXES, AND COVERS

Nominal Size	Device Mounting Screws	Cover Mounting and Fixture Support	Ground Screws	Bar Hanger
6 x 32	X	—	—	—
8 x 32 or larger	—	X	X	X
10 x 32	—	—	X	—

Ferrous screws shall have visible corrosion protection. The heads of grounding screws shall be identified by a green color.

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2.4 OPENINGS

2.4.1 Cable-Size Knockouts

Cable-size knockouts provided in boxes shall be so designed that they can be removed without deforming the box. The openings created from their removal shall be free of sharp and jagged edges which could destroy the integrity of the cable installation.

2.4.2 Knockouts

A knockout shall effectively cover the opening in which it is located, and the clearance between the knockout and the opening shall be not more than 0.030 inch.

2.4.3 Open Holes

No dimension of an open hole in a box shall exceed 17/64 inch, with the exception of prying out slots.

2.4.4 Clamps

Boxes shall be designed to provide clamps for securing the cable as required by the National Electrical Code.

2.5 SUPPORTS

Outlet boxes shall be so designed that they can be securely fastened in place without depending on the support furnished by any system of wiring.

2.6 MARKINGS

Boxes and covers shall be marked with the name or trademark of the manufacturer and cubic capacity as required by the National Electrical Code. The marking shall be readily visible after the installation of the box.

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Section 3
SPECIFIC REQUIREMENTS

3.1 GENERAL

The drawings in this section give minimum and maximum dimensions to assure safe interchangeability with other components.

Specific details and dimensions for outlet boxes, device boxes, covers, box supports, and accessories should be obtained from the manufacturer.

Overall device box sizes, other than those specified in this standard, may be provided for specific applications.

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4" Square Two Device	3-25	31

**May be factory assembled to a bar hanger, mounting bracket or include a ground strap*

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d. ALTERNATE CONFIGURATIONS

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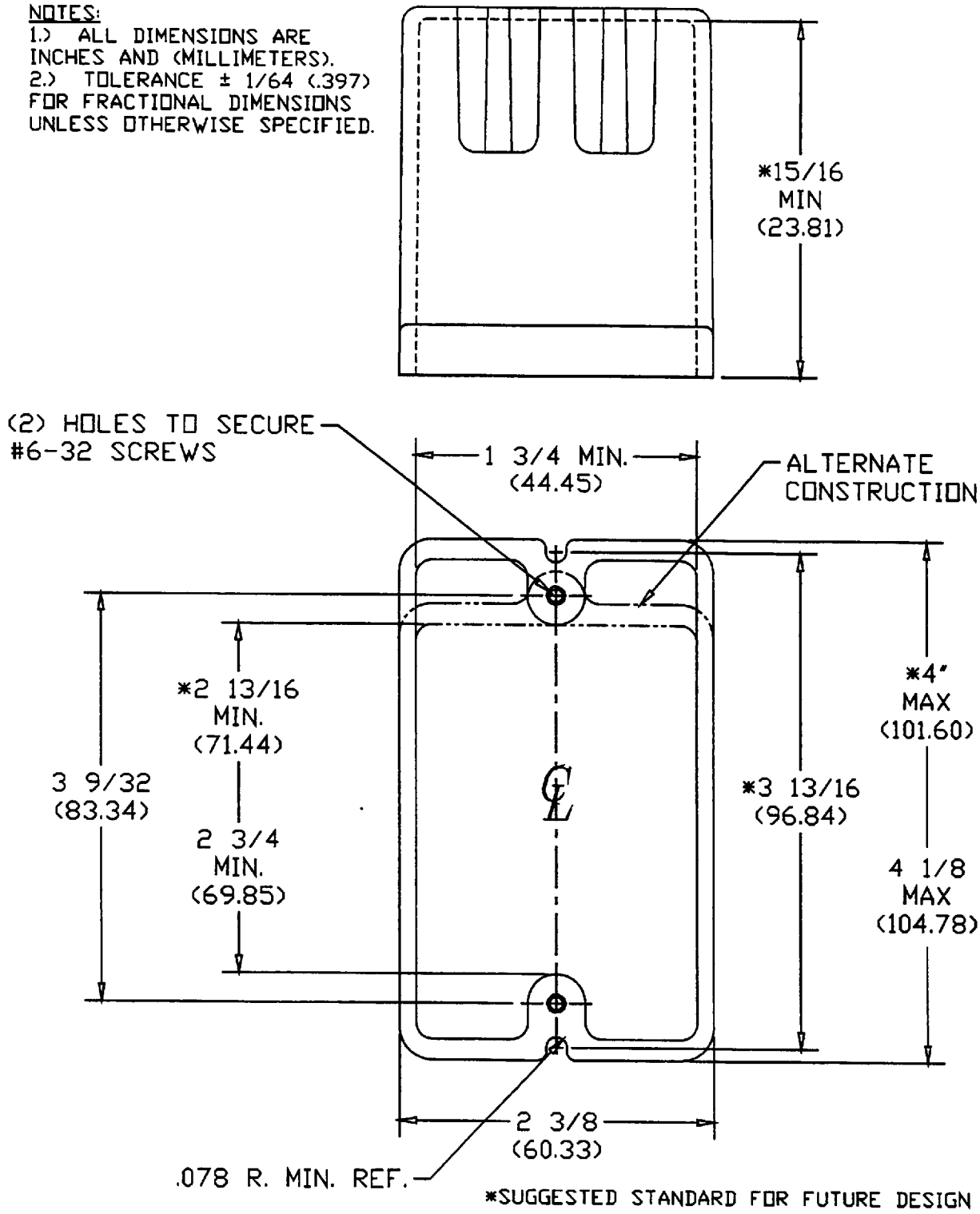
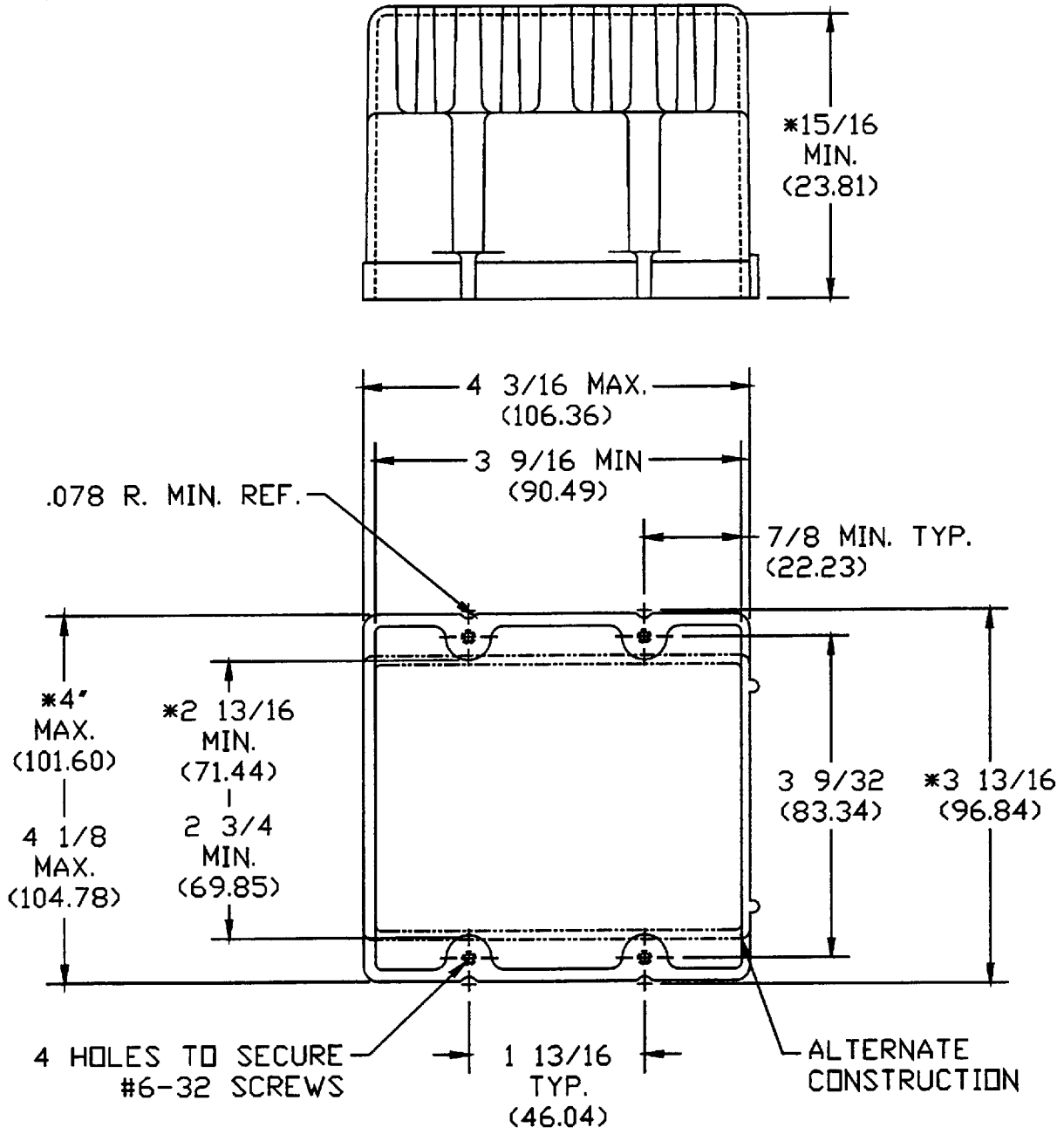


FIGURE 3-1
SINGLE GANG FLUSH OR SURFACE MOUNTED NONMETALLIC DEVICE BOX
(NO KNOCKOUT LOCATIONS SHOWN)

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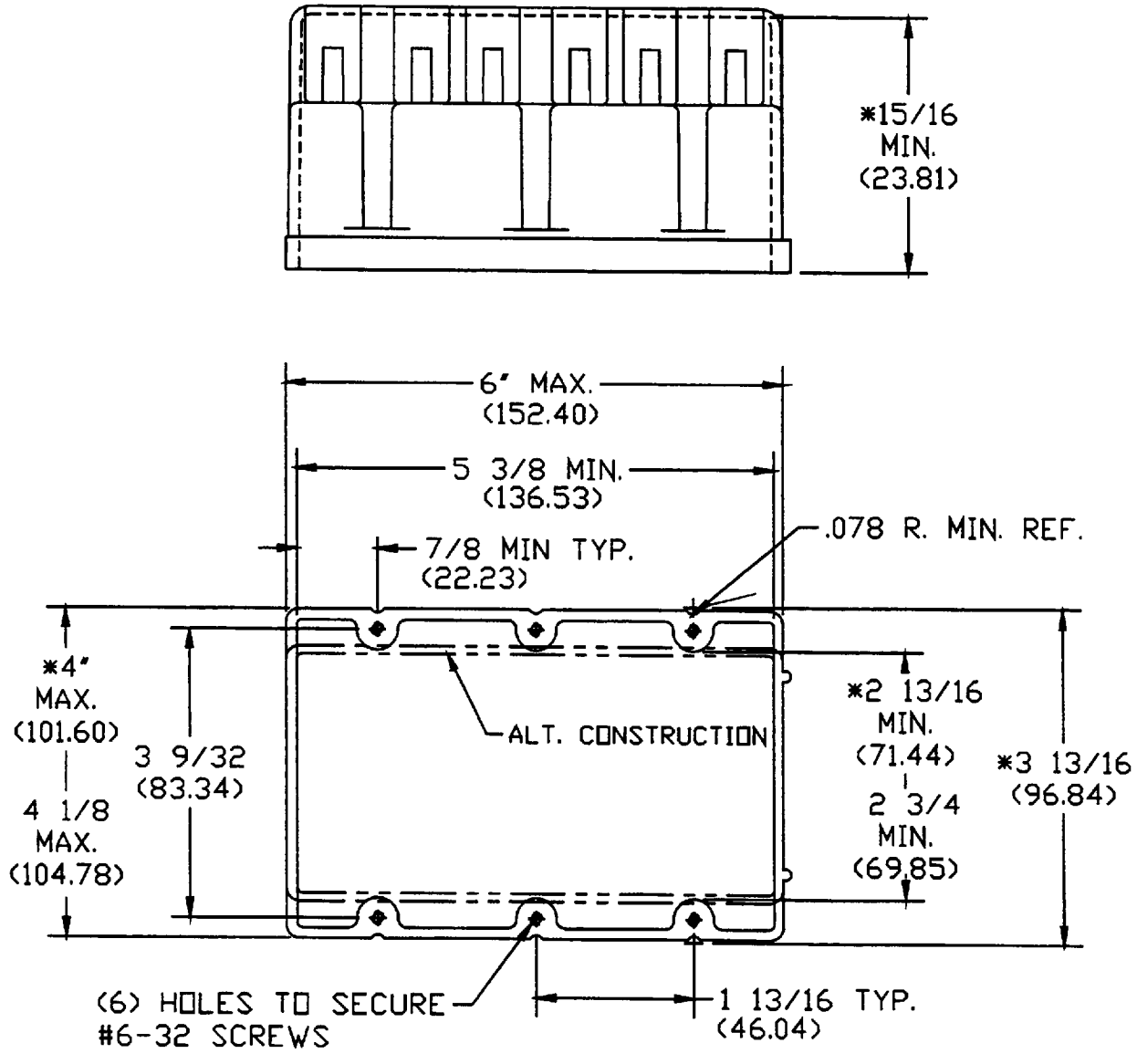


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FIGURE 3-2
TWO GANG FLUSH MOUNTED NONMETALLIC DEVICE BOX

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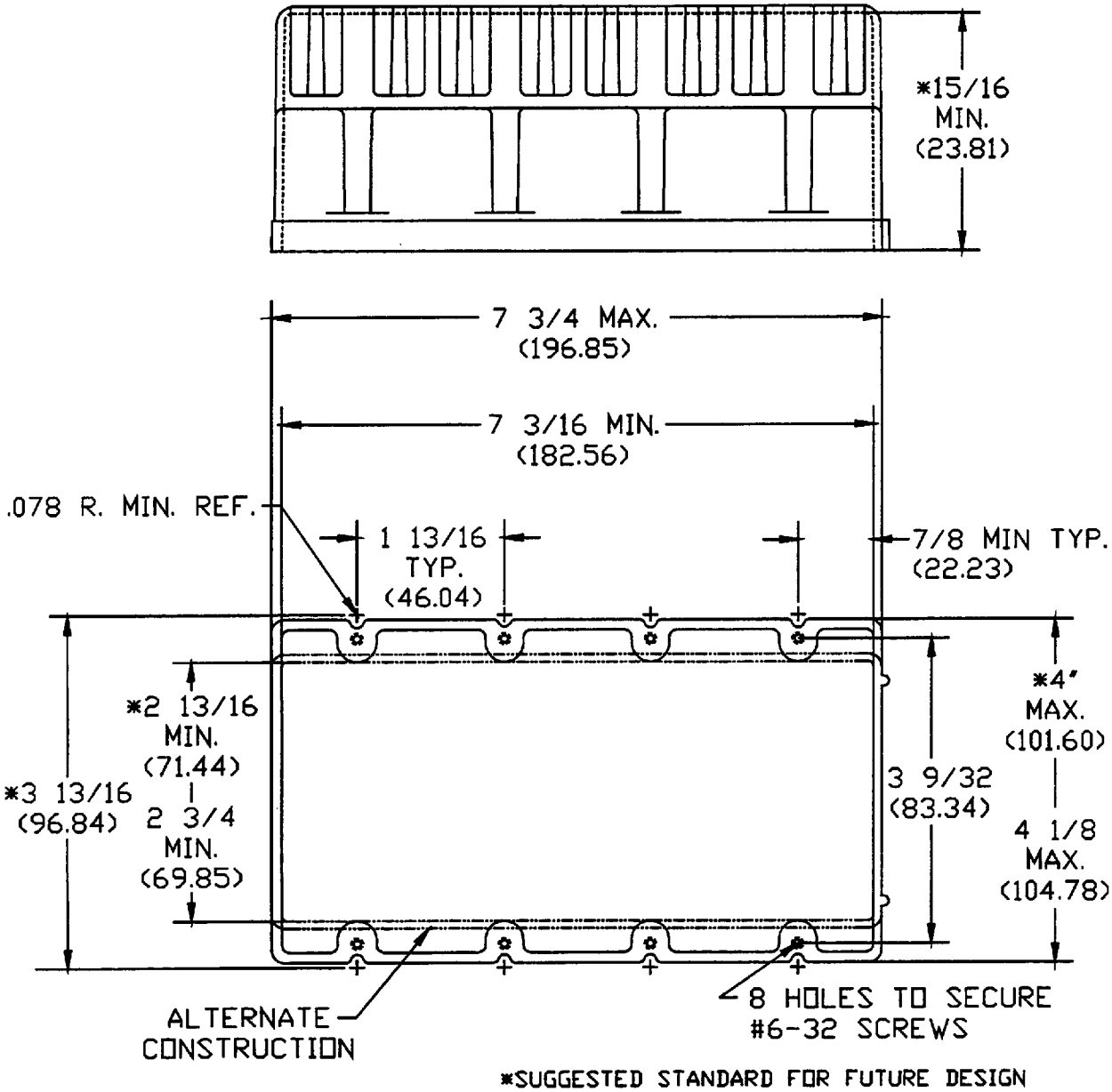


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FIGURE 3-3
THREE GANG FLUSH MOUNTED NONMETALLIC DEVICE BOX

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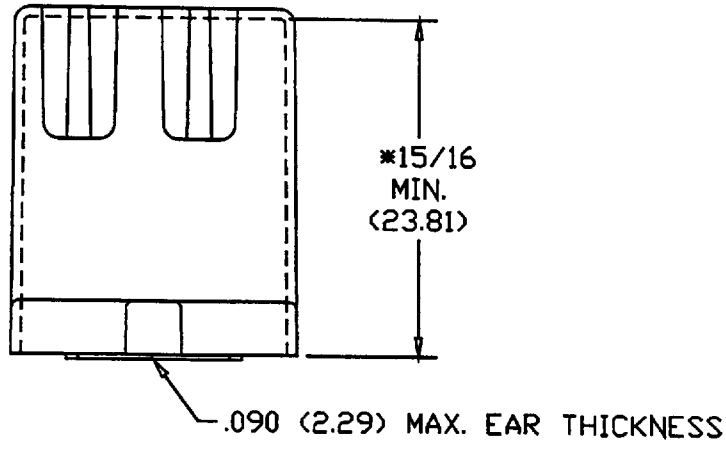


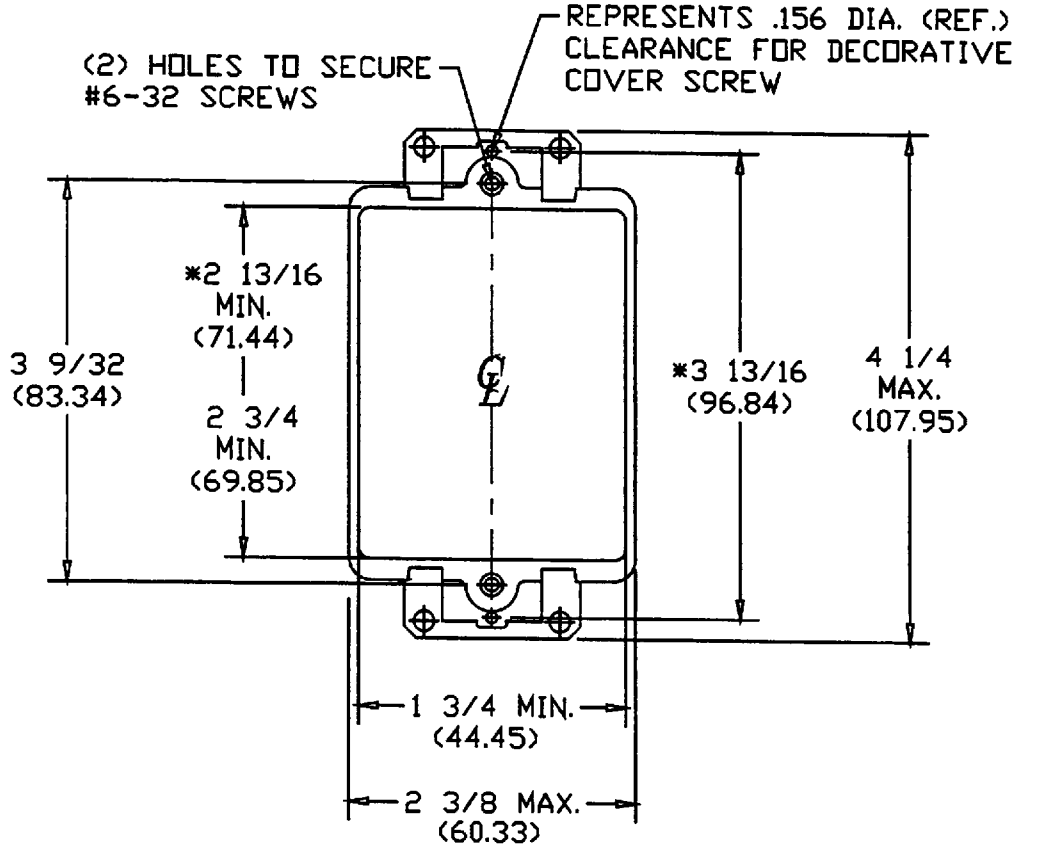
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FIGURE 3-4
FOUR GANG FLUSH MOUNTED NONMETALLIC DEVICE BOX

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3.) REFER TO FIG. 3-27 FOR ALTERNATE EAR CONFIGURATIONS



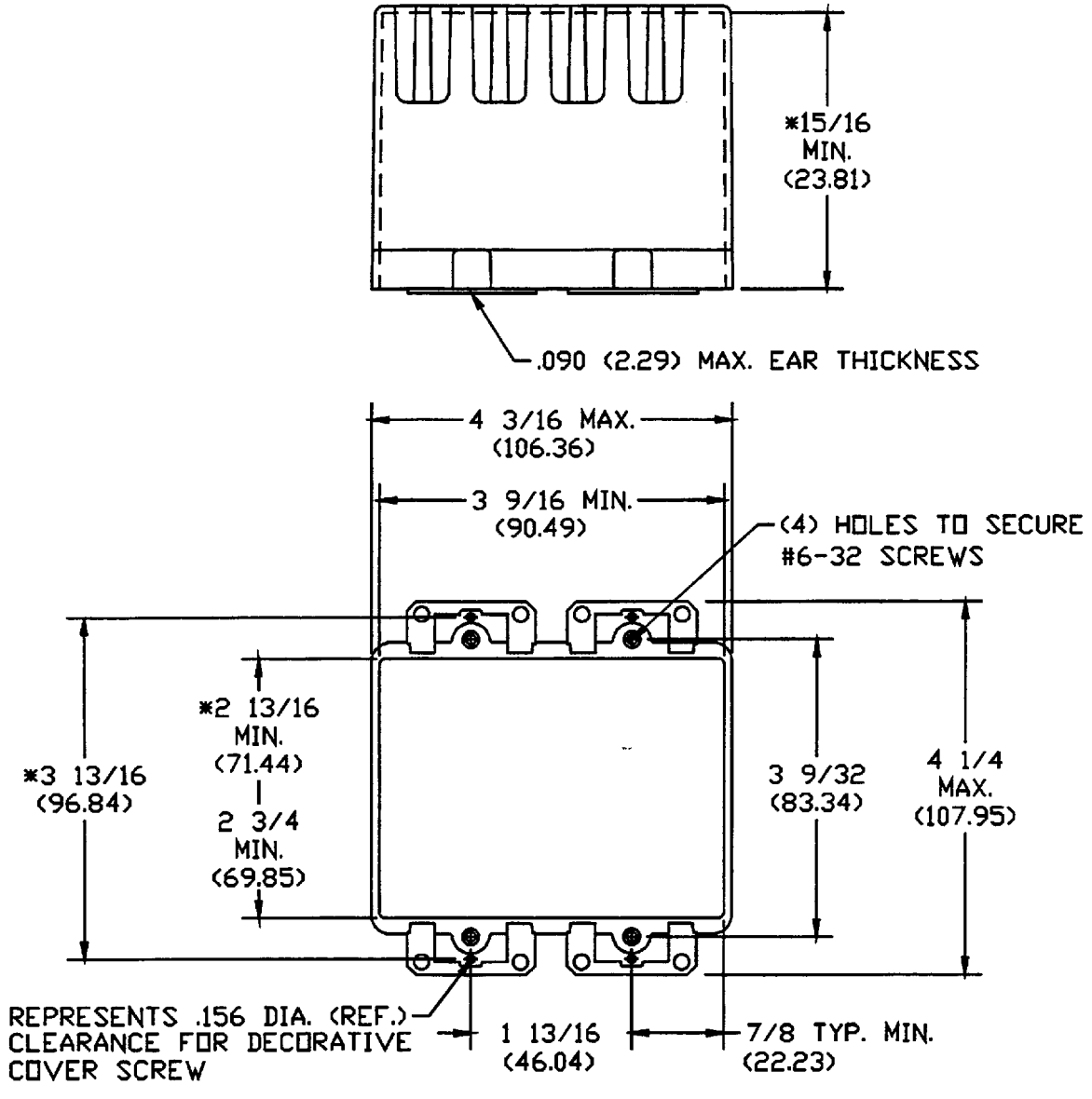


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FIGURE 3-5
SINGLE GANG FLUSH MOUNTED NONMETALLIC DEVICE BOX WITH PLASTER EARS

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3.) REFER TO FIG. 3-27 FOR ALTERNATE EAR CONFIGURATIONS.

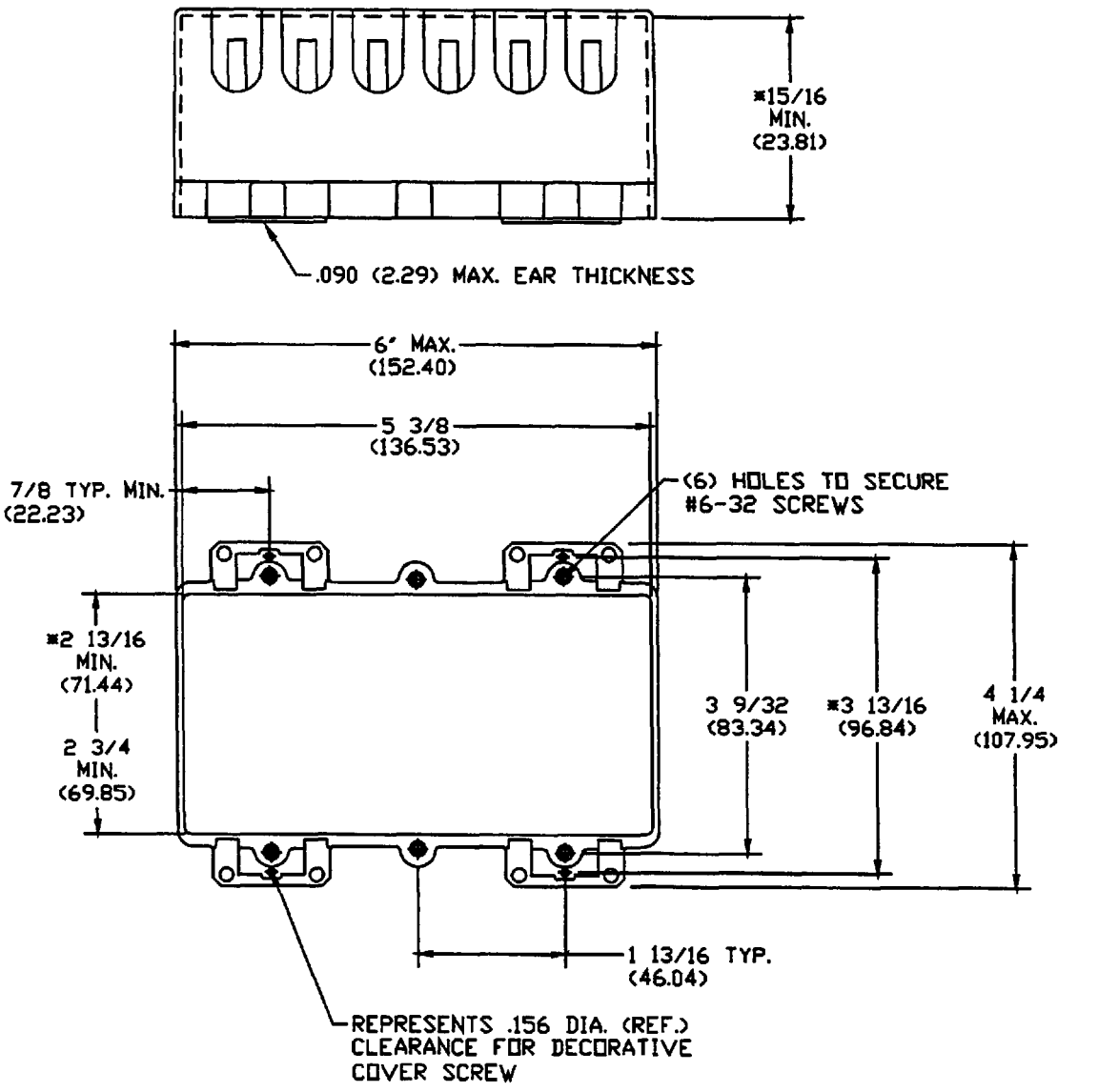


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FIGURE 3-6
TWO GANG FLUSH MOUNTED NONMETALLIC DEVICE BOX
WITH PLASTER EARS

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3.) REFER TO FIG. 3-27 FOR FOR ALTERNATE EAR CONFIGURATIONS.

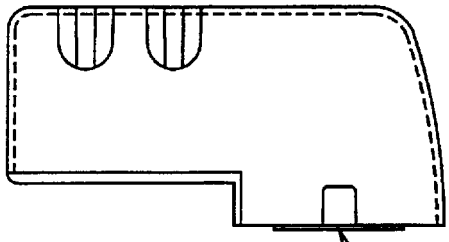


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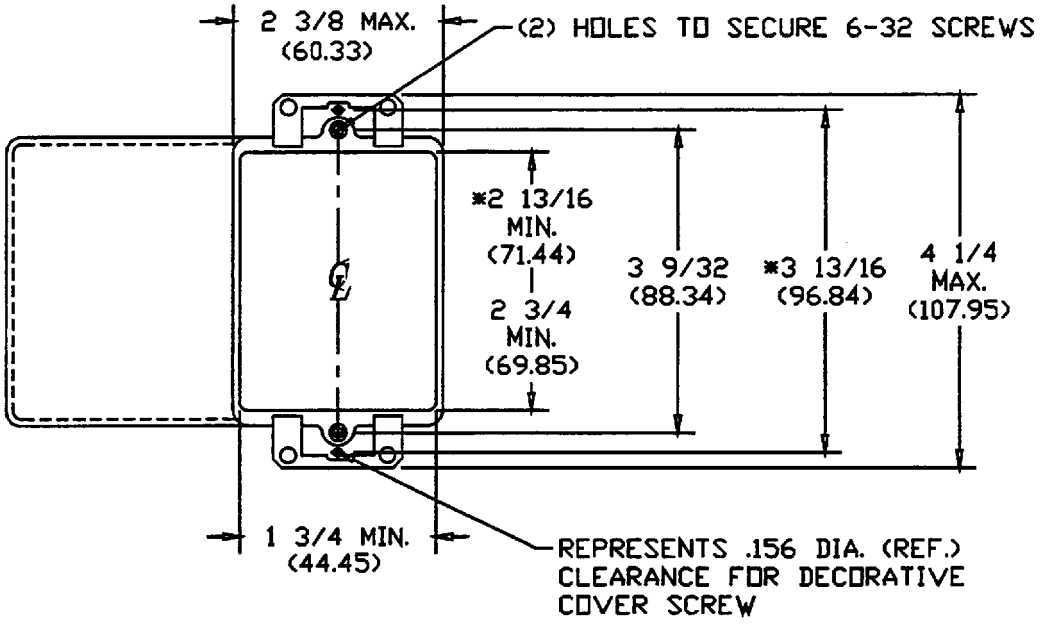
FIGURE 3-7
THREE GANG FLUSH MOUNTED NONMETALLIC DEVICE BOX WITH PLASTER EARS

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3.) REFER TO FIG. 3-27 FOR ALTERNATE EAR CONFIGURATIONS.



.090 (2.29) MAX. EAR THICKNESS



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FIGURE 3-8
SINGLE GANG OFFSET FLUSH MOUNTED NONMETALLIC DEVICE BOX WITH PLASTER EARS

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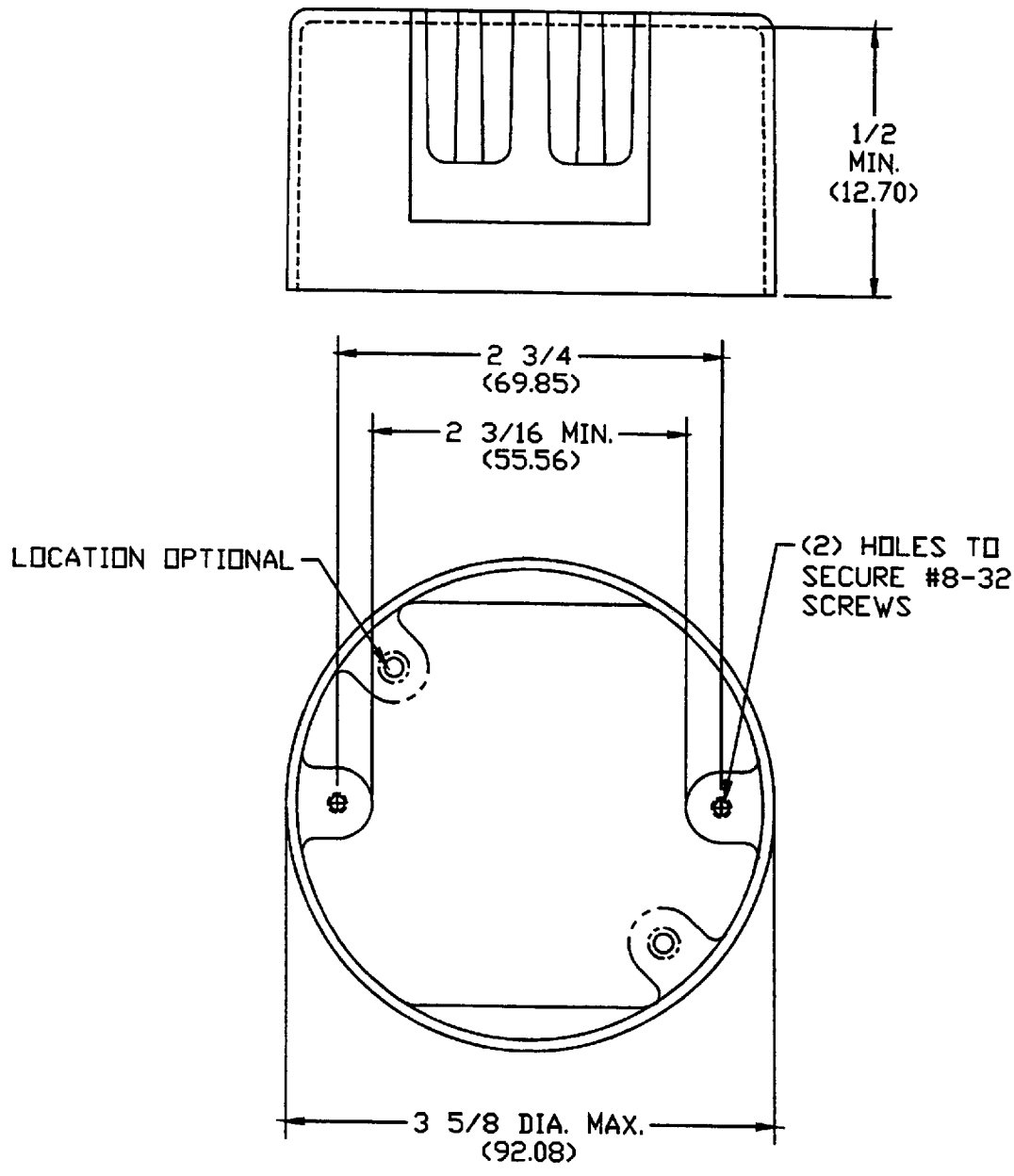


FIGURE 3-9
NOMINAL 3-1/4"/3-1/2" ROUND OR OCTAGONAL NONMETALLIC OUTLET BOX

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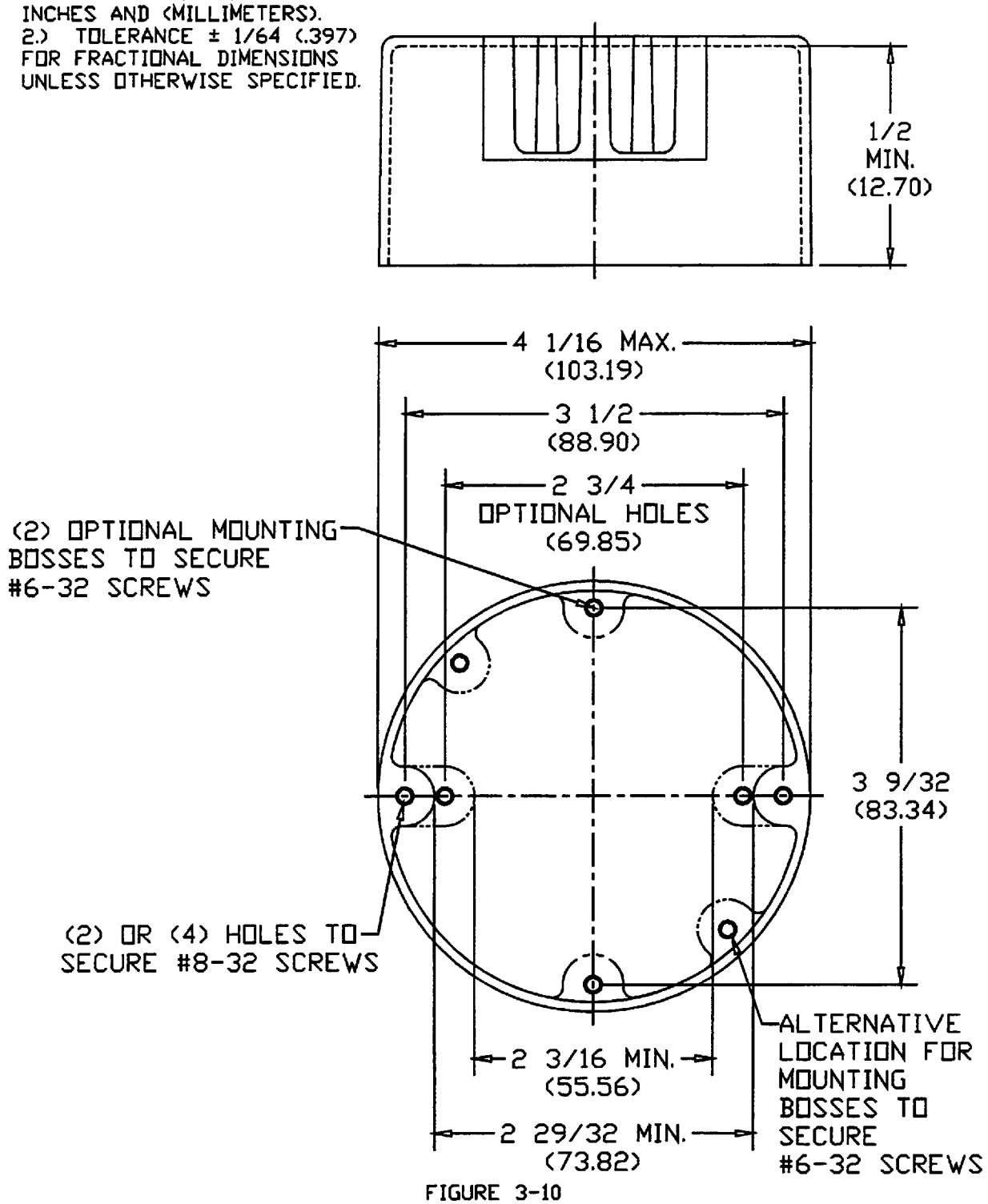


FIGURE 3-10
NOMINAL 4" ROUND OR OCTAGONAL NONMETALLIC OUTLET BOX

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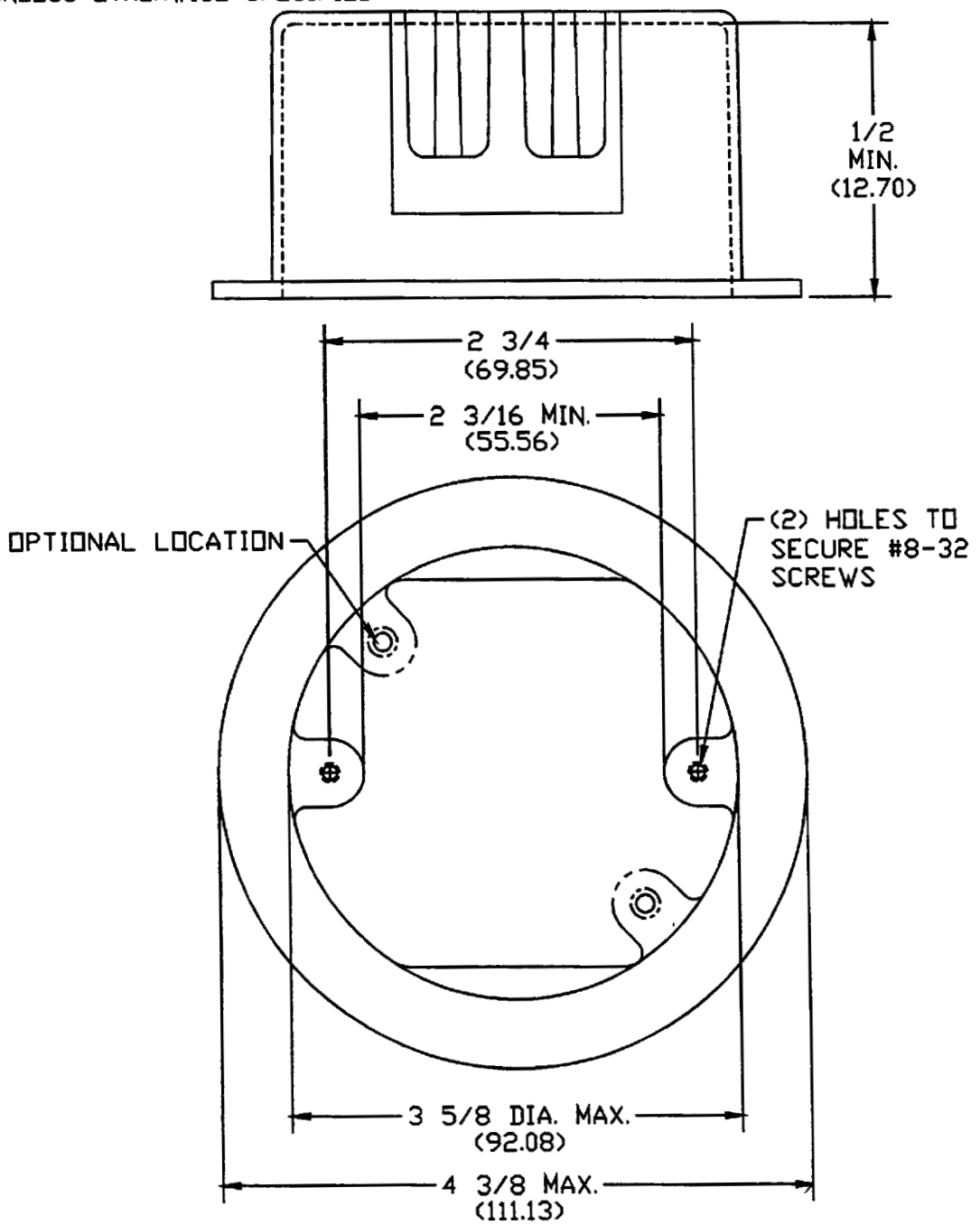


FIGURE 3-11
NOMINAL 3-1/4",3-1/2" ROUND OR OCTAGONAL NONMETALLIC OUTLET BOX WITH FLANGE

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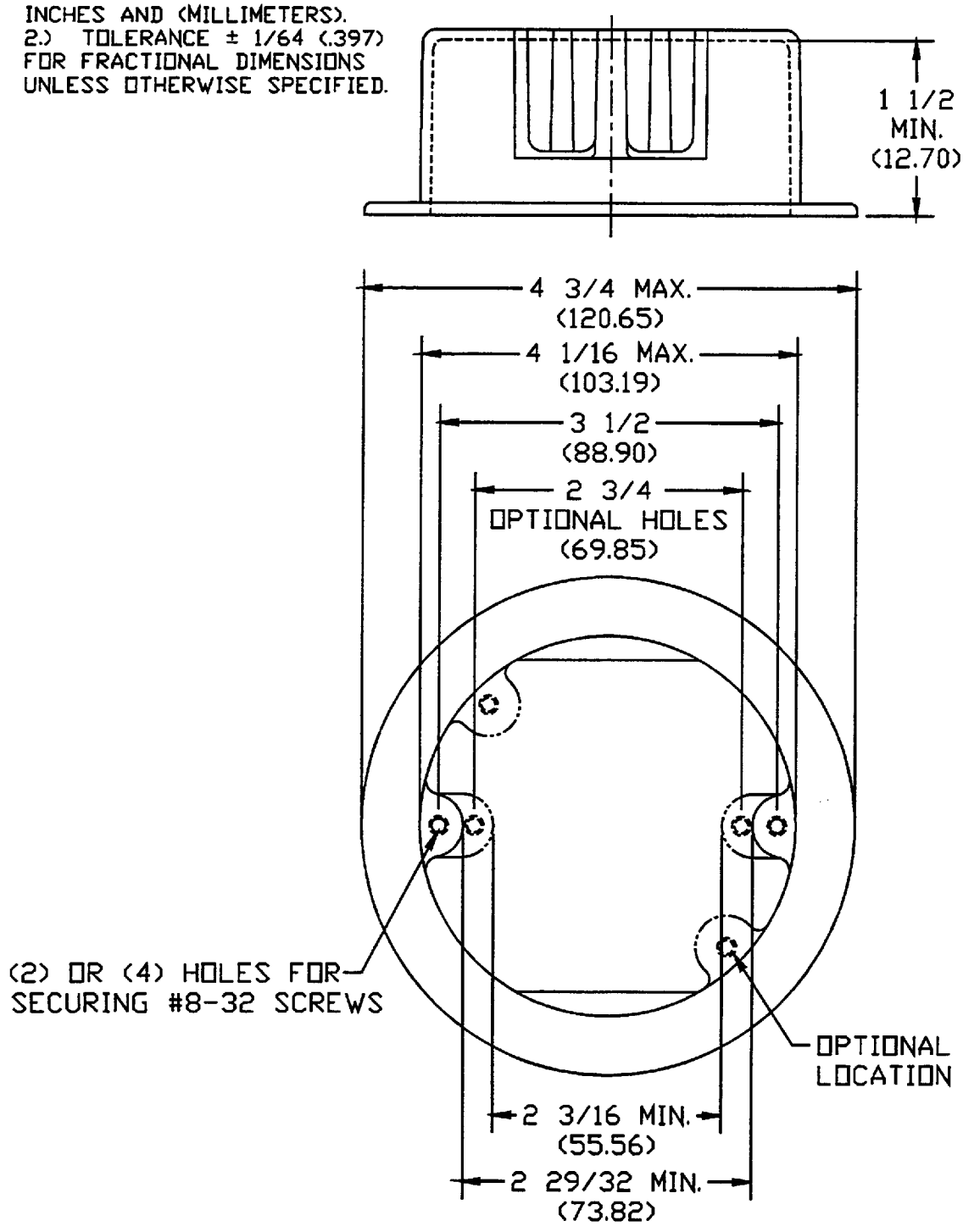
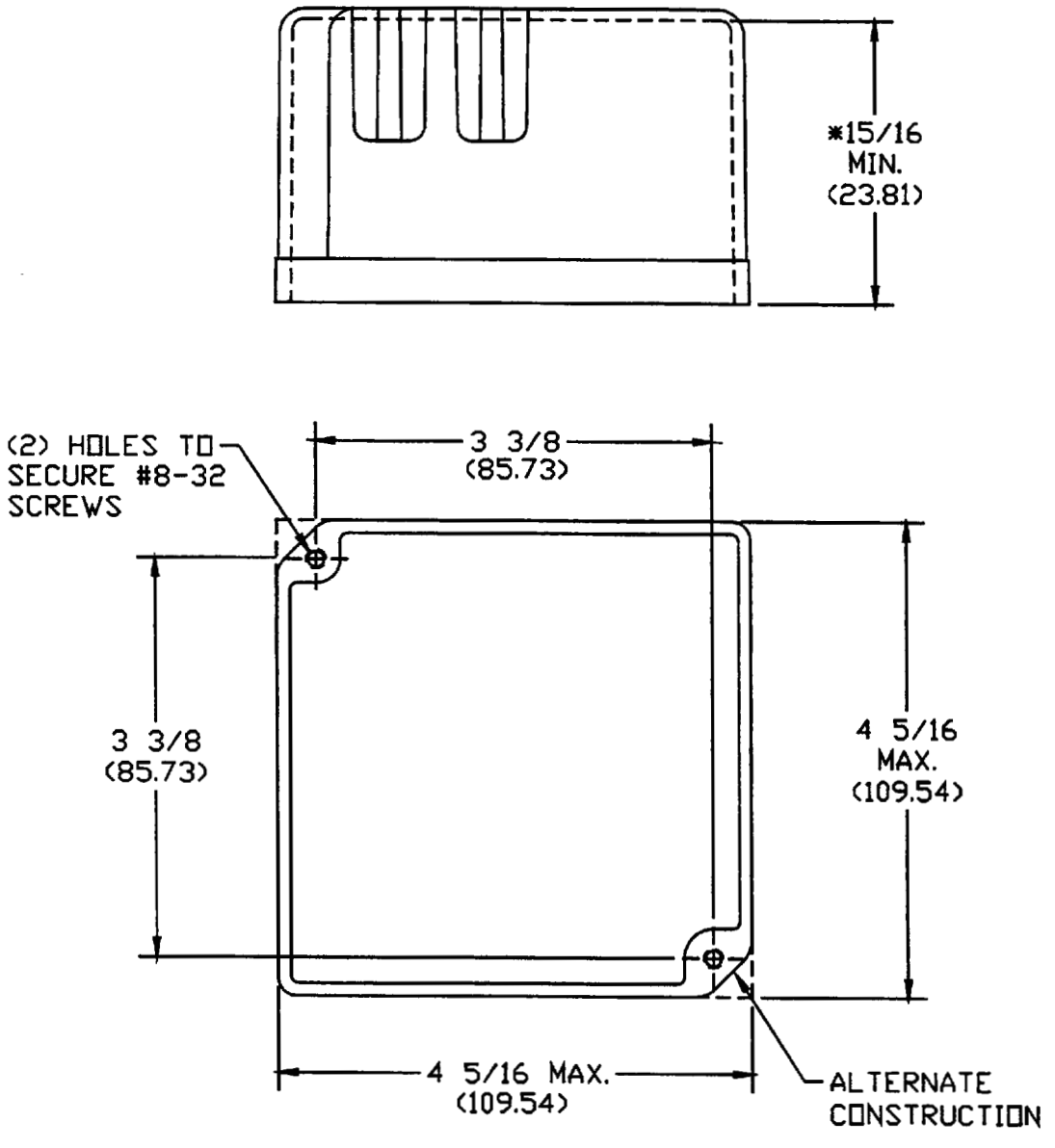


FIGURE 3-12
NOMINAL 4" ROUND OR OCTAGONAL NONMETALLIC OUTLET BOX WITH FLANGE

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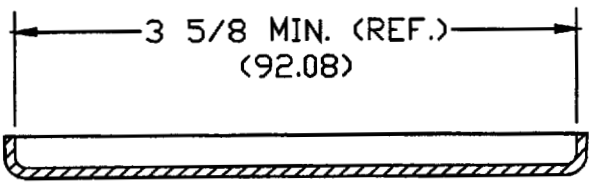


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FIGURE 3-13
NOMINAL 4" SQUARE NONMETALLIC OUTLET BOX

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SECTION $A-A$



OPTIONAL CROSS SECTION

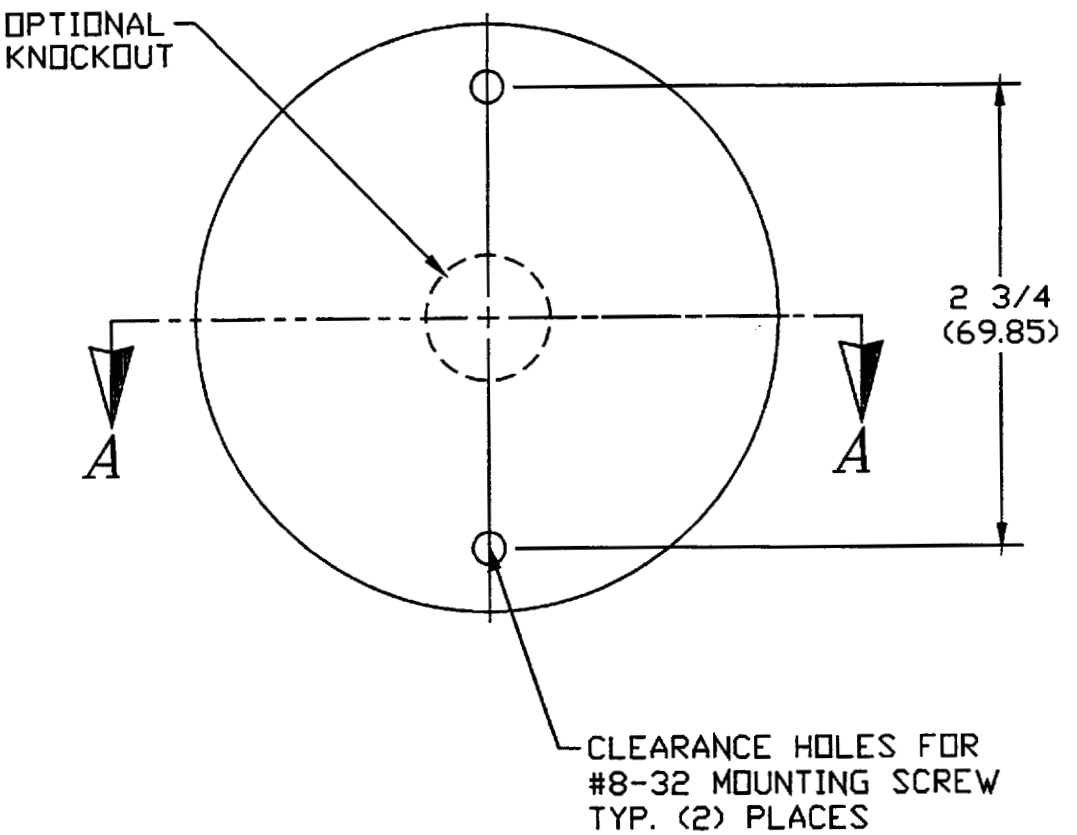
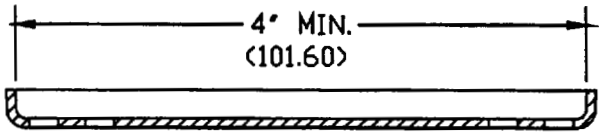


FIGURE 3-14
FLAT BLANK NONMETALLIC COVER FOR NOMINAL 3-1/4", 3-1/2" ROUND OR OCTAGONAL OUTLET BOX

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NOTES:
1.) ALL DIMENSIONS ARE INCHES AND (MILLIMETERS).
2.) TOLERANCES ±1/64 (.397) FOR FRACTIONAL DIMENSIONS UNLESS OTHERWISE SPECIFIED.



SECTION $A-A$



OPTIONAL CROSS SECTION

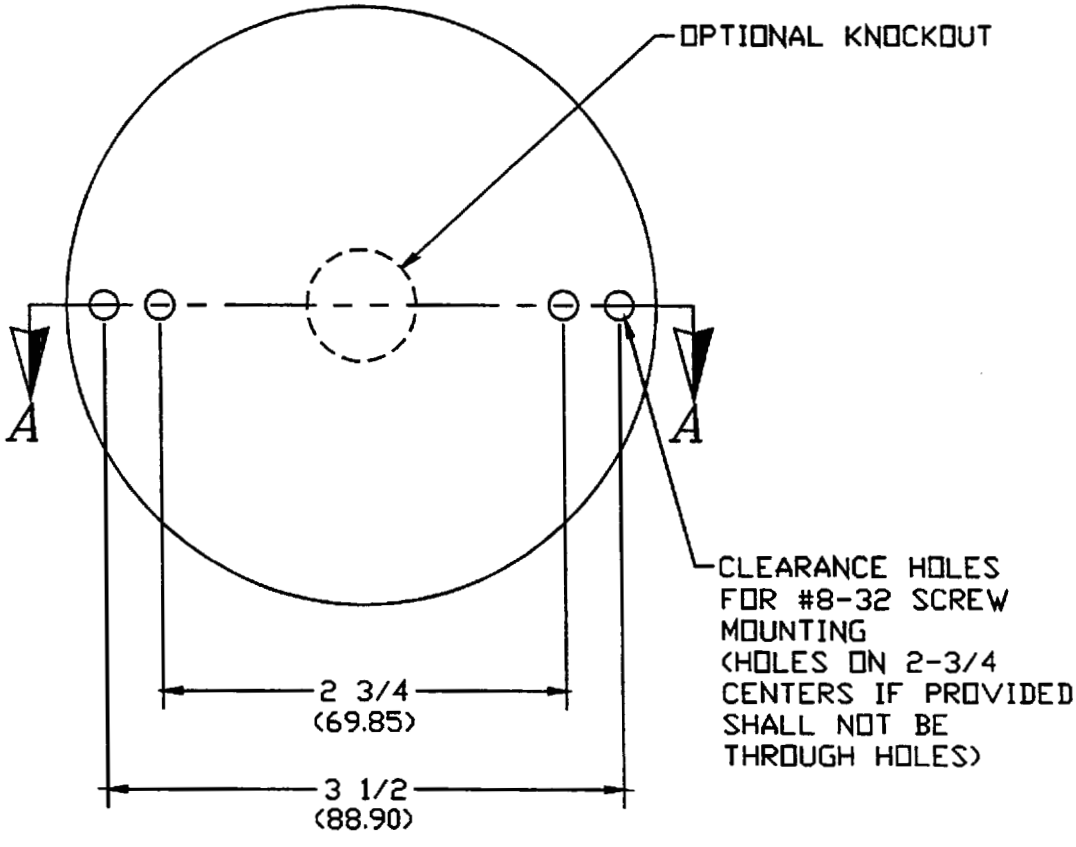
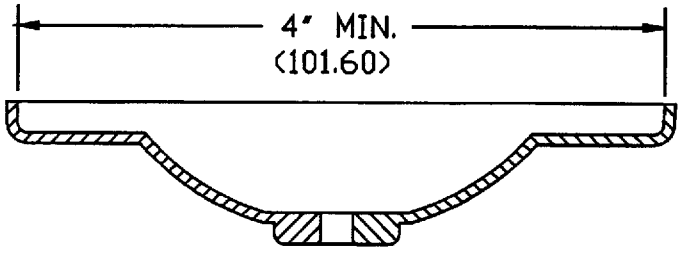


FIGURE 3-15
FLAT BLANK NONMETALLIC COVER FOR NOMINAL 3-1/4",3-1/2",4" ROUND OR OCTAGONAL OUTLET BOX

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2.) TOLERANCE ± 1/64 (.397) FOR FRACTIONAL DIMENSIONS UNLESS OTHERWISE SPECIFIED.



SECTION $A-A$

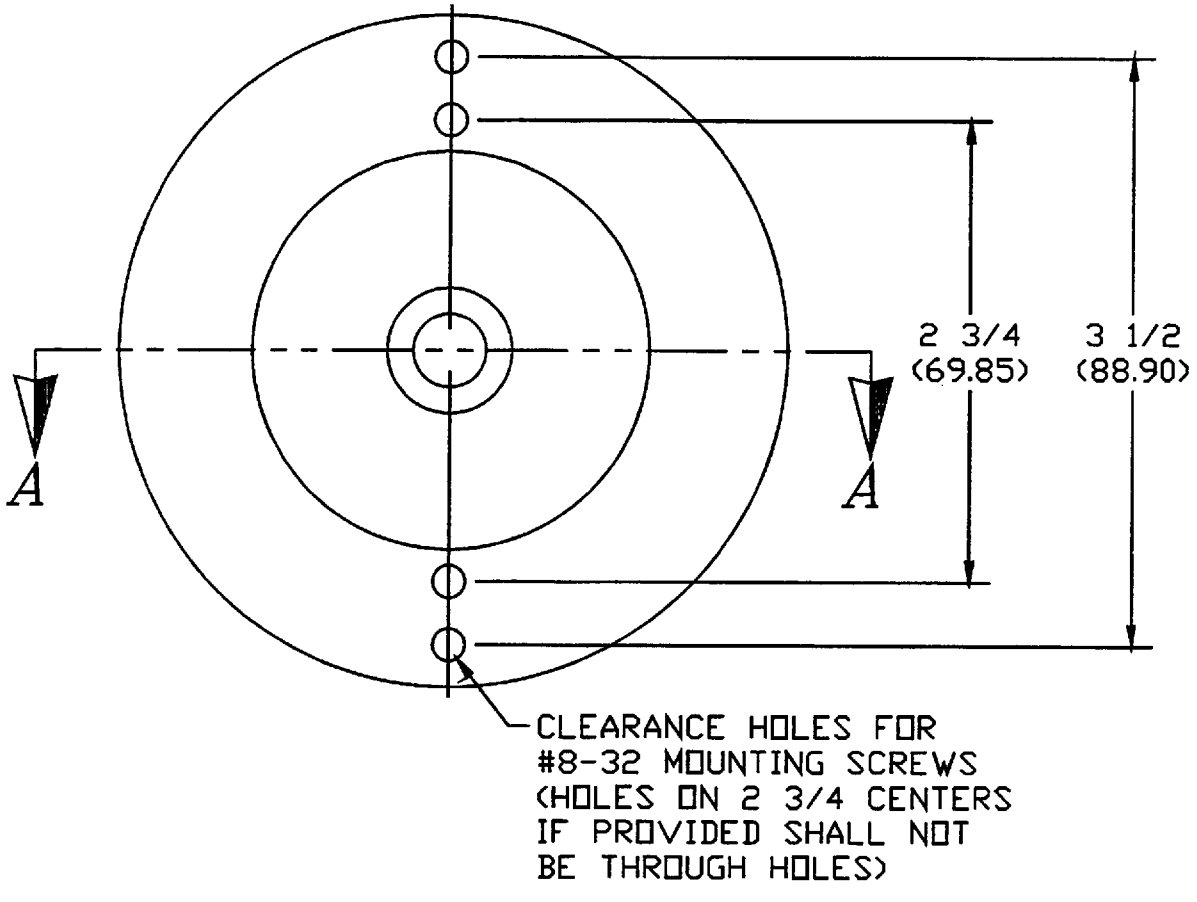


FIGURE 3-16
RAISED BLANK OR CORD DROP NONMETALLIC COVER FOR 3-1/4", 3-1/2", AND 4" ROUND OR OCTAGONAL OUTLET BOX

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2.) TOLERANCE ±1/64 (.397) FOR FRACTIONAL DIMENSIONS UNLESS OTHERWISE SPECIFIED.
3.) SEE FIG. 3-26 FOR ALTERNATE MOUNTING HOLE/SLOT CONFIGURATIONS.

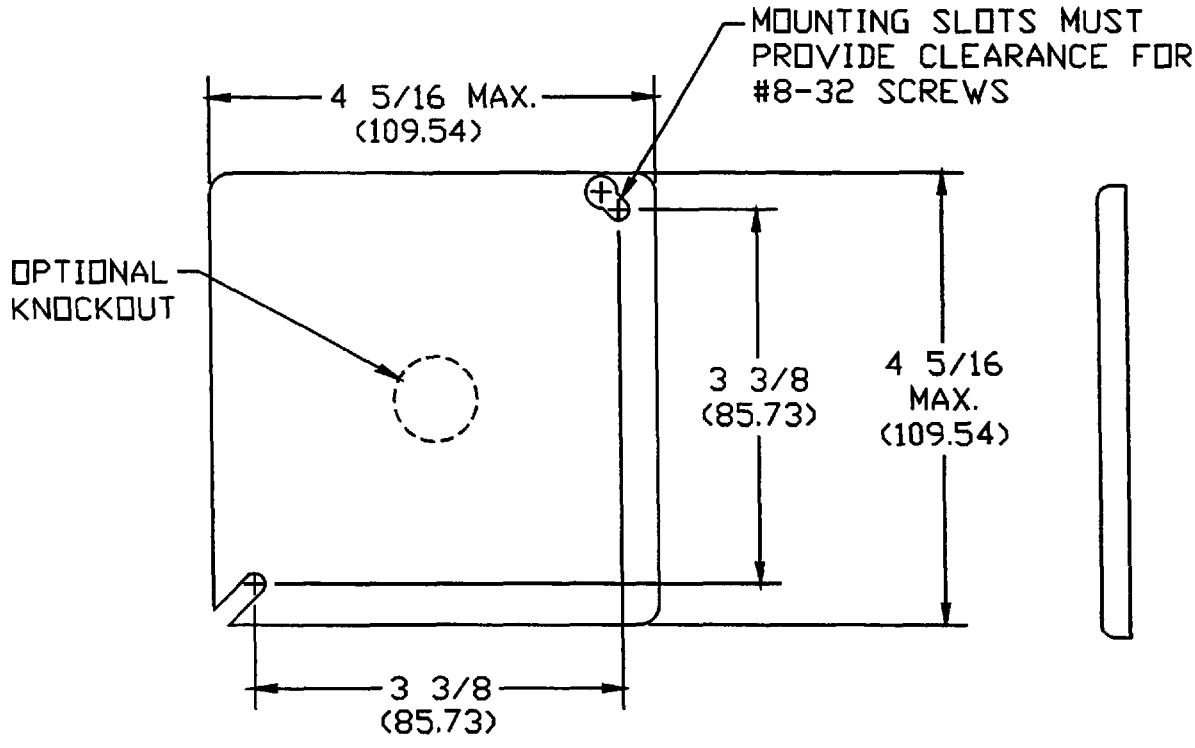


FIGURE 3-17
FLAT BLANK NONMETALLIC COVER FOR 4" SQUARE OUTLET BOX

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NOTES:
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2.) TOLERANCE ± 1/64 (.397) FOR FRACTIONAL DIMENSIONS UNLESS OTHERWISE SPECIFIED.

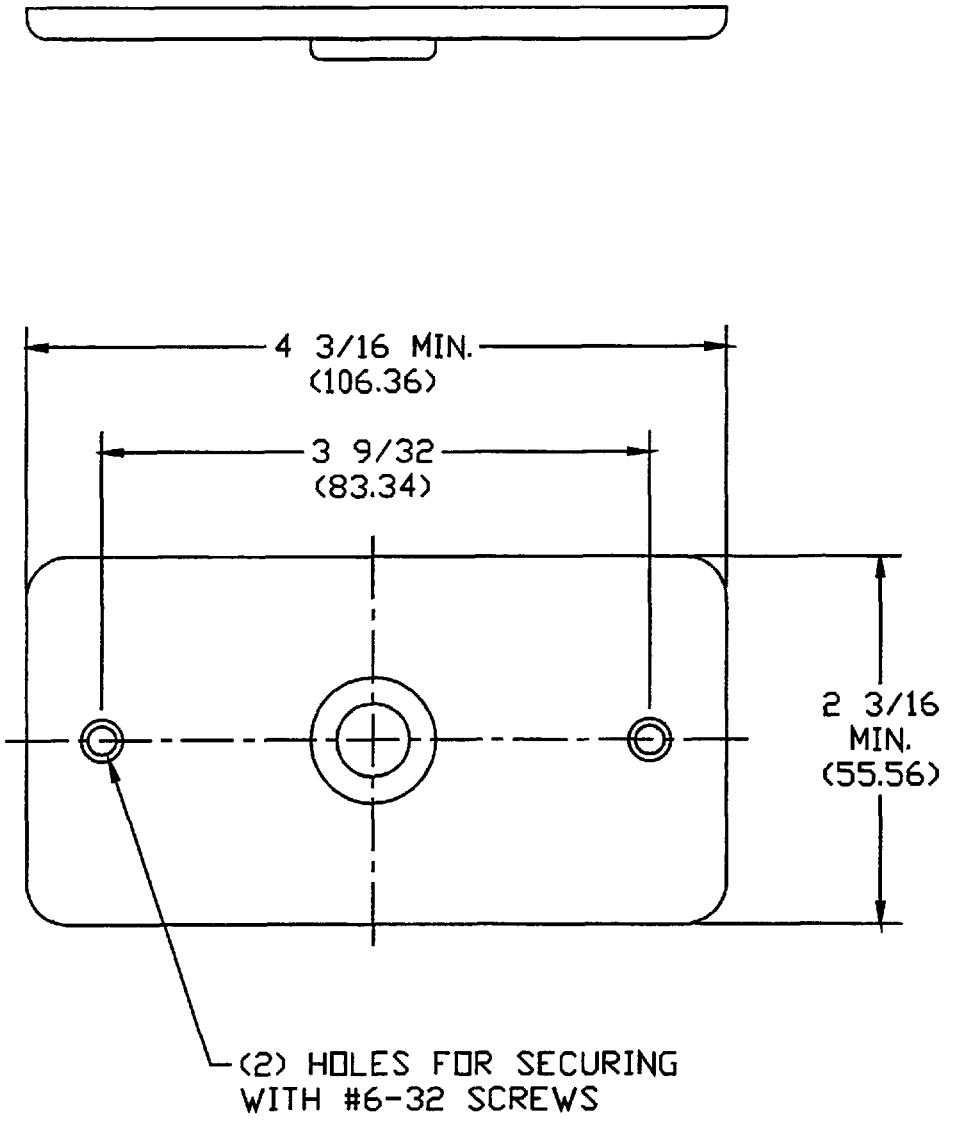


FIGURE 3-18
NONMETALLIC BLANK OR PENDANT COVER
FOR SURFACE MOUNTING DEVICE BOXES

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NOTES:
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2.) TOLERANCE ±1/64 (.397) FOR FRACTIONAL DIMENSIONS UNLESS OTHERWISE SPECIFIED.

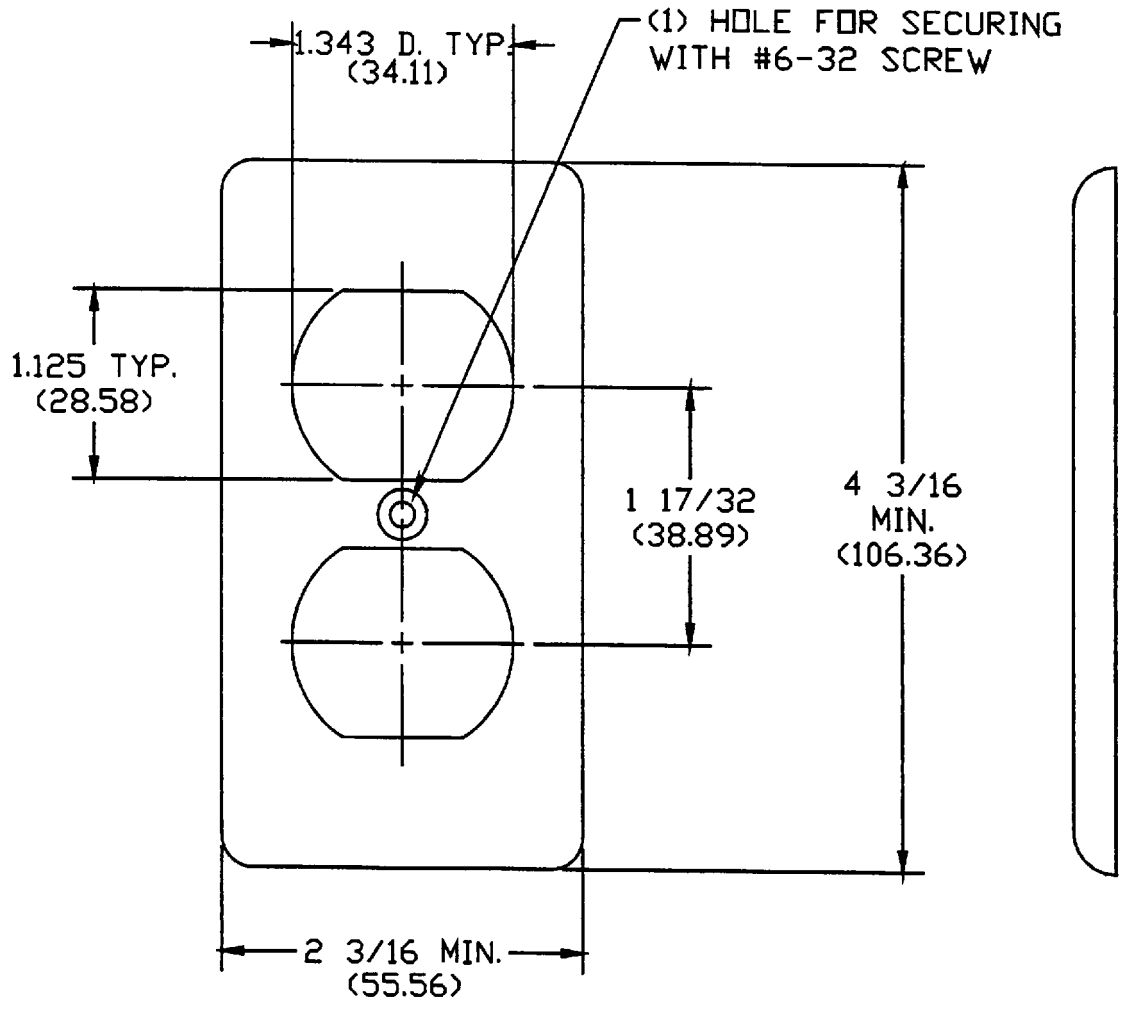


FIGURE 3-19
NONMETALLIC DUPLEX RECEPTACLE COVER FOR SURFACE MOUNTED DEVICE BOXES

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2.) TOLERANCE ± 1/64 (.397) FOR FRACTIONAL DIMENSIONS UNLESS OTHERWISE SPECIFIED.

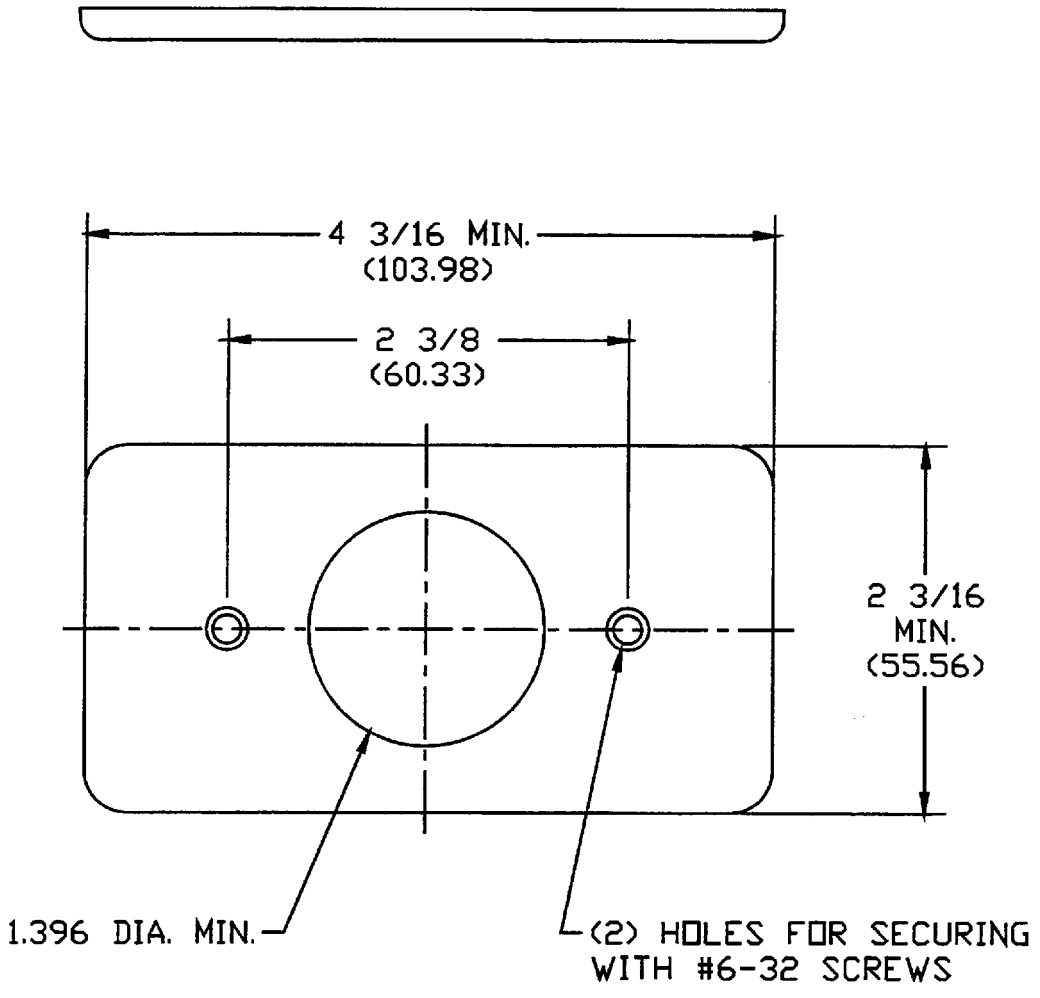


FIGURE 3-20
NONMETALLIC SINGLE RECEPTACLE COVER
FOR SURFACE MOUNTED DEVICE BOXES

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2.) TOLERANCE ±1/64 (.397) FOR FRACTIONAL DIMENSIONS UNLESS OTHERWISE SPECIFIED.

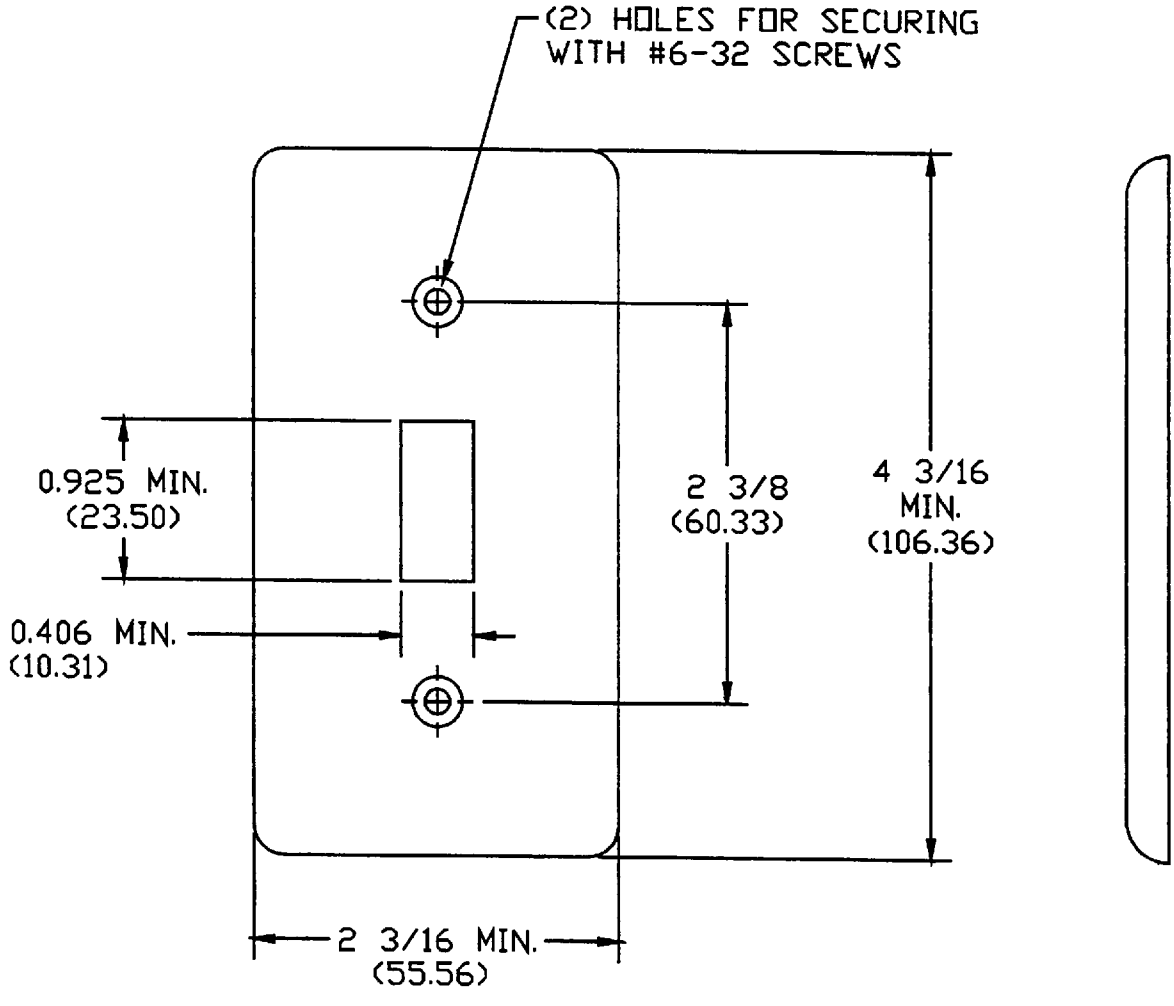
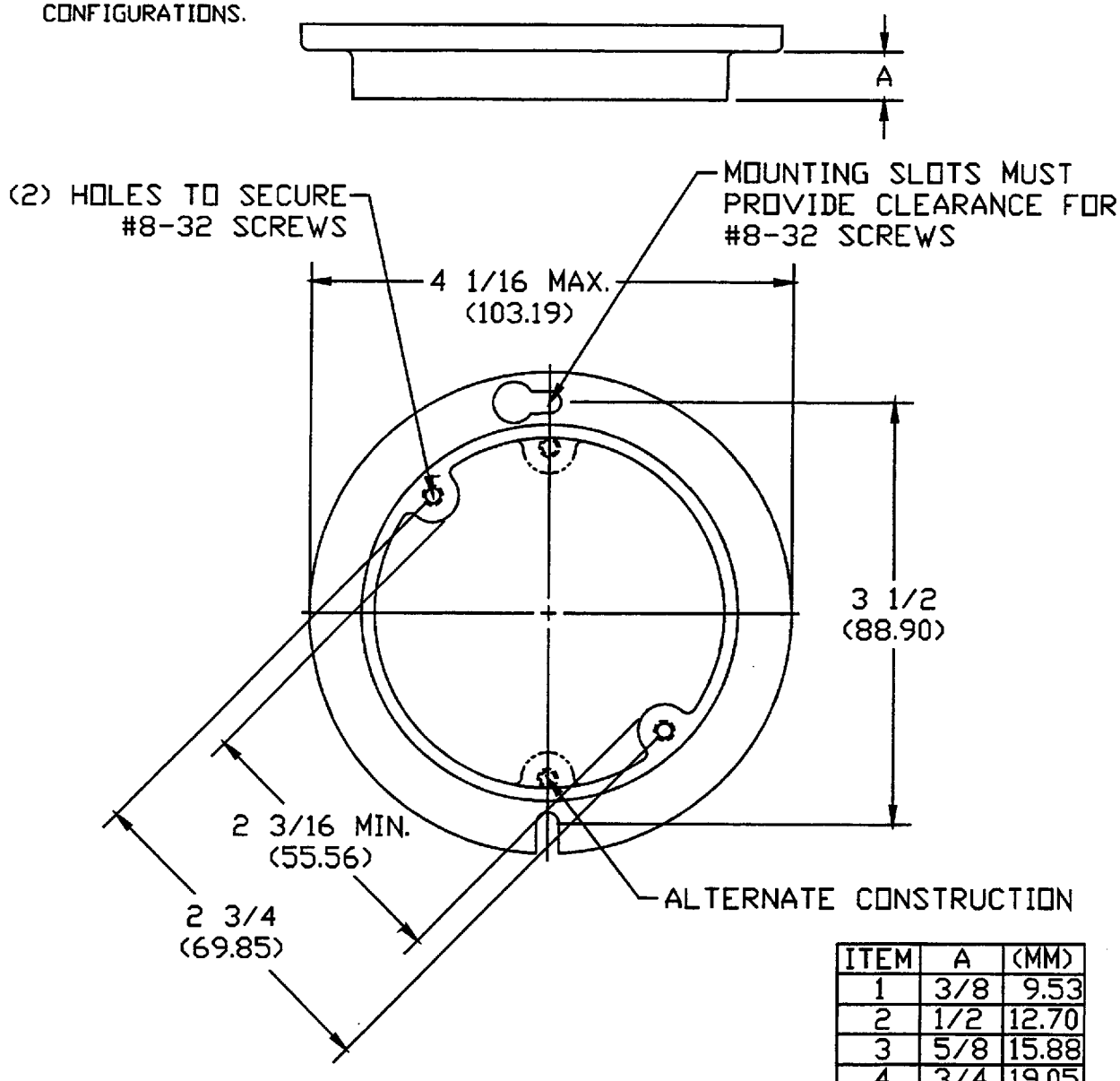


FIGURE 3-21
NONMETALLIC TOGGLE SWITCH COVER FOR SURFACE MOUNTED DEVICE BOXES

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NOTES:
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2.) TOLERANCE ± 1/64 (.397) FOR FRACTIONAL DIMENSIONS UNLESS OTHERWISE SPECIFIED.
3.) SEE FIG. 3-26 FOR ALTERNATE MOUNTING HOLE/SLOT CONFIGURATIONS.

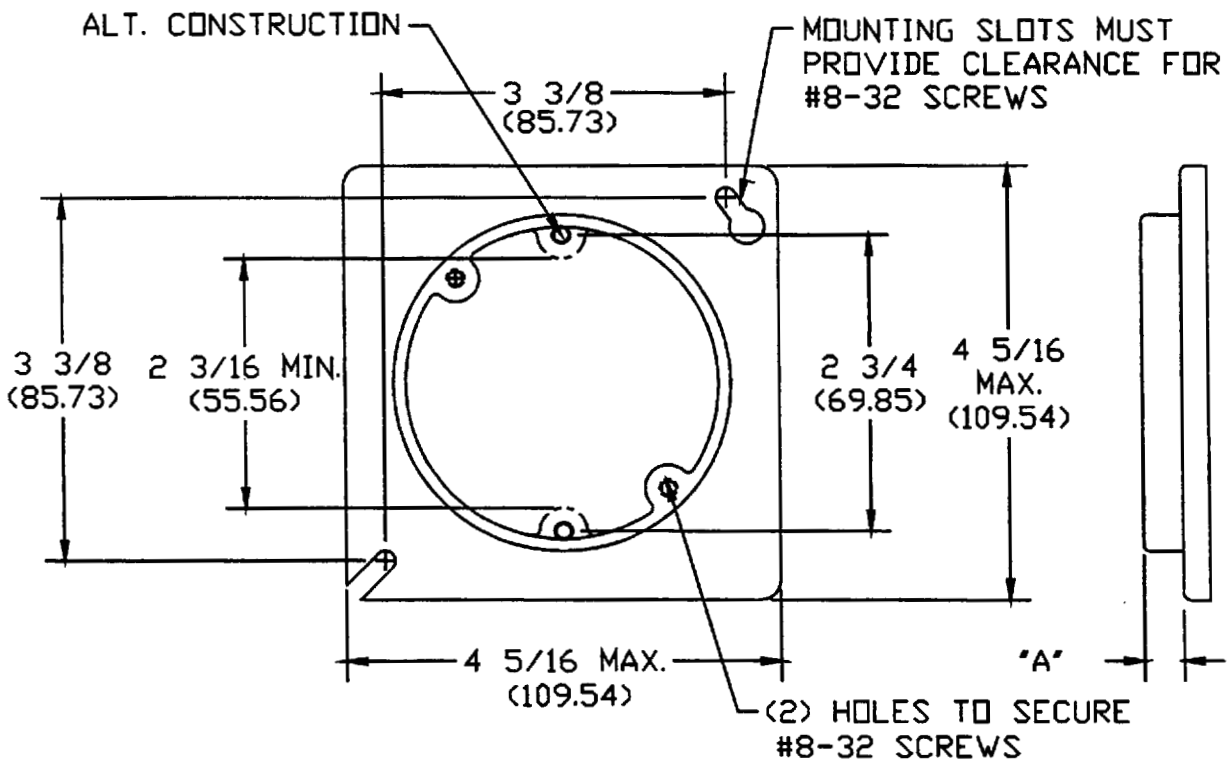


ITEM	A	(MM)
1	3/8	9.53
2	1/2	12.70
3	5/8	15.88
4	3/4	19.05
5	1	25.40
6	1 1/4	31.75

FIGURE 3-22
RAISED FIXTURE ATTACHMENT NONMETALLIC COVER FOR 4" ROUND OR OCTAGONAL OUTLET BOX

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NOTES:
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2.) TOLERANCE ±1/64 (.397) FOR FRACTIONAL DIMENSIONS UNLESS OTHERWISE SPECIFIED.
3.) ALTERNATE MOUNTING HOLE/SLOT CONFIGURATIONS SHOWN IN 3-26 OR ALTERNATE SLOT LOCATIONS SHOWN IN 3-24 MAY BE USED.

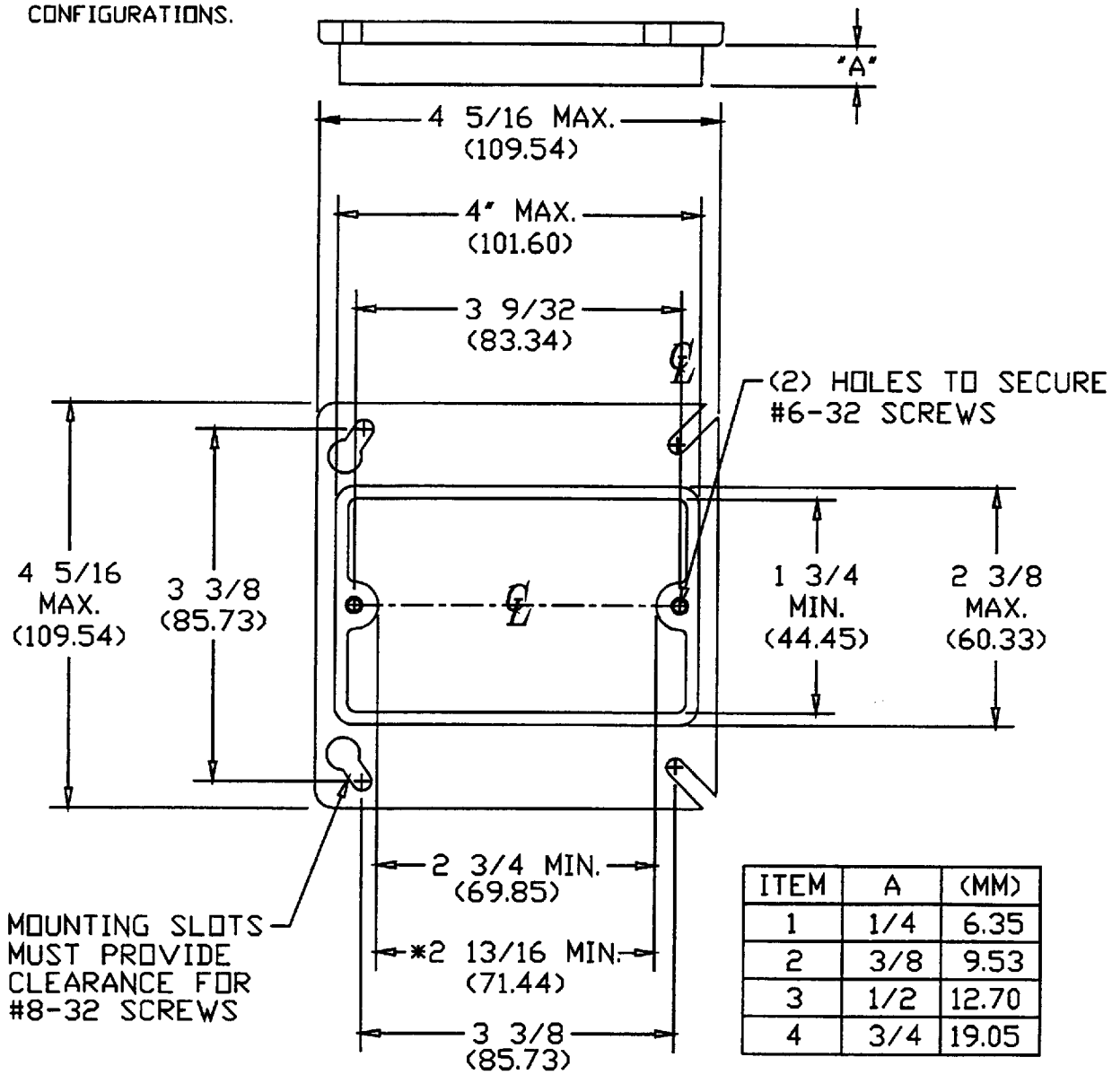


ITEM	A	(MM)
1	3/8	9.53
2	1/2	12.70
3	5/8	15.88
4	3/4	19.05
5	1"	25.40
6	1 1/4	31.75

FIGURE 3-23
RAISED FIXTURE ATTACHMENT NONMETALLIC COVER FOR 4" SQUARE OUTLET BOX

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NOTES:
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2.) TOLERANCE ± 1/64 (.397) FOR FRACTIONAL DIMENSIONS UNLESS OTHERWISE SPECIFIED.
3.) SEE FIG. 3-26 FOR ALTERNATE MOUNTING HOLE/SLOT CONFIGURATIONS.



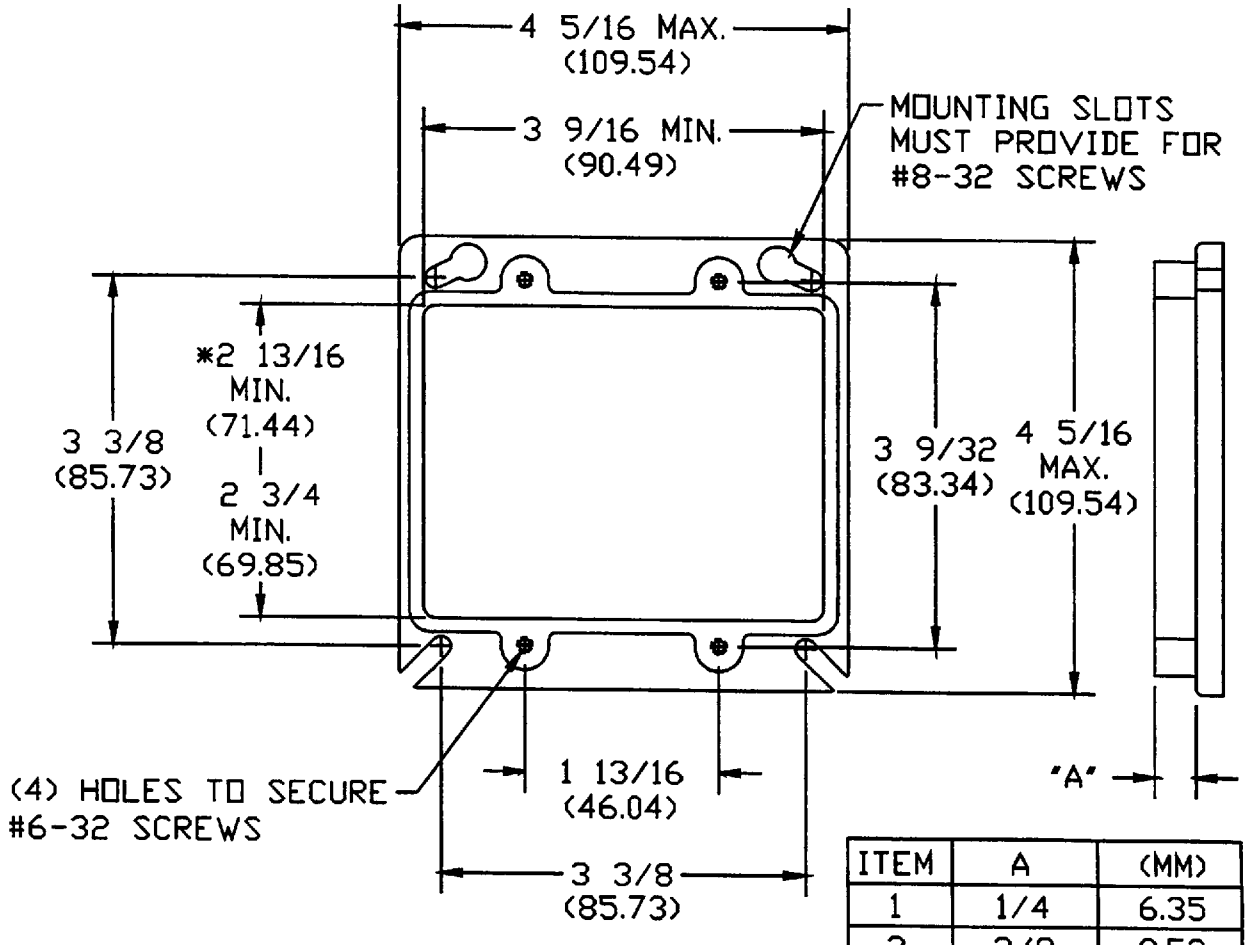
ITEM	A	(MM)
1	1/4	6.35
2	3/8	9.53
3	1/2	12.70
4	3/4	19.05

*SUGGESTED STANDARD FOR FUTURE DESIGN

FIGURE 3-24
RAISED SINGLE-DEVICE NONMETALLIC COVER
FOR 4" SQUARE OUTLET BOX

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NOTES:
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2.) TOLERANCE ±1/64 (.397) FOR FRACTIONAL DIMENSIONS UNLESS OTHERWISE SPECIFIED.
3.) SEE FIG. 3-26 FOR ALTERNATE MOUNTING HOLE/SLOT CONFIGURATIONS.



ITEM	A	(MM)
1	1/4	6.35
2	3/8	9.53
3	1/2	12.70
4	3/4	19.05

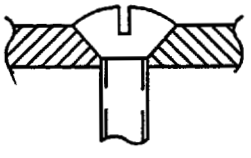
*SUGGESTED STANDARD FOR FUTURE DESIGN

FIGURE 3-25
RAISED TWO-DEVICE NONMETALLIC COVER FOR 4" SQUARE OUTLET BOX

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MOUNTING SLOTS MUST PROVIDE
CLEARANCE FOR #8-32 SCREWS



MOUNTING CONFIGURATIONS MAY
BE COUNTERSUNK 82 DEGREES
FOR #6 OVAL HEAD MACHINE
SCREW.

FIG. 3-26
ALTERNATE COVER MOUNTING HOLE(S) , SLOT(S) CONFIGURATIONS
(NO SCALE)

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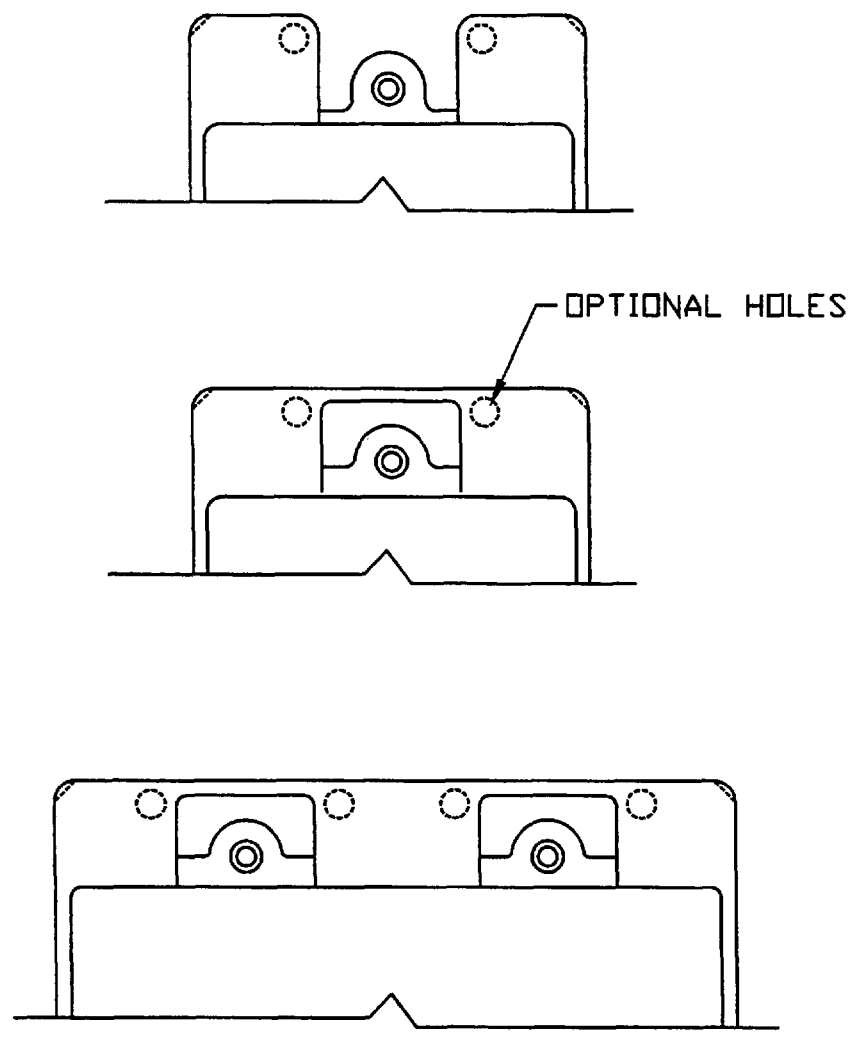


FIG. 3-27
ALTERNATE EAR CONFIGURATIONS
(NO SCALE)

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