



The Association of Design, Production, and Technology Professionals in the Performing Arts and Entertainment Industry

USITT S3-1997 Standard for Stage Pin Connectors

A Project of the USITT Engineering Commission

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USITT S3-1997

STANDARD for STAGE PIN CONNECTORS

USITT ENGINEERING COMMISSION

Final Standard, March 1997

United States Institute for Theatre Technology, Inc.
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Syracuse, NY 13206-1111

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REVISION HISTORY

First draft: November, 1995
Second draft: January, 1996
Third draft: April, 1996
Fourth draft: January, 1997 (final)
Editorial corrections: March 1997

FOREWORD

The purpose of this standard is to present the dimensional and other requirements of a series of wiring devices used in the Entertainment Industry and known as Stage Pin Connectors. In preparation of this Standard, input from manufacturers and other interested parties has been sought and evaluated. Upon occasion this Standard may be revised to expand it and keep it up-to-date with changes in the Industry. Proposed changes should be submitted to the Engineering Commission of the United States Institute for Theatre Technology, Inc.

SCOPE 1.0

- 1.1 This standard covers the general and dimensional requirements for a series of split-pin and sleeve wiring devices known as Pin Connectors, Stage Pin Connectors, or Bates Connectors which are used predominately in the theatre, television and motion picture industries.
- 1.2 Appendix A contains a Connector Configuration Chart of past, present and future pin connector configurations. It is for reference only. Only those connectors in the body of this document are an official part of this Standard.

REFERENCES 2.0

In this publication, reference is made to the standards listed below. Copies are available from the indicated sources.

NFPA70-1996 National Electrical Code (NEC)
National Fire Protection Association
Batterymarch Park
Quincy, MA. 02269

DEFINITIONS AND CONVENTIONS 3.0

DEFINITIONS 3.1

- 3.11** Attachment Plug (Cap) – A plug is a device with male contacts which, when inserted into a receptacle or cord connector, establishes connection between the conductors of the attached flexible cord or cable and the conductors connected to the receptacle or cord connector.
- 3.12** Cord Connector (Connector Body) – A cord connector is a portable female receptacle which is attached to or provided with a means for attachment to a flexible cord or cable, and which is not intended for fixed mounting.
- 3.13** Grounded Conductor (System Ground) – A grounded conductor is a circuit conductor (normally current carrying) which is intentionally connected to earth ground. This conductor is known in the Entertainment industry as the Neutral, but is technically not the Neutral in all cases. (It is identified in North America by a white or grey insulation, and in Europe by a blue (single-phase) or black (3-phase) insulation.)
- 3.14** Grounding Conductor (Equipment Ground) – A grounding conductor is a conductor which connects non-current-carrying metal parts of equipment to the system ground to provide an intentional low impedance path for fault current. (It is bare, or is identified by green or green with yellow striped insulation.)
- 3.15** Inlet (Male Base, Motor Base) – An inlet is a male plug which is intended for flush or surface mounting on an appliance or equipment, and which serves to connect utilization equipment to a cord connector.
- 3.16** Polarized – “Polarized” is a term used to describe a connector that is constructed such that it cannot be mated in any manner other than the intended one.
- 3.17** Pole – The term “pole” as used in designating plugs and receptacles refers to a terminal to which a circuit conductor (normally current carrying) is connected. The grounding conductor terminal is not considered a pole.
- 3.18** Receptacle – A receptacle is a device with female contacts which is primarily installed at an outlet or on equipment, and which is intended to establish electrical connection with an inserted plug.
- 3.19** Wire (with reference to plugs and receptacles) – The term “wire” as used in designating plugs and receptacles indicates the total number of conductors to be connected to the wiring device. This definition includes the grounding conductor.

CONVENTIONS 3.2

- 3.21** Dash Symbol (-) – The “dash” symbol as used in wiring device ratings indicates that the device is suitable for use on any circuit within the range of the ratings.
- 3.22** Slant Symbol (/) – The “slant” symbol as used in wiring device ratings indicate that two or more voltages are present simultaneously between different terminals.

GENERAL REQUIREMENTS 4.0

- 4.1** Unless otherwise marked, attachment plugs and connector bodies are designed to attach to cords or cables sized per Table 400-5(A) of the NEC. If Table 400-5(A) does not indicate sufficient ampacity, cables are sized per the 60 degree C columns E and F of Table 400-5(B). Devices suitable for use with 75 degree C, 90 degree C or column D cables shall be so marked.
- 4.2** Unless otherwise marked, all devices are designed for indoor use, or outdoor use where protected and supervised per Section 520-10 and 530-6 of the NEC. Connectors suitable for damp or wet locations shall be so marked.
- 4.3** All male pins shall be of the split type. Male devices shall be made so as to mate with the female fixture described in figures 5.5 thru 5.8.
- 4.4** All female devices shall be made so as to mate with the male fixture described in figures 5.5 thru 5.8.
- 4.5** Grounded terminals shall be indicated by the letter "W" on the configuration drawings for field connection of a grounded circuit conductor shall be identified by a metallic coating substantially "white" in color, or marked with "W" or "White" or a "White" marking.
- 4.6** Grounding terminals shall be indicated by the letter "G" on the configuration drawings for field connection of a equipment grounding conductor shall be identified with a "G", "Green" or a "Green" marking.
- 4.7** Other terminals may be marked or unmarked, if marked shall be marked "X"; "X" and "Y"; or "X", "Y", and "Z". These terminals must be distinguishable from those marked in accordance with 4.4 and 4.5 above.
- 4.8** Connectors rated 20A or less which meet the UL guarding test are suitable for use in unrestricted areas. Connectors with ratings greater than 20A do not necessarily meet the probe test and must be guarded from the general public.
- 4.9** The dimension for the entrance hole on the 20 Amp female connector is recommended. However, if the recommended dimension is exceeded on a 20 Amp device it shall be guarded from the public and marked "To be used by Qualified Personnel Only."
- 4.10** It is not the intent of this Standard to limit alternate constructions.

DRAWING NOTES 5.0

The following notes apply to the configurations shown in Figures 5.1 thru 5.8.

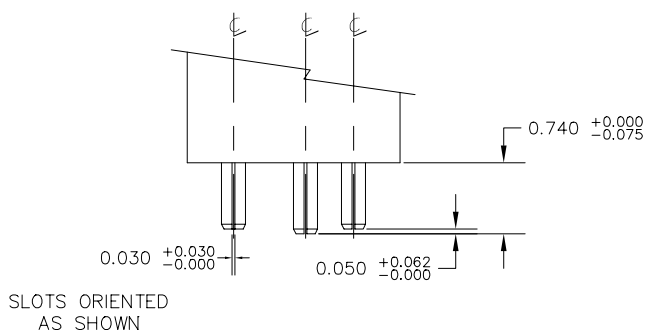
- 5.1** All dimensions are in inches.
- 5.2** Decimal dimensions tolerances shall be subject to a +/- 0.005 inch tolerance unless otherwise specified.
- 5.3** Angular dimensions tolerances shall be subject to a +/- 1 degree tolerance unless otherwise specified.
- 5.4** Leading edges of all pins and sleeves shall be free of burrs and sharp edges.

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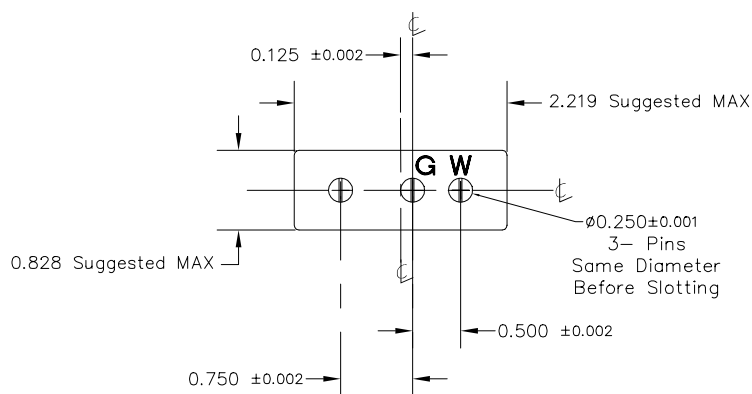
2-POLE, 3-WIRE GROUNDING DEVICES RATED
20 AMPERES 125 VOLTS; 15 AMPERES 250 VOLTS

PLUG

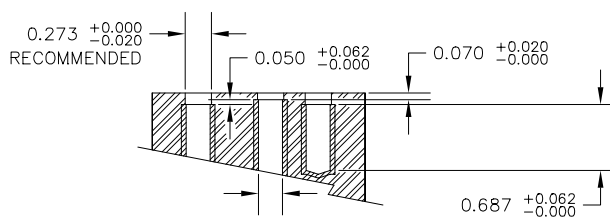


5T20

Figure 5.1



RECEPTACLE



THE RECEPTACLE'S CONTACTS SHALL BE SIZED SO AS TO FUNCTION RELIABLY WITH THE FULL RANGE OF ALLOWABLE PIN DIAMETERS AND PIN SLOT WIDTHS

DECIMAL DIMENSIONS SHALL BE SUBJECT TO A +/- 0.005 INCH TOLERANCE UNLESS OTHERWISE SPECIFIED

ANGULAR DIMENSIONS SHALL BE SUBJECT TO A +/- 1 DEGREE TOLERANCE UNLESS OTHERWISE SPECIFIED

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TITLE S3-1997: 5T20 - Figure 5.1			
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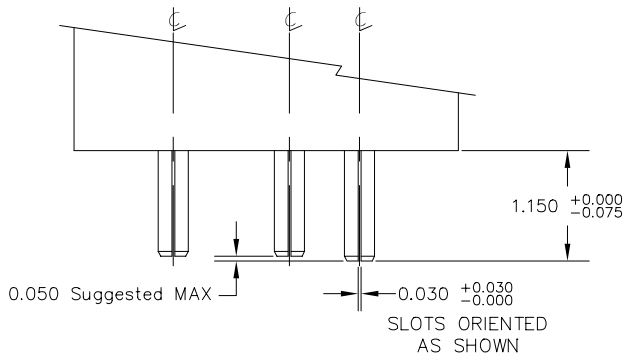
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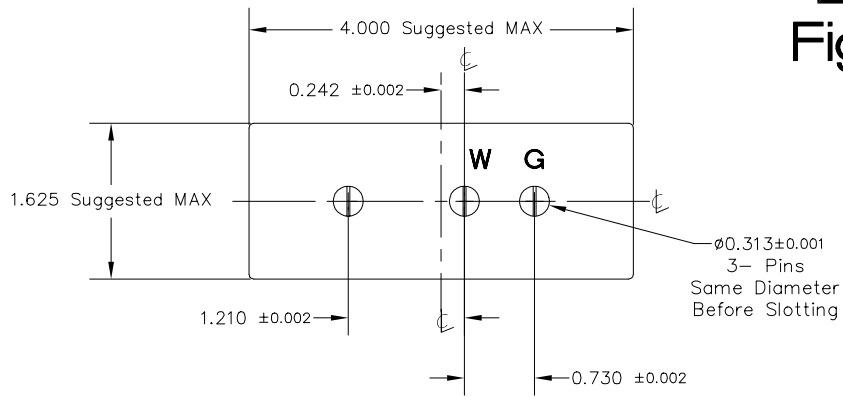
2-POLE, 3-WIRE GROUNDING DEVICES RATED
30 AMPERES 125 VOLTS – 250 VOLTS

PLUG

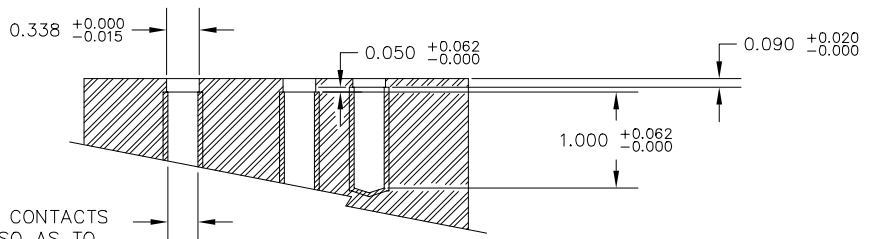


5T30

Figure 5.2



RECEPTACLE



THE RECEPTACLE'S CONTACTS SHALL BE SIZED SO AS TO FUNCTION RELIABLY WITH THE FULL RANGE OF ALLOWABLE PIN DIAMETERS AND PIN SLOT WIDTHS

DECIMAL DIMENSIONS SHALL BE SUBJECT TO A +/- 0.005 INCH TOLERANCE UNLESS OTHERWISE SPECIFIED
ANGULAR DIMENSIONS SHALL BE SUBJECT TO A +/- 1 DEGREE TOLERANCE UNLESS OTHERWISE SPECIFIED

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2-POLE, 3-WIRE GROUNDING DEVICES RATED
60 AMPERES 125 VOLTS – 250 VOLTS

PLUG

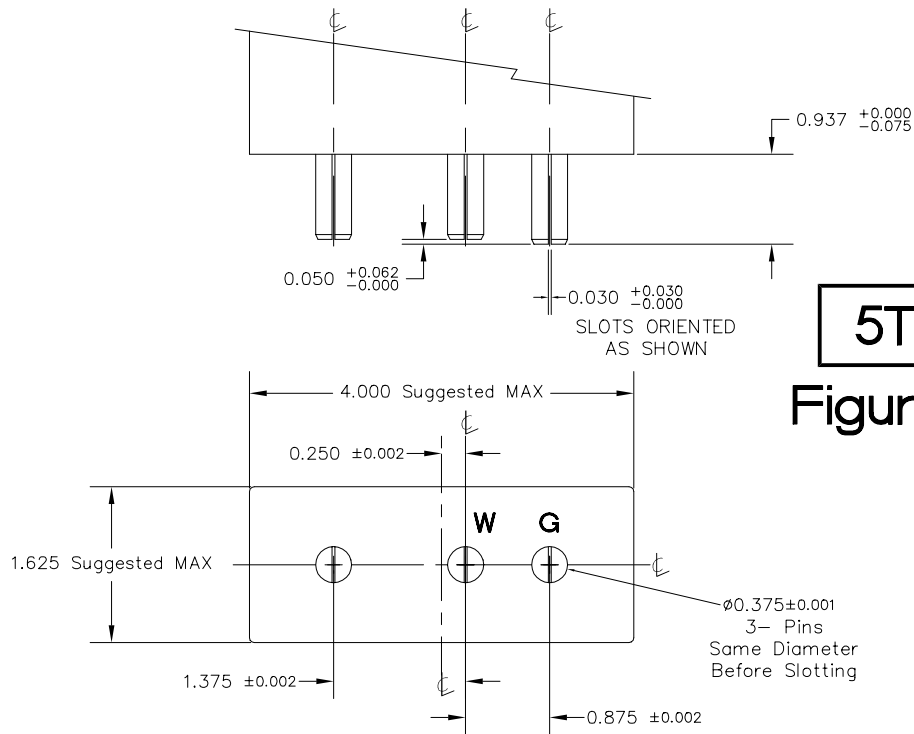
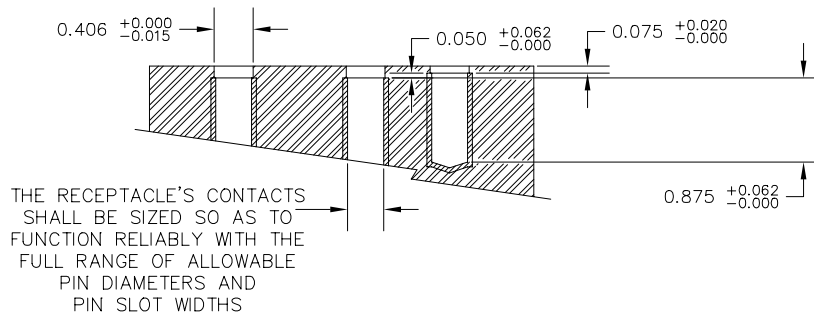


Figure 5.3

RECEPTACLE



DECIMAL DIMENSIONS SHALL BE SUBJECT TO A +/- 0.005 INCH TOLERANCE UNLESS OTHERWISE SPECIFIED

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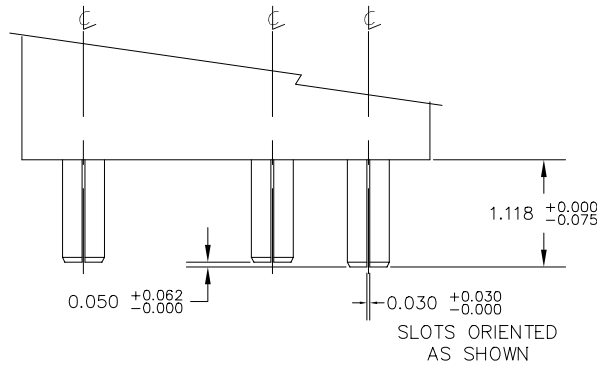
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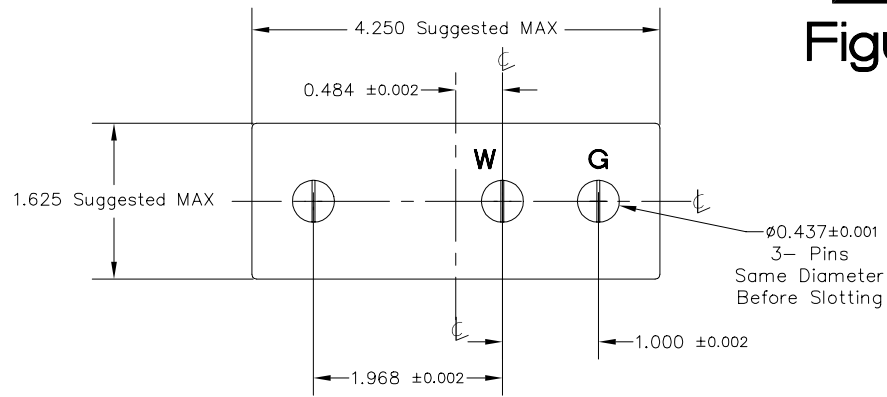
2-POLE, 3-WIRE GROUNDING DEVICES RATED
100 AMPERES 125 VOLTS - 250 VOLTS

PLUG

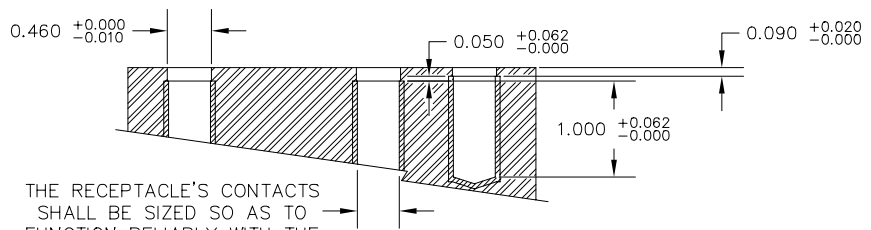


5T100

Figure 5.4



RECEPTACLE



THE RECEPTACLE'S CONTACTS SHALL BE SIZED SO AS TO FUNCTION RELIABLY WITH THE FULL RANGE OF ALLOWABLE PIN DIAMETERS AND PIN SLOT WIDTHS

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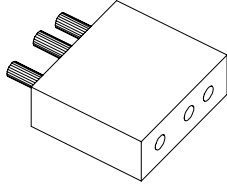
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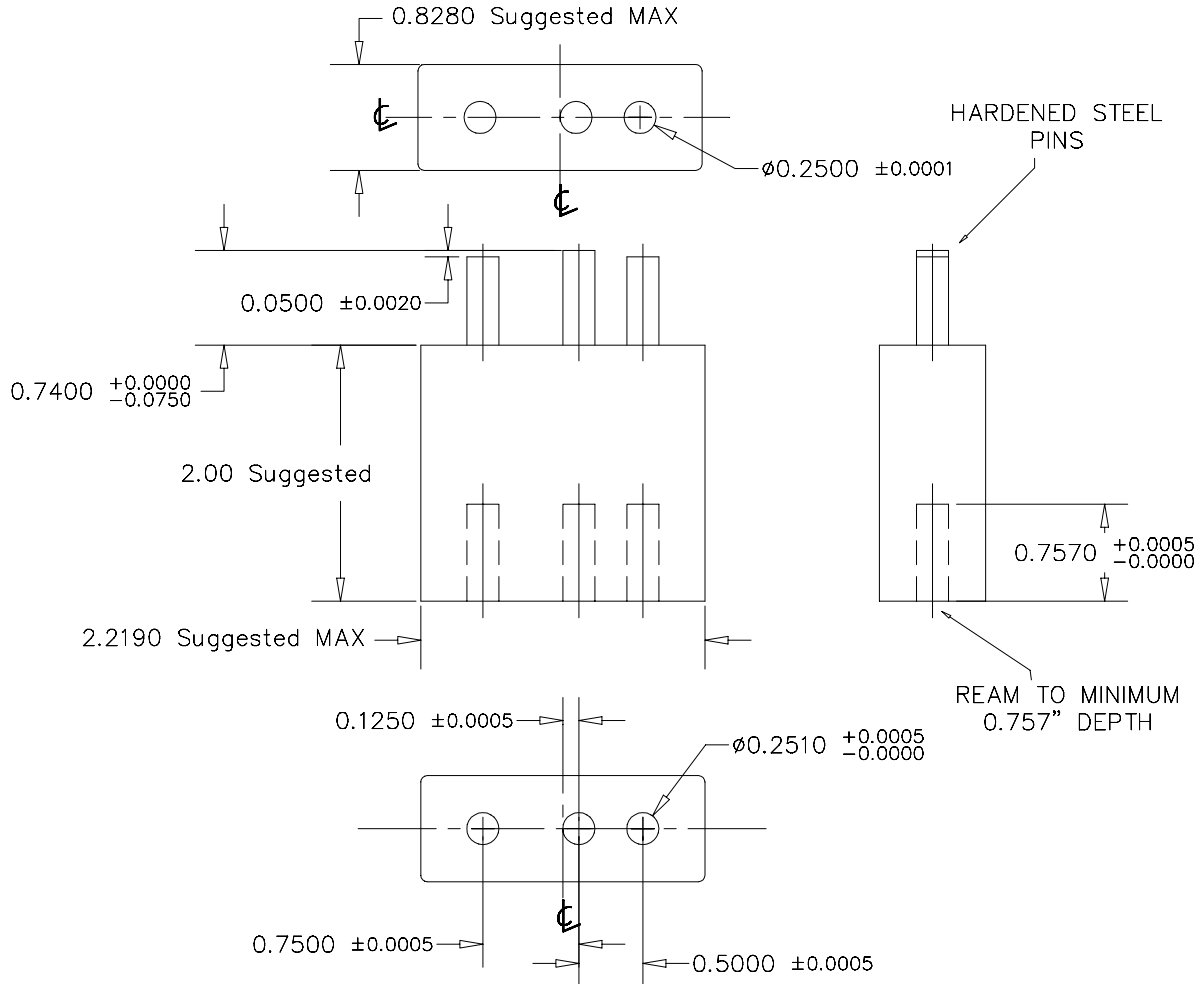
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5T20 REFERENCE

Figure 5.5



DECIMAL DIMENSIONS SHALL BE SUBJECT TO A +/- 0.005 INCH TOLERANCE UNLESS OTHERWISE SPECIFIED

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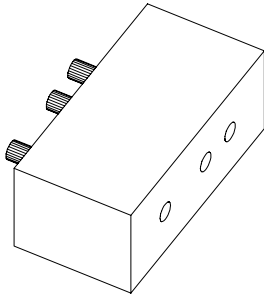
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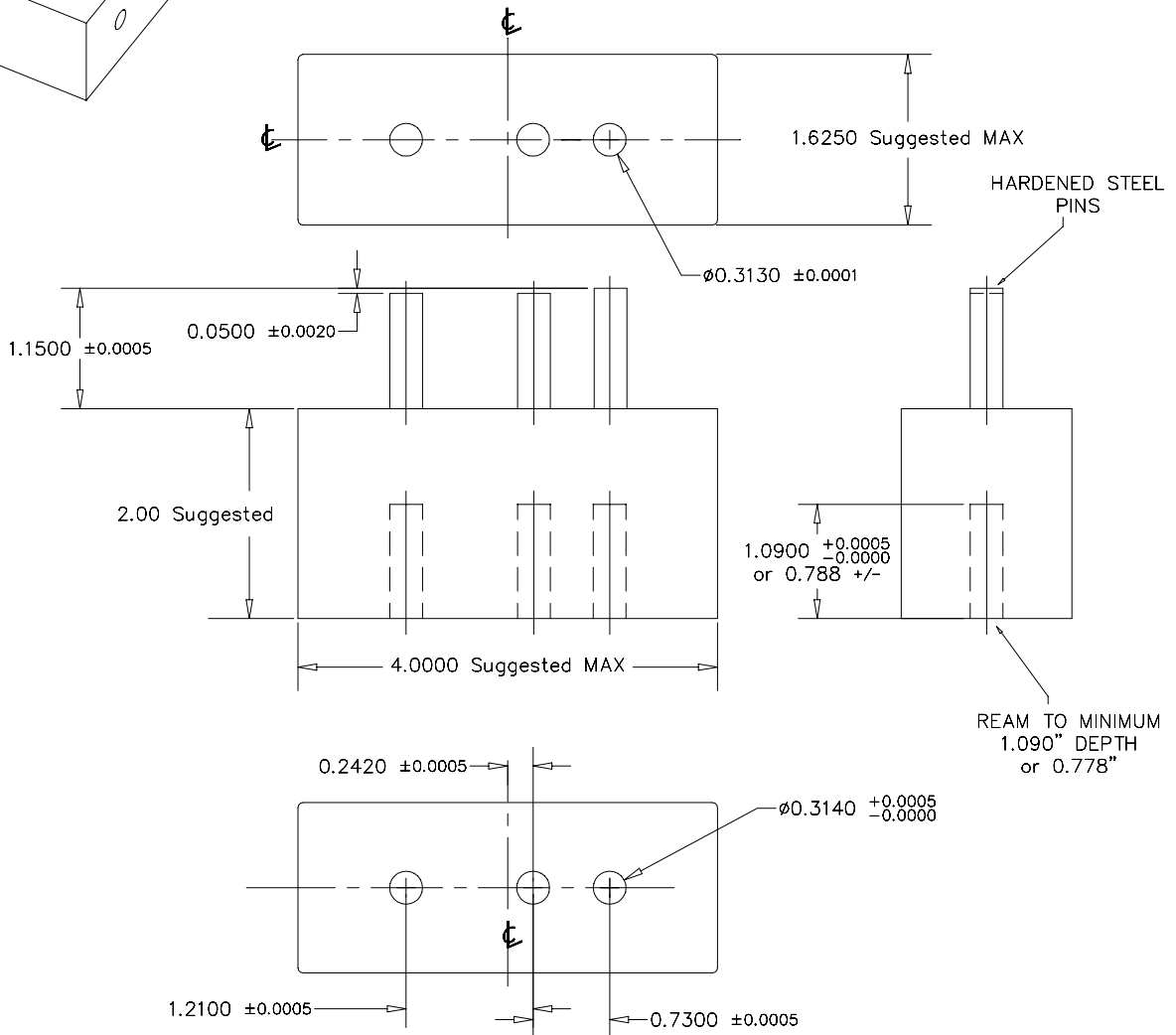
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5T30 REFERENCE

Figure 5.6



DECIMAL DIMENSIONS SHALL BE SUBJECT TO A ± 0.005 INCH TOLERANCE UNLESS OTHERWISE SPECIFIED

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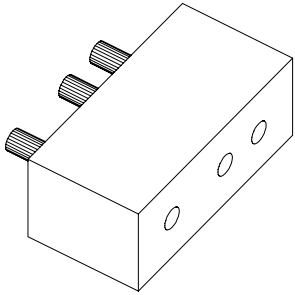
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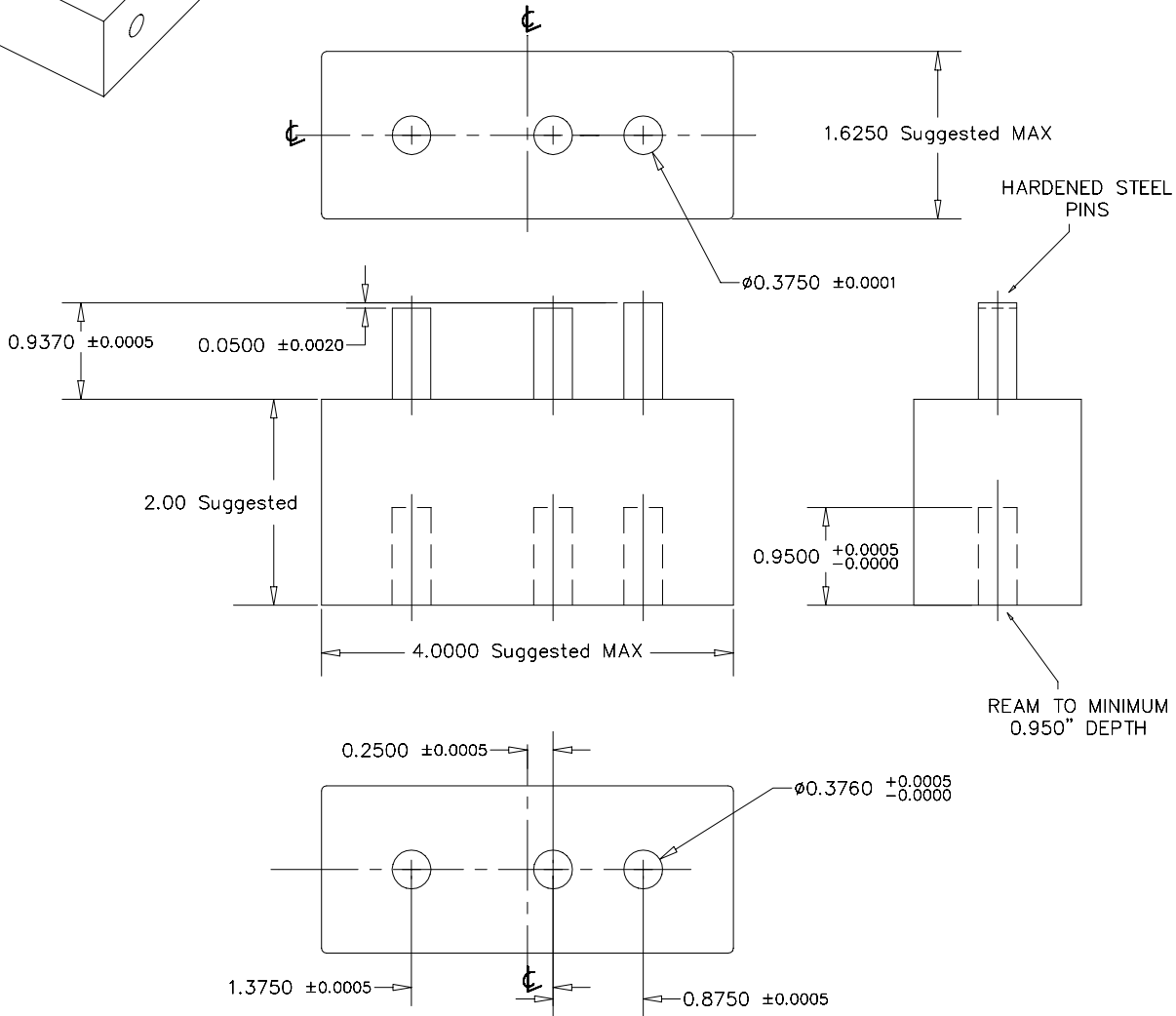
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5T60 REFERENCE

Figure 5.7



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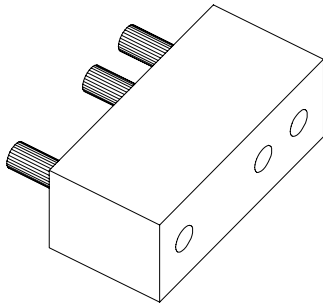
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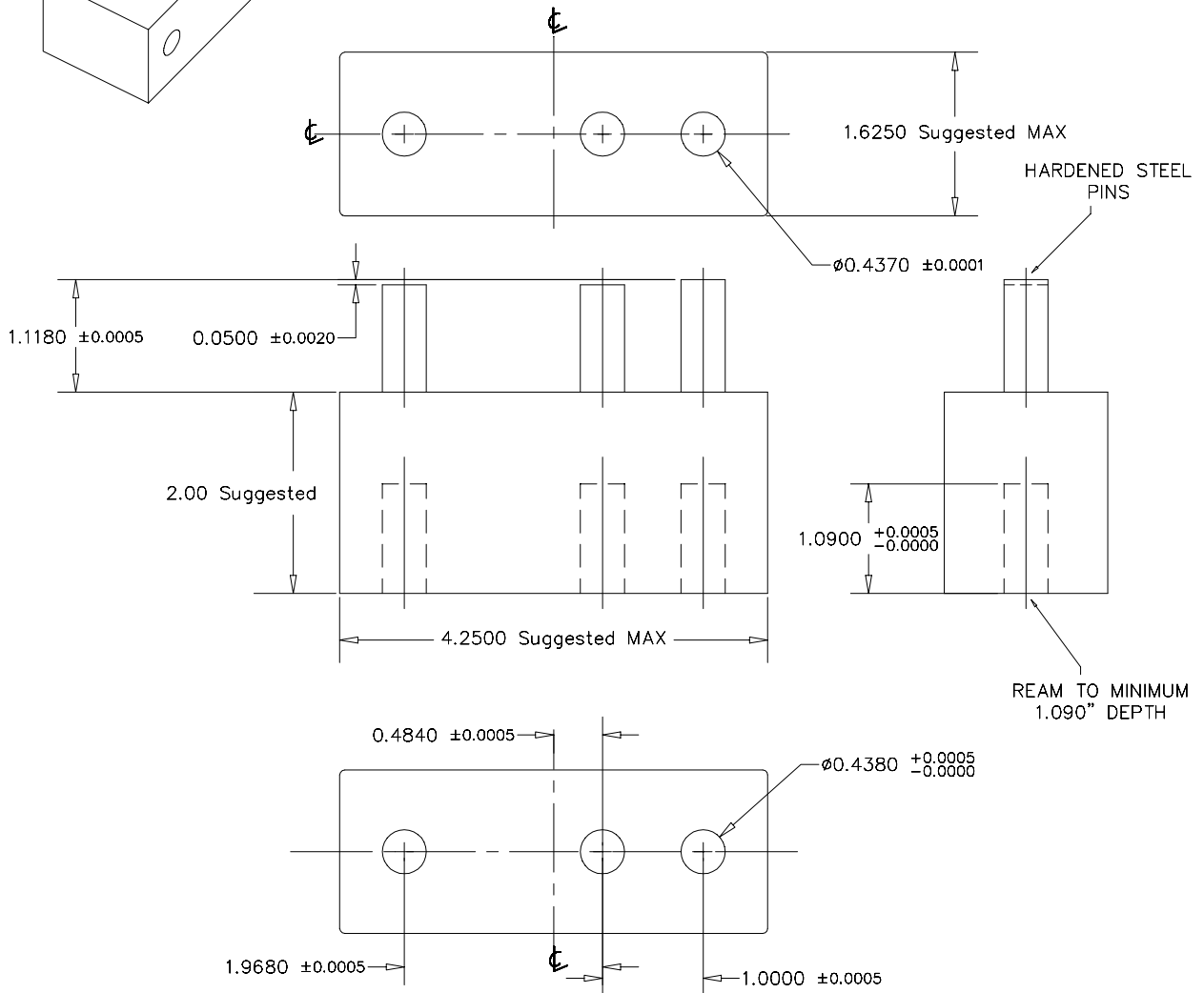
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5T100 REFERENCE

Figure 5.8



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APPENDIX A - INFORMATIVE USITT STAGE PIN CONNECTOR CONFIGURATIONS CHART

RECEPTACLE	5 AMPERE		20 AMPERE		30 AMPERE		60 AMPERE		75 AMPERE		100 AMPERE	
	RECEPTACLE	PLUG	RECEPTACLE	PLUG	RECEPTACLE	PLUG	RECEPTACLE	PLUG	RECEPTACLE	PLUG	RECEPTACLE	PLUG
2-POLE 2-WIRE	125 V	1	125 V	1	125 V	1	125 V	1	125 V	1	125 V	1
2-POLE 2-WIRE	250 V	2	250 V	2	250 V	2	250 V	2	250 V	2	250 V	2
2-POLE 3-WIRE GROUNDING	125 V (2)	5	125 V (2)	5	125 V (2)	5	125 V (2)	5	125 V (2)	5	125 V (2)	5
2-POLE 3-WIRE GROUNDING	250 V	6	250 V	6	250 V	6	250 V	6	250 V	6	250 V	6
3-POLE 3-WIRE	125 V / 250 V	10	125 V / 250 V	10	125 V / 250 V	10	125 V / 250 V	10	125 V / 250 V	10	125 V / 250 V	10
3-POLE 3-WIRE	30Δ / 250 V	11	30Δ / 250 V	11	30Δ / 250 V	11	30Δ / 250 V	11	30Δ / 250 V	11	30Δ / 250 V	11
3-POLE 4-WIRE GROUNDING	125 V / 250 V	14	125 V / 250 V	14	125 V / 250 V	14	125 V / 250 V	14	125 V / 250 V	14	125 V / 250 V	14
3-POLE 4-WIRE GROUNDING	30Δ / 250 V	15	30Δ / 250 V	15	30Δ / 250 V	15	30Δ / 250 V	15	30Δ / 250 V	15	30Δ / 250 V	15
4-POLE 4-WIRE	120Y / 208 V	18	120Y / 208 V	18	120Y / 208 V	18	120Y / 208 V	18	120Y / 208 V	18	120Y / 208 V	18
4-POLE 4-WIRE	30Y / 120V / 208 V	21	30Y / 120V / 208 V	21	30Y / 120V / 208 V	21	30Y / 120V / 208 V	21	30Y / 120V / 208 V	21	30Y / 120V / 208 V	21

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B RELEASED		mkh	02/13/97		
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- NOTES:
- PIN DIAMETERS: 5A 3/16"
20A 1/4"
30A 5/16"
60A 3/8"
75A 3/8"
100A 7/16"
 - HISTORICALLY THE TYPE 5 (125 V) CONNECTORS WERE RATED @ 250 V AND USUALLY USED @ 125 V WITH THE CONTACT CLOSEST TO THE GROUNDING (NEUTRAL) WIRED TO THE GROUNDING (NEUTRAL) THESE CONNECTORS ARE RATED @ 125 V AS INDICATED AND ARE ALSO RATED @ 250 V FOR USE ONLY ON SYSTEMS WITH ONE GROUNDED CIRCUIT CONDUCTOR (NOT NORMALLY AVAILABLE IN NORTH AMERICA). THESE 20 AMP AMERICAN TYPE RATED @ 15 AMPS WHEN USED @ 250 V.

- CONTACT FUNCTIONS:
W GROUNDED CONDUCTOR
G (NEUTRAL)
X, Y, Z GROUNDING CONDUCTOR (NO STANDARD FUNCTIONS ARE ASSIGNED)
P MECHANICAL POLARIZATION (NOT CONDUCTIVE)
- ASTERSK (*) INDICATES CONFIGURATION MECHANICALLY REVERSIBLE (NOT POLARIZED)



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APPENDIX B

Notes

Connectors rated 20A, 60A and 100A are suitable for use on 15A, 50A and 90A branch circuits, respectively. When installed in a fixed wiring system, they shall be used at only one of the ratings on any given premises. When installed in portable wiring systems, they may be used at more than one rating on any given premises providing they are marked in the field with the rating at which they are to be operated.

Connectors are suitable for use on AC or DC. When installed in a fixed wiring system, they shall be used on only one type of voltage source on any given premises. When installed in portable wiring systems, they may be used on both types of voltage source on any given premises providing they are marked in the field with the type of voltage source which they are to be operated on.

Historically the Type 5 (125V) connectors were rated at 250V, and usually used at 125V with the unmarked contact closest to the grounding contact wired to the grounded conductor. Currently these connectors are rated at 125V, and also at 250V for use only on systems with one grounded circuit conductor. Since 240V is usually available in North America from two ungrounded conductors, the 240V rating is usually only useful outside North America.

These connectors shall be periodically inspected to make sure the pins remain spread.