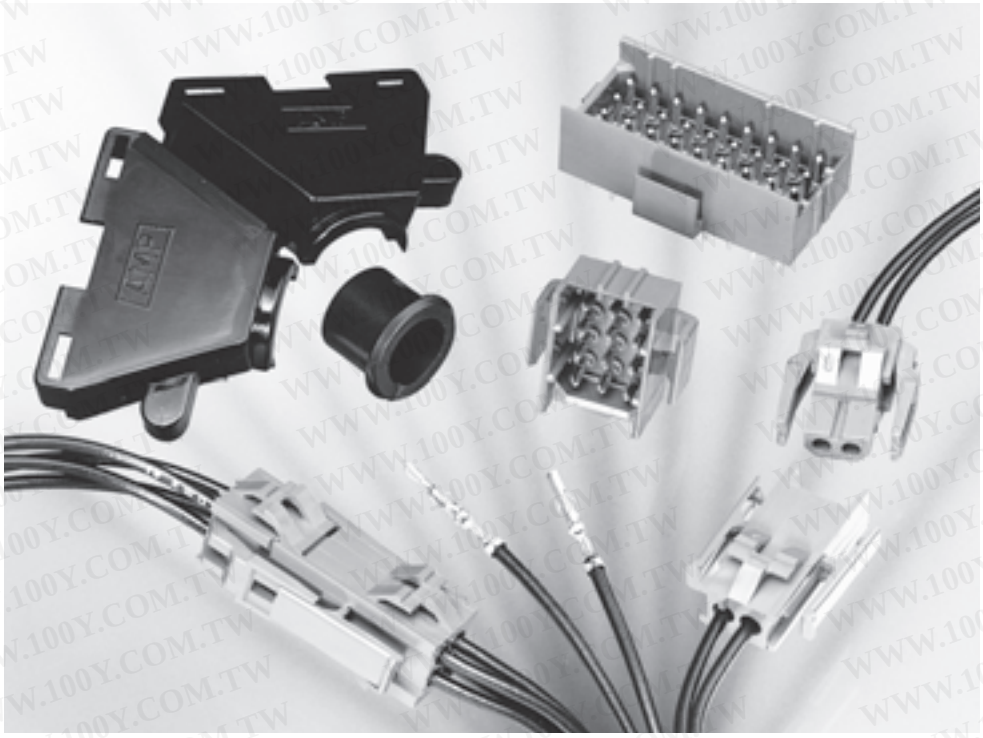
(MR) Miniature Rectangular Connectors (Continued)

Product Facts

- Housings positively lock to help prevent accidental disengagement
- Either cap or plug housing can be mounted in same rectangular panel cutout without additional hardware
- UL94V-0 housings
- Plug and cap design includes molded-in polarizing feature for proper mating
- Numbered cavities for easy circuit identification
- Egg crate design of plug half fully encloses socket contacts, reducing shock hazard
- Molded skirt extension on cap protects pin contacts
- Strain reliefs for 6 through 36 positions are available
- Choice of tin or gold plated contacts
- Not for interrupting current
- Socket solder tail contacts available for hot side PC Board mounting
- High density achieved through .165 [4.19] contact centerline spacing
- Extraction tool removes both pins and sockets
- Contacts accept 26-18 AWG [.12-.8 mm²] wire sizes and insulation diameters of .025-.115 [.635-2.92]
- Same applicator crimps pins and sockets
- Vertical PC Board pin headers are available
- Pin header standoffs on housings at board interface facilitates gas venting and cooling during soldering
- Recognized under the Component Program of Underwriters Laboratories Inc., File No. E28476
- Certified by Canadian Standards Association, File No. LR 7189



Performance Characteristics

The Miniature Rectangular Connector performance characteristics found on pages 103-104 are based on free hanging and panel mount connectors, loaded with contacts crimped on stranded wire.

Dielectric Withstanding Voltage
2.5 KVAC between adjacent circuits

Insulation Resistance—
1500 megohms minimum initial between adjacent circuits

Voltage Rating—250 V AC

Connector Mating—
Split Pin — 1.0 lb. max. per circuit

Connector Unmating—
Split Pin — .25 lb. min. per circuit

Contact Insertion Force—
1.75 lb. max. per contact

Contact Retention—10 lb. min. per contact

Durability—25 cycles, mating and unmating

Technical Documents

Product Specifications

108-1022 (MR) Miniature Rectangular Connectors

108-1078 (MR) Miniature Rectangular Headers

Application Specification

114-1014 (MR) Miniature Rectangular Contacts

Instruction Sheet

408-3231 Pin, Socket, Housing, Contacts, and Accessories

Catalog 82181
Revised 5-06

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Dimensions are shown for reference purposes only. Specifications subject to change.

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Japan: 81-44-844-8013
UK: 44-208-420-8341

(MR) Miniature Rectangular Connectors (Continued)

Performance Characteristics
(Continued)

Maximum Current—Maximum current rating of Miniature Rectangular connectors is limited by the maximum operating temperature of the housings which is 105°C including the temperature rise of the contacts which is a maximum of 30°C. There are several variables which have a direct effect on this maximum current-carrying capability for a given connector and must be considered for each application. These variables are:

Wire Size—Larger diameter wire will carry more current since it has less internal resistance to current flow and thus generates less heat. Longer wire lengths also enhance current-carrying capabilities since the wire conducts heat away from the connector.

Connector Size—In general, the more circuits in a connector, the less current can be carried.

Ambient Temperature—The higher the ambient temperature, the less current can be carried in any given connector.

Printed Wiring Board Conductor Size—The finished trace conductor width and thickness should be maximized to allow for the greatest current-carrying capacity and heat dissipation.

Miniature Rectangular connectors also will withstand the following tests:

Vibration—10-55-10 cycles per minute at .06 inch total excursion

Physical Shock—18 drops, 50 G sawtooth at 10 milliseconds

Housing Panel Retention—50 lb. min.

Housing Lock Strength—20 lb. min.

Thermal Shock— -55°C to +85°C

Temperature-Humidity Cycling—25°C to 65°C at 95 RH

Corrosion—48 hr. at 5% salt concentration

Related Product Data

Product Specifications

108-1022 (MR) Miniature Rectangular Connectors

108-1078 (MR) Miniature Rectangular Headers

Current Rating Verification for 30°C Maximum Temperature Rise 100% Energized

Wire-to-Wire MR Calculated Current Table

Number of Circuits	Wire Gauge				
	18	20	22	24	26
2	9.00	8.00	6.50	5.50	5.00
3	8.50	7.00	6.00	5.00	4.50
4	7.00	6.50	5.50	5.00	4.00
6	6.00	6.00	5.00	4.00	4.00
9	5.00	5.00	4.00	4.00	3.50
12	4.50	4.50	4.00	3.50	3.00
15	4.50	4.00	3.50	3.00	2.50
20	4.00	4.00	3.50	3.00	2.50
24	4.00	3.50	3.00	2.50	2.00
36	3.50	3.00	2.50	2.00	2.00

Values are based on initial Temperature Rise versus Current Testing and are intended to be a guide in the selection of a connector family. All applications should be tested by the end user. The values listed are per circuit for fully loaded housings being 100% energized. **Note:** All combinations were not tested and this chart contains interpolated and extrapolated values.

Minimum Wire Lengths for T-Rise vs. Current Testing

AWG	Min. Length (in.)	AWG	Min. Length (in.)
30	2.6	18	9.4
28	3.2	16	11.3
26	4.1	14	13.7
24	5.1	12	16.4
20	7.8	10	19.3

Note: If wire lengths used are less than those listed above, the current-carrying ability of the system will be reduced due to less heat being conducted away from the connector. The customer should fully test all applications.

Wire-to-Board

Due to the vast differences in trace geometry and printed circuit board configurations, we are unable to provide a separate current carrying chart for our printed circuit board header products. However, the above Wire-to-Wire charts may be used as a guideline for headers if the trace width and thickness is equal to the listed wire gauge. For vertical headers, only 95% of the Wire-to-Wire value should be used. For right-angle headers, only 75% of the Wire-to-Wire value should be used. The charted values are only a tool for connector selection and will require the customer to fully test their application.

Termination Resistance/Contact Crimp Tensile Force

Wire Size		Termination Resistance		Contact Crimp Tensile Force	
AWG	mm²	Test Current (Amps)	Resistance Milliohms (Max. Init.)	Force (Min.) lbs.	Force (Min.) N
26	.12	1	5.00	5	22
24	.2	1.5	5.00	8	36
22	.3	3	4.50	14	62
20	.5	4.5	4.00	14	62
18	.8	6	4.00	30	133

Note: This is the total resistance between wire crimps of a mated pin and socket.

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(MR) Miniature Rectangular Connectors (Continued)

(MR) Miniature Rectangular Connector Mating Combinations

Connector Part Number				Mating Connector Part Number			
Number of Circuits	Flammability Rating	Style	Pin Housing (Cap) Part No.	Socket Housing (Plug) Part No.	PC Board Vertical Pin Headers		
					Plating	.062 Board	.120 Board
2	UL94V-0	In-Line	1-640507-0	1-640517-0	Tin	640497-1	640497-3
					Duplex[1]	2-640497-2	2-640497-4
3	UL94V-0	In-Line	1-640508-0	1-640518-0	Tin	640498-1	640498-3
					Duplex[1]	2-640498-2	2-640498-4
4	UL94V-0	Matrix	1-640509-0	1-640519-0	Tin	640499-1	640499-3
					Duplex[1]	2-640499-2	2-640499-4
6	UL94V-0	Matrix	1-640510-0	1-640520-0	Tin	640500-1	640500-3
					Duplex[1]	2-640500-2	2-640500-4
9	UL94V-0	Matrix	1-640511-0	1-640521-0	Tin	640501-1	640501-3
					Duplex[1]	2-640501-2	2-640501-4
12	UL94V-0	Matrix	1-640512-0	1-640522-0	Tin	640502-1	640502-3
					Duplex[1]	2-640502-2	2-640502-4
15	UL94V-0	Matrix	1-640513-0	1-640523-0	Tin	640503-1	640503-3
					Duplex[1]	2-640503-2	2-640503-4
20	UL94V-0	Matrix	1-640514-0	1-640524-0	Tin	640504-1	640504-3
					Duplex[1]	2-640504-2	2-640504-4
24	UL94V-0	Matrix	1-640515-0	1-640525-0	Tin	640505-1	640505-3
					Duplex[1]	2-640505-2	2-640505-4
36	UL94V-0	Matrix	1-640516-0	1-640526-0	Tin	640506-1	640506-3
					Duplex[1]	2-640506-2	2-640506-4

[1]Duplex Finish — Plated with .000030 [.000762] min. gold in mating area, matte tin on solder tail end over .000050 [.00127] min. nickel underplate on entire contact.

Note: **All part numbers are RoHS Compliant.**

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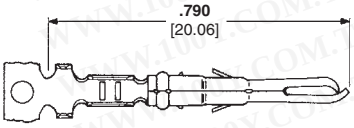
(MR) Miniature Rectangular Connectors (Continued)

Contacts

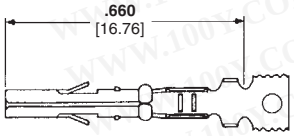
Pin diameter .068 [1.73]

Material

Phosphor bronze
Stock thickness .008 [.203]



Live Split Pin



Standard Socket

Wire Size Range AWG [mm²]	Ins. Dia. Range	Finish	Contact Part Numbers				HDM Applicator Part No.	Hand Tool Part No.
			Live Split Pin		Standard Socket			
			Strip Form	Loose Piece	Strip Form	Loose Piece		
26-24 [.12-.2]	**.025-.050** .635-1.27	Pre-tin	350968-1	640579-1	794000-1	794001-1	466352-1[3] 466352-2[3] 466352-3[3]	91534-1
		Select Gold[1]	350968-2	640579-2	794000-2	794001-2		
26-18[2] [.12-.8]	**.050-.115** 1.27-2.92	Pre-tin	350967-1	640545-1	641294-1	641300-1	466351-1[3] 466351-2[3] 466351-4[3]	91526-1
		Select Gold[1]	350967-2	640545-2	641294-2	641300-2		

[1]Select Gold Finish—Plated with .000030 min. [.000762] gold in mating area over .000050 [.00127] min. nickel underplate on entire contact.
[2]1650 CMA maximum.
[3]HDM Applicator part number ending in -1 is used on AMPOMATOR CLS Machine with T or G Terminators, -2 is used on AMP-O-LECTRIC Model K Machine, -3 or -4 is used on AMP-O-LECTRIC Model G Machine. See pages 201-204 for further information.

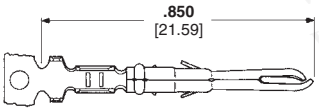
Grounding Pins

(Mate first, break last, not for interrupting current)

Pin diameter .068 [1.73]
Stock thickness .008 [.203]

Material

Phosphor bronze



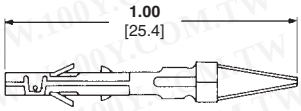
Wire Size Range AWG [mm²]	Ins. Dia. Range	Finish	Grounding Pin Part Numbers		HDM Applicator Part No.	Hand Tool Part No.
			Strip Form	Loose Piece		
26-18[2] [.12-.8]	**.050-.115** 1.27-2.92	Pre-tin	350969-1	640580-1	466351-1[3] 466351-2[3] 466351-4[3]	91526-1
		Select Gold[1]	350969-2	640580-2		

[1]Select Gold Finish—Plated with .000030 [.000762] min. gold in mating area over .000050 [.00127] min. nickel underplate on entire contact.
[2]1650 CMA maximum.
[3]HDM Applicator part number ending in -1 is used on AMPOMATOR CLS Machine with T or G Terminators, -2 is used on AMP-O-LECTRIC Model K Machine, -3 or -4 is used on AMP-O-LECTRIC Model G Machine. See pages 201-204 for further information.

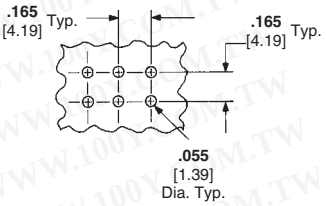
Solder Tail Socket

Material and Finish

Phosphor bronze, pre-tin
Stock thickness .008 [.203]



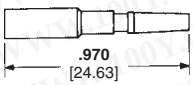
Part Number 350838-1
Note: Recommended for use with MR Socket Housings



Recommended PC Board Hole Layout
.062 [1.57] or .093 [2.36] thick board

Keying Plug

IS 408-3231



Part Number 350591-1
UL94V-0 Nylon material
Note: Use in socket housings only.

Related Product Data

Product Specification
108-1022 (MR) Miniature Rectangular Connectors

Application Specification
114-1014 (MR) Miniature Rectangular Contacts

Performance Characteristics—pages 103-104
Housings—pages 107-108
Technical Documents—pages 103 and 199-200
Application Tooling—pages 201-204

Contact Extraction Tool
Part No. 455822-2
IS 408-9570

Contact Insertion Tool
(For inserting contacts applied to small diameter wire)
Part No. 455830-1
IS 408-7984

Note: All part numbers are RoHS Compliant.

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(MR) Miniature Rectangular Connectors (Continued)

Housings

Free Hanging or Panel Mount

.165 [4.19] Centerline spacing

Material

Nylon, Natural (Color—Brick Red)

Flammability Rating—UL94V-0

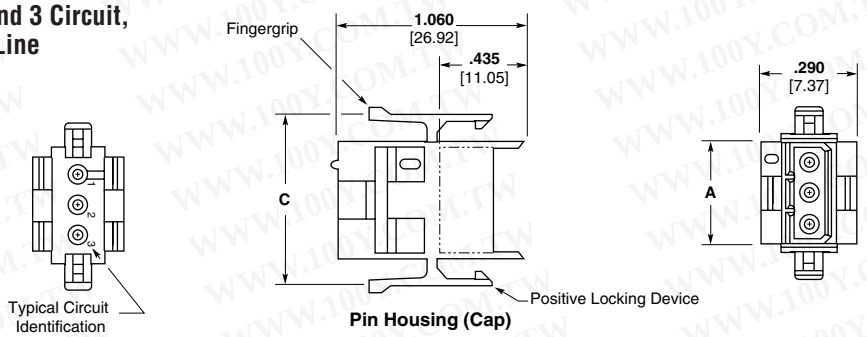
Related Product Data

Product Specification

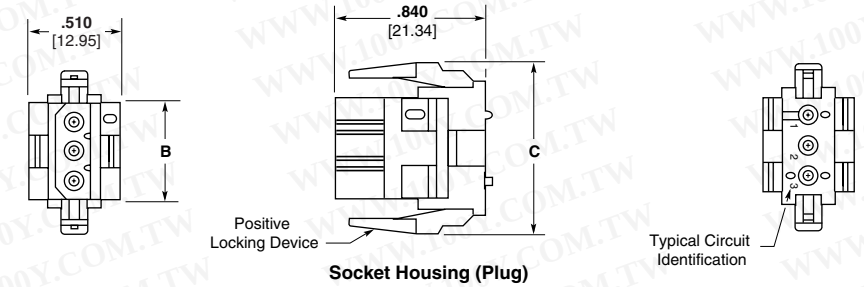
108-1022 (MR) Miniature Rectangular Connectors

Performance Characteristics—pages 103-104
Panel Cutout Recommendations—page 109
Contacts—page 106
Keying Plug—page 106
Strain Reliefs—page 110
Commoning Bars—page 110
Technical Documents—pages 103 and 199-200
Mating Headers—pages 111-112

2 and 3 Circuit, In-Line



Pin Housing (Cap)

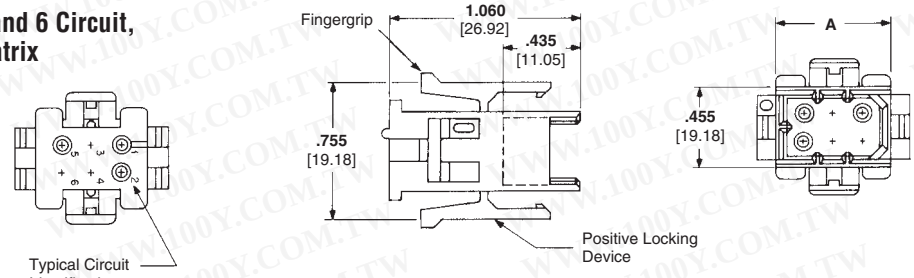


Socket Housing (Plug)

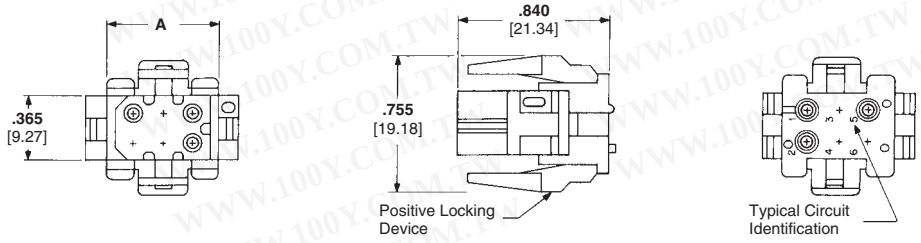
Number of Circuits	Dimensions			Part Numbers	
	A	B	C	Pin Housing (Cap)	Socket Housing (Plug)
2	.455 11.56	.365 9.27	.755 19.18	1-640507-0	1-640517-0
3	.620 15.75	.530 13.46	.920 23.37	1-640508-0	1-640518-0

Note: **All part numbers are RoHS Compliant.**

4 and 6 Circuit, Matrix



Pin Housing (Cap)



Socket Housing (Plug)

Number of Circuits	A Dim.	Part Numbers	
		Pin Housing (Cap)	Socket Housing (Plug)
4	.455 11.56	1-640509-0	1-640519-0
6	.620 15.75	1-640510-0	1-640520-0

Note: **All part numbers are RoHS Compliant.**

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(MR) Miniature Rectangular Connectors (Continued)

Housings

Free Hanging or Panel Mount

.165 [4.19] Centerline spacing

Material

Nylon, Natural (Color—Brick Red)

Flammability Rating—UL94V-0

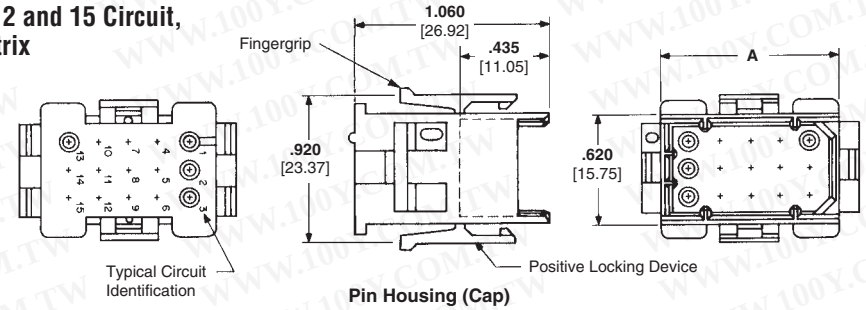
Related Product Data

Product Specification

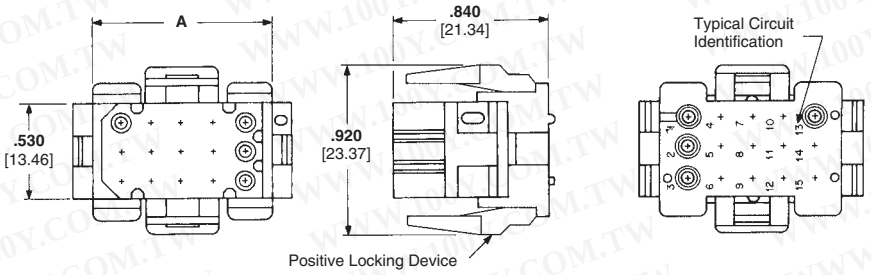
108-1022 (MR) Miniature Rectangular Connectors

Performance Characteristics—pages 103-104
Panel Cutout Recommendations—page 109
Contacts—page 106
Keying Plug—page 106
Strain Reliefs—page 110
Commoning Bars—page 110
Technical Documents—pages 103 and 199-200
Mating Headers—pages 111-112

9, 12 and 15 Circuit, Matrix

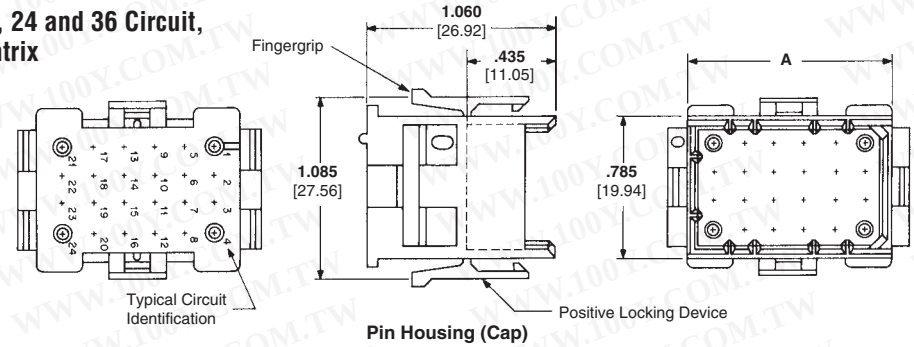


Pin Housing (Cap)

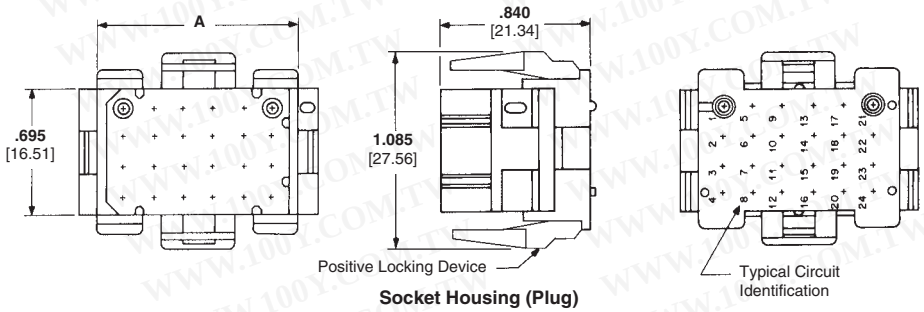


Socket Housing (Plug)

20, 24 and 36 Circuit, Matrix



Pin Housing (Cap)



Socket Housing (Plug)

Number of Circuits	A Dim.	Part Numbers	
		Pin Housing (Cap)	Socket Housing (Plug)
9	**.620** [15.75]	1-640511-0	1-640521-0
12	**.785** [19.94]	1-640512-0	1-640522-0
15	**.950** [24.13]	1-640513-0	1-640523-0
20	**.950** [24.13]	1-640514-0	1-640524-0
24	**1.115** [28.32]	1-640515-0	1-640525-0
36	**1.610** [40.89]	1-640516-0	1-640526-0

Note: All part numbers are RoHS Compliant.

(MR) Miniature Rectangular Connectors (Continued)

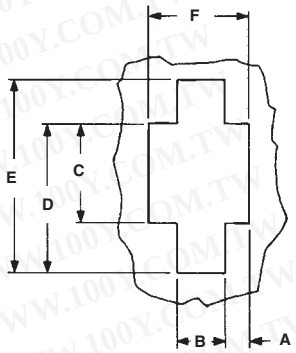
Recommended Panel Cutouts for Pin and Socket Housings

Related Product Data

Product Specification

108-1022 (MR) Miniature Rectangular Connectors

Housings— pages 107-108
Technical Documents— pages 103 and 199-200



View is from housing entry side

Panel Thickness .068 [1.75] Max.

Number of Circuits	Panel Cutout Dimensions					
	A	B	C	D	E	F
2	**.105** 2.67	**.220** 5.59	**.475** 12.07	**.630** 16.00	**.785** 19.94	**.430** 10.92
3	**.105** 2.67	**.220** 5.59	**.640** 16.26	**.795** 20.19	**.950** 24.13	**.430** 10.92
4	**.157** 3.99	**.280** 5.28	**.475** 12.07	**.630** 16.00	**.785** 19.94	**.595** 15.11
6	**.208** 5.28	**.345** 8.76	**.475** 12.07	**.630** 16.00	**.785** 19.94	**.760** 19.30
9	**.208** 5.28	**.345** 8.76	**.640** 16.26	**.795** 20.19	**.950** 24.13	**.760** 19.30
12	**.225** 5.72	**.475** 12.07	**.640** 16.26	**.795** 20.19	**.950** 24.13	**.925** 23.50
15	**.308** 7.82	**.475** 12.07	**.640** 16.26	**.795** 20.19	**.950** 24.13	**1.090** 27.69
20	**.308** 7.82	**.475** 12.07	**.805** 20.45	**.960** 24.38	**1.115** 28.32	**1.090** 27.69
24	**.390** 9.91	**.475** 12.07	**.805** 20.45	**.960** 24.38	**1.115** 28.32	**1.255** 31.88
36	**.625** 15.86	**.500** 12.70	**.800** 20.32	**.950** 24.13	**1.100** 27.94	**1.750** 44.45

Notes:
1. When mounted in a .060 [1.52] thick panel, the cap's mating end extends .800 [20.32] beyond the panel front; wire end extends .220 [55.88] from the panel rear. Plug mating end extends .580 [14.73] beyond the panel front; wire end extends .220 [55.88] from the panel rear.
2. The panel should be punched so that the housing enters the panel in the same direction as the punch for ease of assembly.

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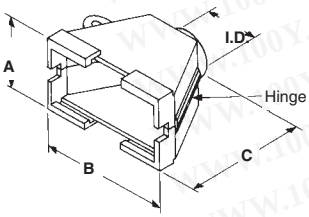
C. America: 57-1-254-4444

South America: 55-11-2103-6000
Hong Kong: 852-2735-1628
Japan: 81-44-844-8013
UK: 44-208-420-8341

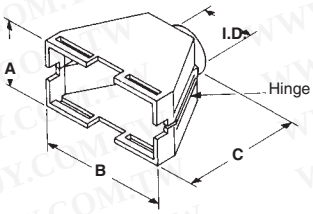
Strain Reliefs
One Piece — Clam Shell
(Illustrated in closed position)
IS 408-3231

Material
Nylon, Natural (Color—Brick Red)

Flammability Rating — UL94V-0



6, 9, 12, 15 and 20 Circuit



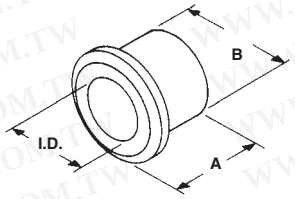
24 and 36 Circuit

Number of Circuits	Dimensions I.D.	A	B	C	Part Numbers
6	**.374** 9.50	**.634** 16.10	**.760** 19.30	**1.000** 25.4	350373-1
9	**.420** 10.67	**.800** 20.32	**.760** 19.30	**1.000** 25.4	350522-1
12	**.420** 10.67	**.790** 20.07	**.925** 23.50	**1.000** 25.4	350374-1
15	**.420** 10.67	**.790** 20.07	**1.090** 27.69	**1.000** 25.4	350523-1
20	**.560** 14.22	**.960** 24.38	**1.090** 27.69	**1.280** 23.51	480634-1
24	**.560** 14.22	**.900** 22.86	**1.255** 31.88	**1.280** 23.51	350524-1
36	**.560** 14.22	**.900** 22.86	**1.750** 44.45	**1.280** 23.51	480594-1

Notes:
1. These strain reliefs can be used with either pin or socket housings.
2. **Customer supplied:** One No. 6 Panhead Type B self-taping screw, 3/8 long. Plating is optional to conform to customer requirements.
3. Strain reliefs are also available in UL94V-2 nylon, black in color. To order strain reliefs in this material use the appropriate dash numbers: 1-XXXXXX-9.

Strain Relief
Adapting Grommets
IS 408-3231

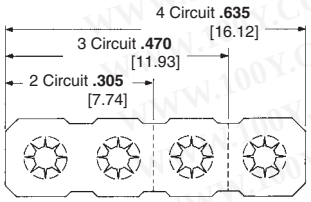
Material
Flexible PVC (55/75 Durometer) black color

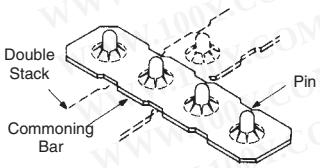


Number of Circuits	Dimensions I.D.	A	B	Part Numbers
6	**.156** 3.96	**.375** 9.53	**.375** 9.53	2-350377-0
	.218 5.54	**.375** 9.53	**.375** 9.53	2-350376-0
	.296 7.52	**.375** 9.53	**.375** 9.53	2-350375-0
9, 12 & 15	**.218** 5.54	**.375** 9.53	**.420** 10.67	2-350378-1
	.250 6.35	**.375** 9.53	**.420** 10.67	2-350379-1
	.281 7.14	**.375** 9.53	**.420** 10.67	2-350380-1
20, 24 & 36	**.437** 11.10	**.500** 12.70	**.562** 14.27	2-380935-0
	.375 9.53	**.500** 12.70	**.562** 14.27	2-380936-0
	.312 7.92	**.500** 12.70	**.562** 14.27	2-380937-0

Commoning Bars
IS 408-3231

Material
Brass
Stock thickness .008 [.203]





Finish	Part Numbers 2 Circuit	3 Circuit	4 Circuit
Pre-tin	350020-1	350021-1	350022-1
Gold[1]	350020-2	350021-2	350022-2

[1]Gold Finish—Plated with .000030 [.000762] min. gold over .000050 [.00127] min. nickel underplate on entire contact.

Related Product Data
Housings—pages 107-108

Notes:
1. Commoning bars can be used to common adjacent pin contacts in any column or row. Maximum stack per pin is two.
2. The above illustrates the proper insertion of the Commoning Bar.
3. Use the mating socket housing to assemble the Commoning Bar onto the pins.

Commoning Bar Extraction Tool
Part No. 457306-1
IS 408-3231

Note: **All part numbers are RoHS Compliant.**

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UK: 44-208-420-8341

(MR) Miniature Rectangular Connectors (Continued)

PC Board Vertical Pin Headers

.165 [4.19] Centerline spacing

Material

Housing — Nylon, Natural (Color—Brick Red)

Flammability Rating — UL94V-0

Contacts — Phosphor bronze

Solder tail diameter .040 [1.02]

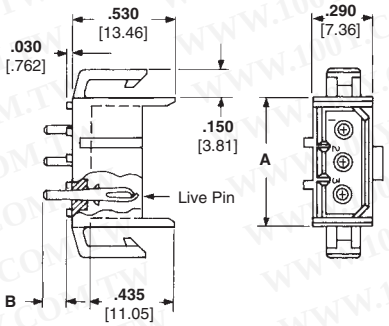
Related Product Data

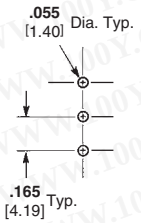
Product Specification

108-1078 (MR) Miniature Rectangular Headers

Dimensions A and B — page 112
Performance Characteristics— pages 103-104
Technical Documents— pages 103 and 199-200
Mating Socket Housings— pages 107-108

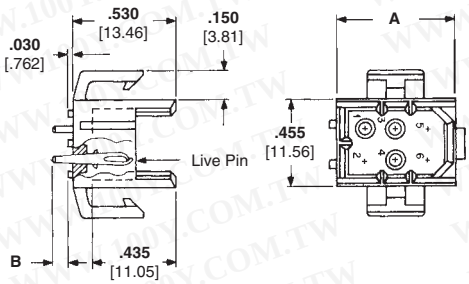
2 and 3 Circuit, In-Line

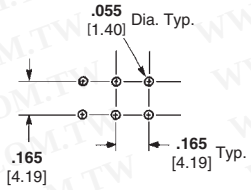




Recommended PC Board Hole Layout

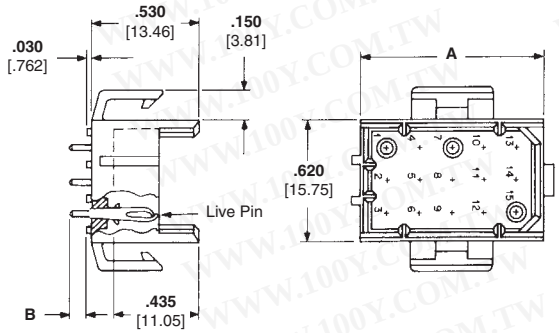
4 and 6 Circuit, Matrix

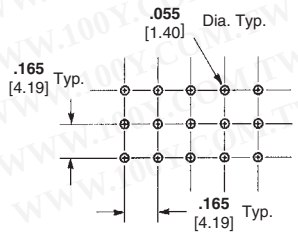




Recommended PC Board Hole Layout

9, 12 and 15 Circuit, Matrix





Recommended PC Board Hole Layout

Catalog 82181
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(MR) Miniature Rectangular Connectors (Continued)

PC Board Vertical Pin Headers

.165 [4.19] Centerline spacing

Material

Housing — Nylon, Natural (Color–Brick Red)

Flammability Rating — UL94V-0

Contacts — Phosphor bronze

Solder tail diameter .040 [1.02]

Related Product Data

Product Specification

108-1078 (MR) Miniature Rectangular Headers

Dimensions (2 and 3 Circuit, In-Line; 4, 6, 9, 12 and 15 Circuit, Matrix) — page 112

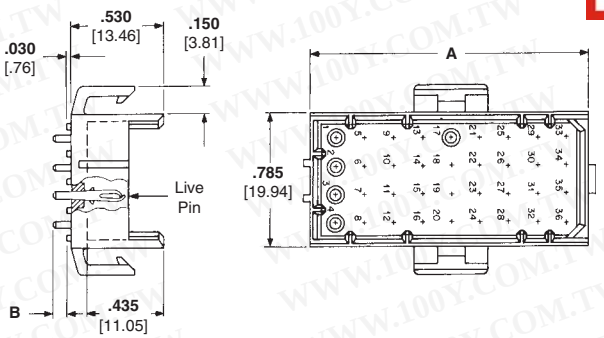
Performance Characteristics— pages 103-104

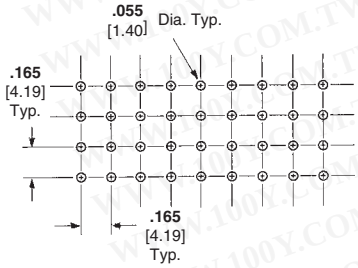
Vertical Pin Headers and Recommended PC Board Hole Layouts—pages 111-112

Technical Documents— pages 103 and 199-200

Mating Socket Housings— pages 107-108

20, 24 and 36 Circuit, Matrix





Recommended PC Board Hole Layout

Number of Circuits	Board Thickness	Dimensions A	Dimensions B	Header Part Numbers Tin Finish	Header Part Numbers Duplex Finish[1]	Mates with Socket Housing Part No.
2 In-Line	**.062** 1.57	**.455** 11.56	**.120** 3.05	640497-1	2-640497-2	1-640517-0
	.120 3.05	**.455** 11.56	**.180** 4.57	640497-3	2-640497-4	
3 In-Line	**.062** 1.57	**.620** 15.75	**.120** 3.05	640498-1	2-640498-2	1-640518-0
	.120 3.05	**.620** 15.75	**.180** 4.57	640498-3	2-640498-4	
4	**.062** 1.57	**.455** 11.56	**.120** 3.05	640499-1	2-640499-2	1-640519-0
	.120 3.05	**.455** 11.55	**.180** 4.57	640499-3	2-640499-4	
6	**.062** 1.57	**.620** 15.75	**.120** 3.05	640500-1	2-640500-2	1-640520-0
	.120 3.05	**.620** 15.75	**.180** 4.57	640500-3	2-640500-4	
9	**.062** 1.57	**.620** 15.75	**.120** 3.05	640501-1	2-640501-2	1-640521-0
	.120 3.05	**.620** 15.75	**.180** 4.57	640501-3	2-640501-4	
12	**.062** 1.57	**.785** 19.94	**.120** 3.05	640502-1	2-640502-2	1-640522-0
	.120 3.05	**.785** 19.94	**.180** 4.57	640502-3	2-640502-4	
15	**.062** 1.57	**.950** 24.13	**.120** 3.05	640503-1	2-640503-2	1-640523-0
	.120 3.05	**.950** 24.13	**.180** 4.57	640503-3	2-640503-4	
20	**.062** 1.57	**.950** 24.13	**.120** 3.05	640504-1	2-640504-2	1-640524-0
	.120 3.05	**.950** 24.13	**.180** 4.57	640504-3	2-640504-4	
24	**.062** 1.57	**1.115** 28.32	**.120** 3.05	640505-1	2-640505-2	1-640525-0
	.120 3.05	**1.115** 28.32	**.180** 4.57	640505-3	2-640505-4	
36	**.062** 1.57	**1.610** 40.89	**.120** 3.05	640506-1	2-640506-2	1-640526-0
	.120 3.05	**1.610** 40.89	**.180** 4.57	640506-3	2-640506-4	

[1]Duplex Finish — Plated with .000030 [.000762] min. gold in mating area, matte tin on solder tail end over .000050 [.00127] min. nickel underplate on entire contact.

Note: All part numbers are RoHS Compliant.

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NOTE

All numerical values are in metric units [with U.S. customary units in brackets]. Dimensions are in millimeters [and inches]. Unless otherwise specified, dimensions have a tolerance of ±0.13 [.005] and angles have a tolerance of ±2°. Figures and illustrations are for identification only and are not drawn to scale.

1. INTRODUCTION

This specification covers the requirements for application of Miniature Rectangular (MR) pin and socket contacts and housings. These requirements are applicable to hand or automatic machine crimping tools.

When corresponding with Tyco Electronics personnel, use the terminology provided on this specification to help facilitate your inquiry for information. Basic terms and features of components are provided in Figure 1.

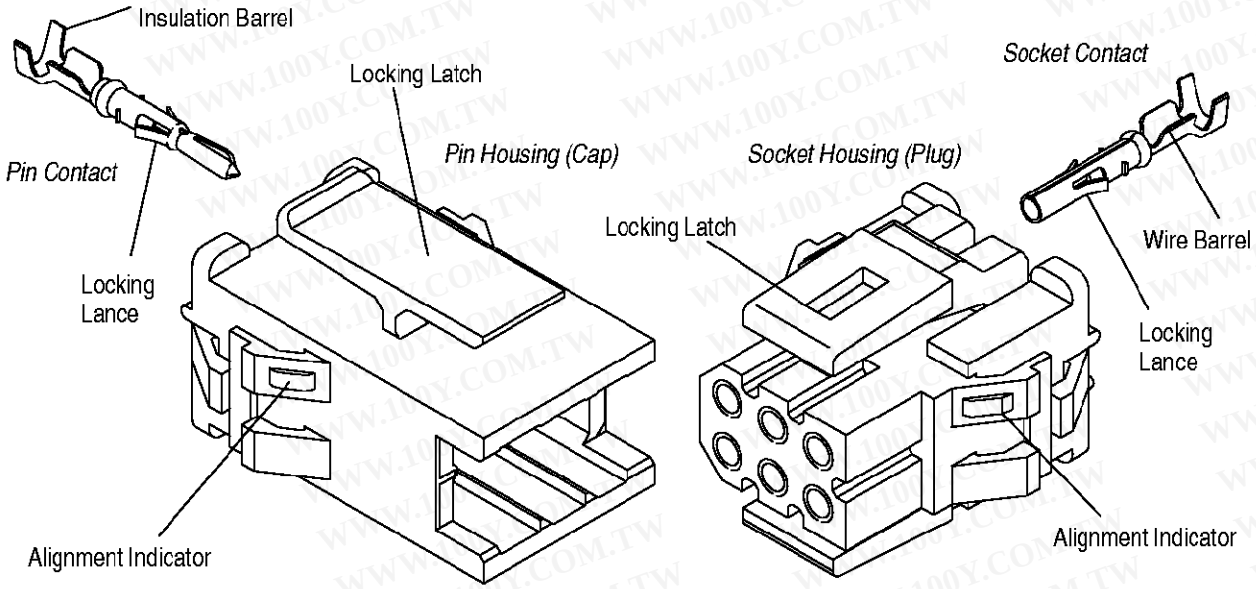


Figure 1

2. REFERENCE MATERIAL

2.1. Revision Summary

This paragraph is reserved for a revision summary of changes and additions made to this specification. The following changes have been made for this revision:

Per EC 0990–0667–02

- Updated document to corporate requirements
- Deleted standard pin and cantilever socket references through–out document
- Added new Paragraphs 3.1 and 3.3 and renumbered
- Added new Figures 3, 4, 6, and 7 and renumbered
- Deleted and added instructional material in Paragraph 2.5
- Deleted and added tooling information in Section 5, TOOLING
- Added new art to Figures 1, 2, 3, 4, 6, 7, 9, and 10

2.2. Customer Assistance

Reference Part Number 350967 and Product Code 1381 are representative numbers of the Miniature Rectangular (MR) Contacts and Housings. Use of these numbers will identify the product line and expedite your inquiries through a service network established to help you obtain product and tooling information. Such information can be obtained through a local Tyco Electronics Representative (Sales Engineer, Field Service Engineer, etc.) or, after purchase, by calling the Tooling Assistance Center or the AMP FAX/Product Information numbers at the bottom of this page.

2.3. Drawings

Customer Drawings for specific products are available from the responsible Tyco Electronics Engineering department via the service network. The information contained in the Customer Drawings takes priority if there is a conflict with this specification or with any other technical documentation supplied by Tyco Electronics.

2.4. Product Specifications

Product Specification 108–1022 provides product performance and test information.

2.5. Instructional Material

The following list includes available instruction sheets (408–series) that provide assembly procedures for product, operation, maintenance and repair of tooling; and customer manuals (409–series) that provides setup, operation, and maintenance of machines.

Document Number	Document Title
408–2498	Crimping Head Cross Reference for Pneumatic Tools
408–3295	Preparing Reel of Contacts for Application Tooling
408–4106	Straight Action Crimp Head Adapter 217201–1
408–4190	C–Head Pneumatic Adapter
408–4321	Pneumatic CERTI–CRIMP* Tool Holder 356304–1
408–7424	Checking Terminal Crimp Height or Gaging Die Closure
408–7749	Hand Crimping Tool 90326–1
408–7984	Insertion Tool 455830–1
408–8040	Heavy Duty Miniature Quick–Change Applicators (Side–Feed Type) with Mechanical
408–8059	General Preventive Maintenance for Applicators
408–8620	Service Hand Tool 696202–1
408–9570	Extraction Tool 455822–2 for Miniature Rectangular (MR) Contacts
408–9640	Crimp Quality Monitor Applicators for Side–Feed and End–Feed Applications
408–9816	Handling of Reeled Products
408–9930	PRO–CRIMPER* II Hand Crimping Tool Frame Assembly 354940–1
408–9973	PRO–CRIMPER II Hand Tool Assembly 58514–1 with Die Assembly 58514–2
409–5128	Basic AMP–O–LECTRIC* Model “K” Terminating Machine 565435–5
409–5842	AMP–O–LECTRIC Model “G” Terminating Machines 354500–[ ]
409–5852	AMPOMATOR* CLS III–G Lead Making Machine 122500–[ ]
409–5862	626 Pneumatic Tooling Assemblies 189721–[ ] and 189722–[ ]
409–5866	AMPOMATOR CLS IV Lead–Making Machine 217500–[ ]
409–5878	AMPOMATOR CLS IV+ Lead–making Machine 356500–[ ]
409–10012	AMP–O–MATIC* Side Feed Stripper–Crimper III Machine 1320895–[ ]
409–10016	Entry Level Terminator (ELT) Machine 1338600–[ ]
409–10027	Stripping Modules 1490500 and 1490502
409–10029	Stripping Modules 1490501 and 1490503

3. REQUIREMENTS

3.1. Storage

A. Ultraviolet Light

Prolonged exposure to ultraviolet light may deteriorate the chemical composition used in the connector housing material.

B. Reel Storage

When using reeled contacts, store coil wound reels horizontally and traverse wound reels vertically.

C. Shelf Life

The contacts should remain in the shipping containers until ready for use to prevent deformation to the contact. The contacts should be used on a first in, first out basis to avoid storage contamination that could adversely affect signal transmissions.

D. Chemical Exposure

Do not store contacts near any chemicals listed below as they may cause stress corrosion cracking in the contacts.

Alkalies	Ammonia	Citrates	Phosphates Citrates	Sulfur Compounds
Amines	Carbonates	Nitrites	Sulfides Nitrites	Tartrates

NOTE *Where the above environmental conditions exist, phosphor–bronze contacts are recommended.*

3.2. Wire Selection and Preparation

A. Wire Selection

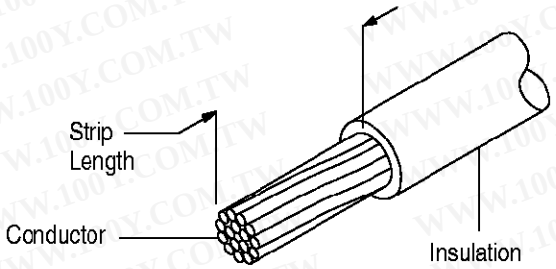
The contacts will accept stranded wire sizes 18 through 26 AWG. Wire insulation minimum and maximum diameters shall be as indicated in Figure 2.

B. Wire Preparation

The wire strip length shall be as indicated in Figure 2.

NOTE *The applied crimp dimension (within the functional range of the product) is dependent on the termination tooling being used. Refer to the documentation (applicator logs and instruction sheets) supplied with the termination tooling for the applied crimp height. See Section 5, TOOLING.*

NOTE *DO NOT nick, scrape, or cut the wire conductor during the stripping operation.*



AUTOMATIC MACHINE WIRE CRIMP DIMENSIONS

CONTACT TYPE		WIRE			WIRE BARREL CRIMP		INSUL BARREL CRIMP	
PIN	SOCKET	SIZE	INSUL DIA RANGE	STRIP LENGTH	HEIGHT RANGE	WIDTH (REF)	HEIGHT (MAX.)	WIDTH
LIVE SPLIT	SOLID	18	1.27–2.92 [.050–.115]	4.34–3.58 [.171–.141]	1.22–1.12 [.048–.044]	1.40 [.055]	3.12 [.123]	3.05 [.120]
		20			1.09–0.99 [.043–.039]			
		22–24			0.91–0.81 [.036–.032]			
		26	1.27–2.92 [.050–.115]	4.34–3.58 [.171–.141]	0.84–0.74 [.033–.029]	1.40 [.055]	3.12 [.123]	3.05 [.120]
		24–26	0.64–1.27 [.025–.050]					1.78 [.070]

HAND TOOL WIRE CRIMP DIMENSIONS

CONTACT TYPE		WIRE			WIRE BARREL CRIMP		INSUL BARREL CRIMP	
PIN	SOCKET	SIZE	INSUL DIA RANGE	STRIP LENGTH	HEIGHT RANGE	WIDTH (REF)	HEIGHT (MAX.)	WIDTH
LIVE SPLIT	SOLID	18–20	1.27–2.92 [.050–.115]	4.34–3.58 [.171–.141]	1.02–0.92 [.040–.036]	1.40 [.055]	3.12 [.123]	3.05 [.120]
		22–26			0.76–0.66 [.030–.026]			
		24–26	0.64–1.27 [.025–.050]					1.78 [.070]

Figure 2

3.3. Crimped Contact Requirements

The contact shall be located in desired tooling and crimped according to the instructions packaged with that tooling. See Section 5, TOOLING, of this document for details on tooling options and instructional materials.

NOTE *Wire insulation shall NOT be cut or broken during the crimping operation, nor shall the insulation be crimped into the contact wire barrel. Reasonable care should be taken by tooling operators to provide undamaged wire terminations.*

A. Wire Barrel Crimp

The crimp applied to the wire portion of the contact is the most compressed area and is most critical in ensuring optimum electrical and mechanical performance of the crimped contact. The contact wire barrel crimp height must be within the dimension provided in Figure 2.

B. Effective Crimp Length

For optimum crimp effectiveness, the crimp must be within the area shown and must meet the crimp dimensions provided in Figure 3. Effective crimp length shall be defined as that portion of the wire barrel, excluding bellmouth(s), fully formed by the crimping tool. Instructions for adjusting, repairing, and inspecting tools are packaged with the tools. See Section 5, TOOLING.

C. Bellmouths

Front and rear bellmouths shall be evident and conform to the dimensions given in Figure 3.

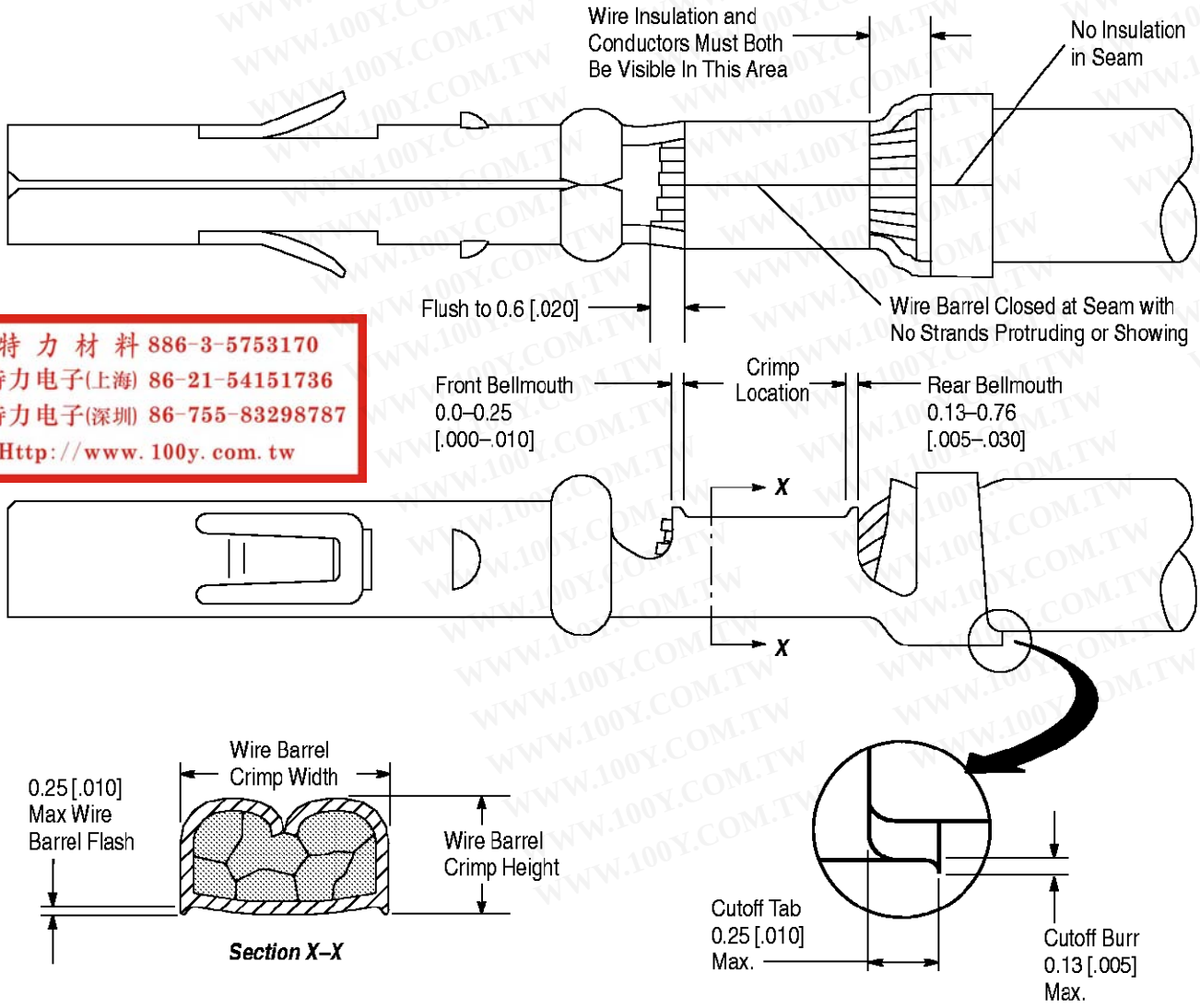


Figure 3

D. Cutoff Tabs

The cutoff tab shall be cut to the dimensions shown in Figure 3.

E. Burrs

The cutoff burr shall not exceed the dimensions shown in Figure 3.

F. Wire Barrel Flash

The wire barrel flash shall not exceed the dimensions shown in Figure 3, Section X–X.

G. Insulation Barrel Crimp

The insulation barrel shall grip the insulation firmly without cutting into it. Care must be taken to prevent cutting, nicking, or scraping of the insulation. Insulation crimp shall comply to width and height provided in Figure 3.

H. Wire Location

The wire conductor and insulation must be visible in the transition area between the wire and insulation barrels.

I. Conductor Extension

The conductor may extend beyond the wire barrel to the maximum shown.

J. Wire Barrel Seam

The wire barrel seam must be closed with no evidence of loose wire strands visible in the seam.

K. Twist and Roll

There shall be no twist, roll, deformation or other damage to the mating portion of the crimped contact that will impair usage of the contact. See Figure 4.

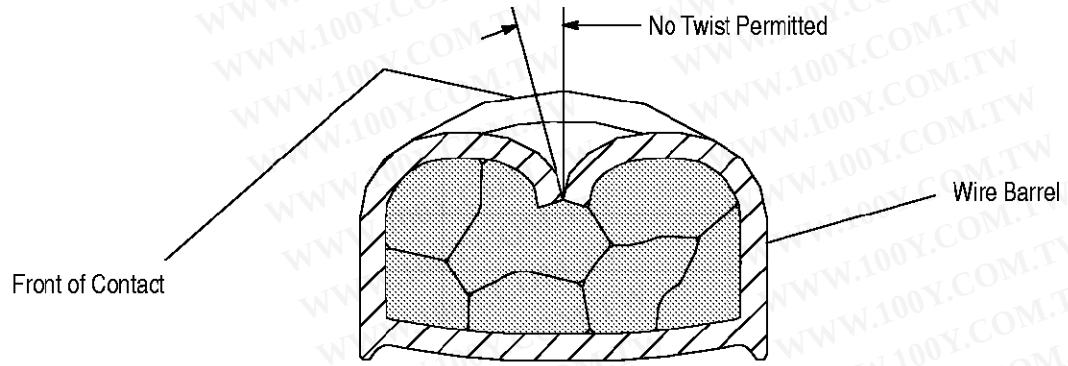


Figure 4

L. Axial Concentricity

NOTE *Periodic inspections must be made to ensure crimped contact formation is consistent as shown.*

1. Crimped insulation barrel shall fall into an area defined by a 3.43 [.135] diameter circle whose center is the centerline of the contact as shown in Figure 5.
2. There shall be no twist or roll in crimped portion that will impair usage of the contact.

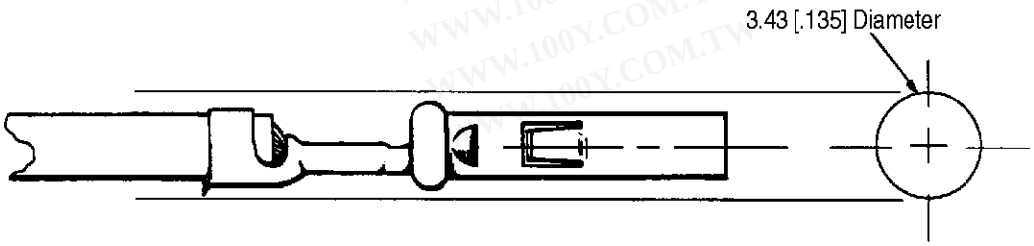


Figure 5

3.4. Housings

The connector assembly consist of a pin housing (cap) that accepts pins (live split); and socket housing (plug) that accept socket (solid) contacts. Both the plug and cap housing assemblies have individually numbered circuit identification on the back surface and are available in 2 through 36 circuit positions. See Figure 6.

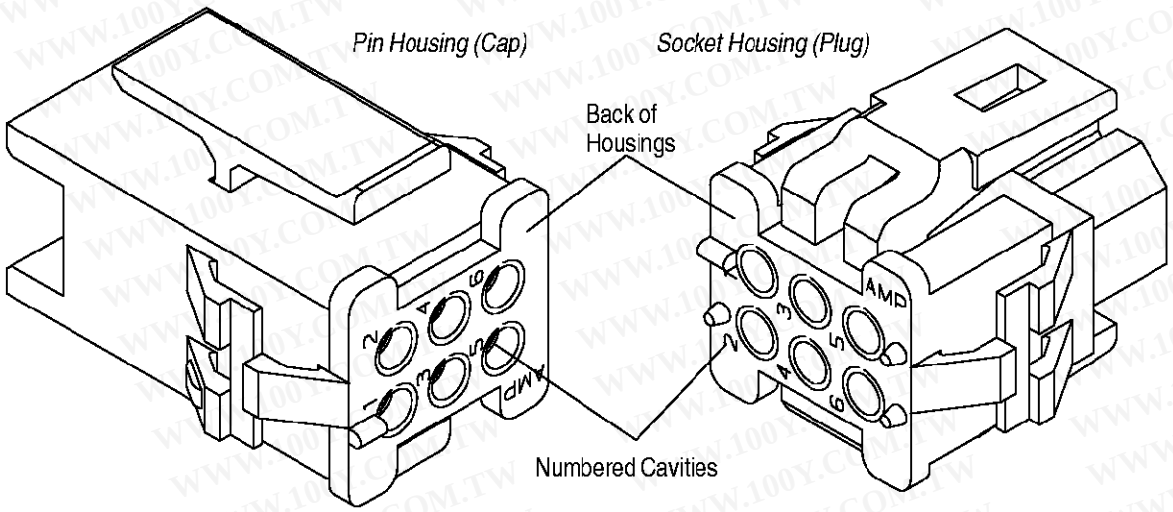


Figure 6

A. Assembly

Crimped pin and socket contacts shall be manually inserted in the rear of their respective housings. Insert contacts and join housing sections together as shown in Figure 7.

Align contact with desired circuit cavity at BACK of rear housing section. Push contact straight into cavity until a tactile and audible "click" is heard. When all necessary contacts have been inserted, complete assembly of the connector by mating the housing latches into the fully locked position. See Figure 7.

B. Disassembly

Depress both locking latches, pull apart to separate the housings.

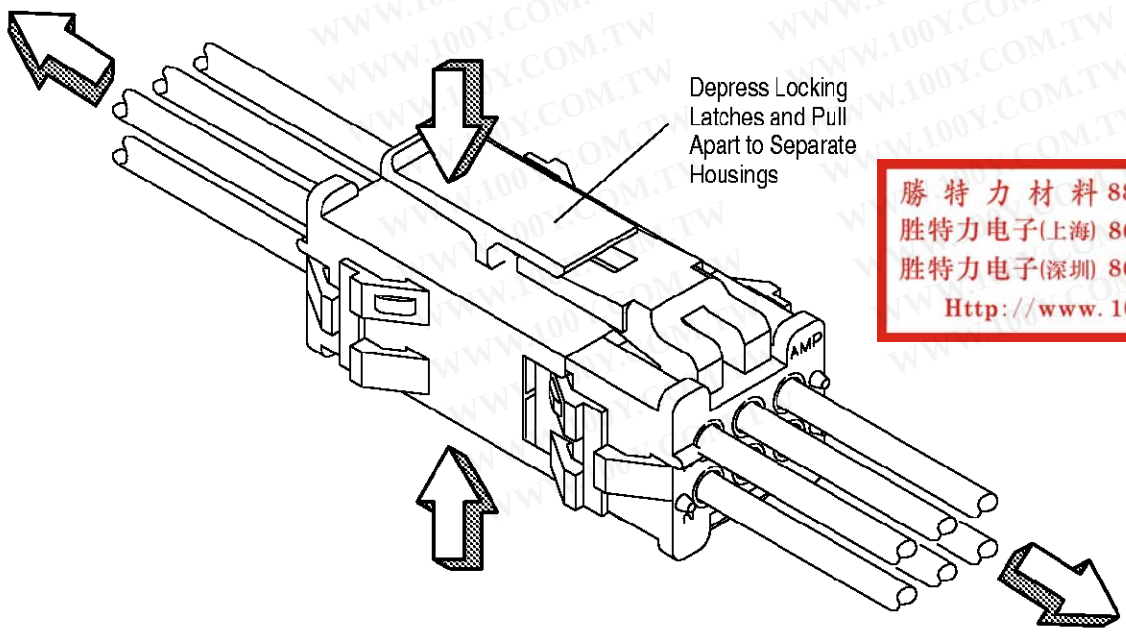


Figure 7

3.5. Panel Cutout Requirements

Typical panel cutout dimensions shown in Figure 8. See customer drawings for other panel cutout variations.

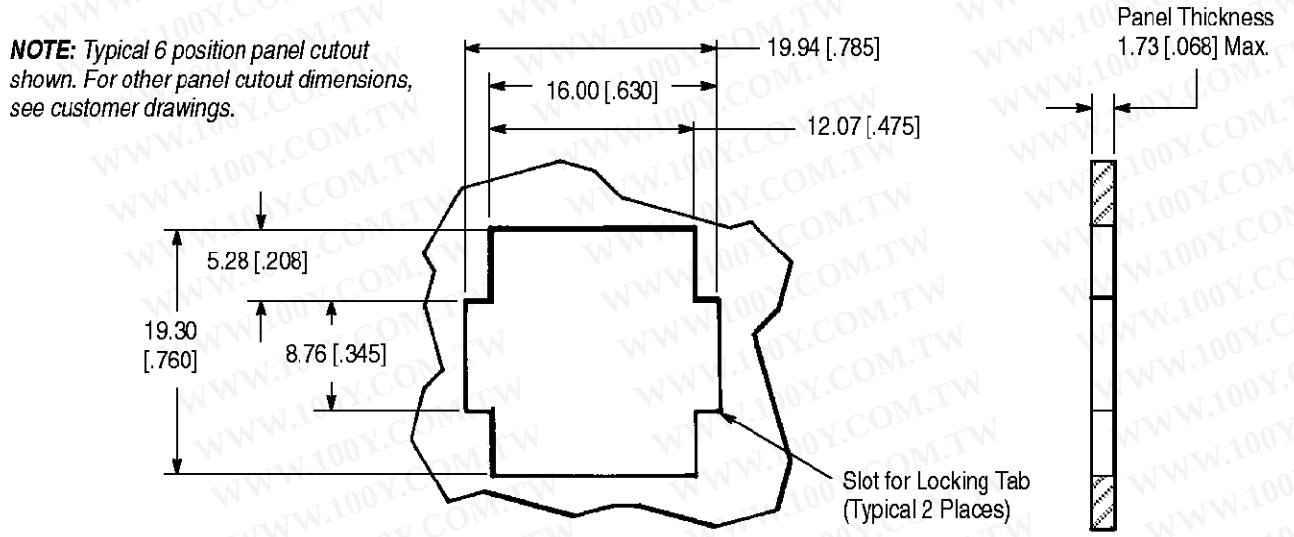


Figure 8

3.6. Polarization

The housings possess, ribs and slots which prohibit accidental inversion of a mating connector.

3.7. Ancillary Items

Contact the Product Information Center number at the bottom of page 1 for information on the following optional items.

A. Keying Plugs

Keying plugs are used in the plug housing to provide connector identification and polarization.

B. Commoning Bars

Commoning bars are used to common adjacent circuits of any row.

C. Strain Relief

Strain relief clamps are used to prevent stress on contacts caused by large wire bundles.

D. Grommets

Grommets are used with a strain relief clamp when a housing is NOT fully loaded and/or wire bundle is small.

3.8. Repair/Replace

Use Extraction Tool 455822–2 to remove individual contacts from housings for replacement or for relocation to another housing cavity. Damaged or worn contacts may be replaced provided there is sufficient slack, after restripping the wire, to insert the new contact.

NOTE *DO NOT re–use damaged or worn contacts. Instead, replace them with new contacts and discard the old ones.*

4. QUALIFICATIONS

Miniature Rectangular (MR) pin and socket contacts and housings are Recognized by Underwriters Laboratories Inc. (UL) under File Number E28476, and Certified with the Canadian Standards Association (CSA) under File number LR7189.

5. TOOLING

Figure 9 provides tool part numbers and instructional material related to wire size.

NOTE

Tyco Electronics Tooling Engineers have designed machines for a variety of application requirements. For assistance in setting up prototype and production line equipment, contact Tyco Electronics Tool Engineering through your local Tyco Electronics Representative or call the Tooling Assistance Center number at the bottom of page 1.

- **Hand Tool**

  Hand crimping tools that accommodate the full wire size range are designed for prototype and low–volume applications such as repair of damaged contacts.

- **Applicator**

  Applicators are designed for the full wire size range of strip–fed, precision formed contacts, and provide for high volume, heavy duty, production requirements. The applicators can be used in bench or floor model power units.

NOTE

Each applicator is shipped with a metal identification tag attached. DO NOT remove this tag or disregard the information on it. Also, a packet of associated paperwork is included in each applicator shipment. This information should be read before using the applicator; then it should be stored in a clean, dry area near the applicator for future reference. Some changes may have to be made to the applicators to run in all related power units. Contact the Tooling Assistance Center number located at the bottom of page 1 for specific changes.

- **Power Units**

  A power unit is an automatic or semi–automatic device used to assist in the application of a product. Power unit includes the power source used to supply the force or power to an applicator.

- **Insertion/Extraction Tooling**

  Insertion Tools are designed for contacts crimped to small fragile wire. They are designed to stabilize the contact during insertion. For use of Insertion Tool 455830–1 which may be used with these contacts, refer to Instruction Sheet 408–7984. Extraction Tools are designed to release the locking lance inside the connector housing without damaging the housing or contacts. For use of Extraction Tool 455822–2 which may be used with these contacts, refer to Instruction Sheet 408–9570.

- **Head**

  A head fits into an applicator or hand tool and holds a die used for crimping the product.

- **Dies**

  A tooling component used in conjunction with an applicator or hand tool to apply product.

- **Holder**

  A component used to hold the head and dies in the power assembly or hand tool.

WIRE SIZE		TOOLING						
AWG RANGE	INSUL DIA RANGE	APPLICATOR (DOCUMENT)	POWER UNIT (DOCUMENT)	HAND TOOL (DOCUMENT)	PNEUMATIC TOOLING (DOCUMENT)			
					HAND TOOL	HEAD	DIES	HOLDER
24–26	0.64–1.27 [.025–.050]	466352–1 (408–8040)	122500–2, –3 (409–5852)	90326–1 (408–7749) or 58514–1 (408–9973) or 696202–1 (408–8620)	189721–1 (408–2498) (409–5862) or 189722–1 (408–2498) (409–5862)	217201–1 (408–4106)	90326–2 (——)	189928–1 (408–2498) (409–4190) or 356304–1 (408–4321)
			217500–1, –2 (409–5866)					
			356500–1, –2 (409–5878)					
		466352–2 (408–8040)	354500–1 (409–5842)					
			565435–5 (409–5128)					
			1338600–3, –4 (409–10016)					
		466916–1 (408–8040)	1320895–1, –3 (409–10012)					

Figure 9 (cont'd)

WIRE SIZE		TOOLING						
AWG RANGE	INSUL DIA RANGE	APPLICATOR (DOCUMENT)	POWER UNIT (DOCUMENT)	HAND TOOL (DOCUMENT)	PNEUMATIC TOOLING (DOCUMENT)			
					HAND TOOL	HEAD	DIES	HOLDER
26–18	1.27–2.92 [.050–.115]	466351–1 (408–8040)	122500–2, –3 (409–5852)	91526–1 (—)	189721–1 (408–2498) (409–5862) or 189722–1 (408–2498) (409–5862)	217201–1 (408–4106)	90325–2 (—)	189928–1 (408–2498) (409–4190) or 356304–1 (408–4321)
			217500–1, –2 (409–5866)					
			356500–1, –2 (409–5878)					
		466351–2, –3 (408–8040)	354500–1 (409–5842)					
			565435–5 (409–5128)					
			1338600–3, –4 (409–10016)					
		466351–4 (408–8040)	354500–[ ] (409–5842)					
			1338600–[ ] (409–10016)					
		466913–1 (—)	1320895–1, –3 (409–10012)					
		567658–2 (408–8040)	354500–5 (409–5842)					
		567832–1 (—)	1320895–2, –4 (409–10012)					

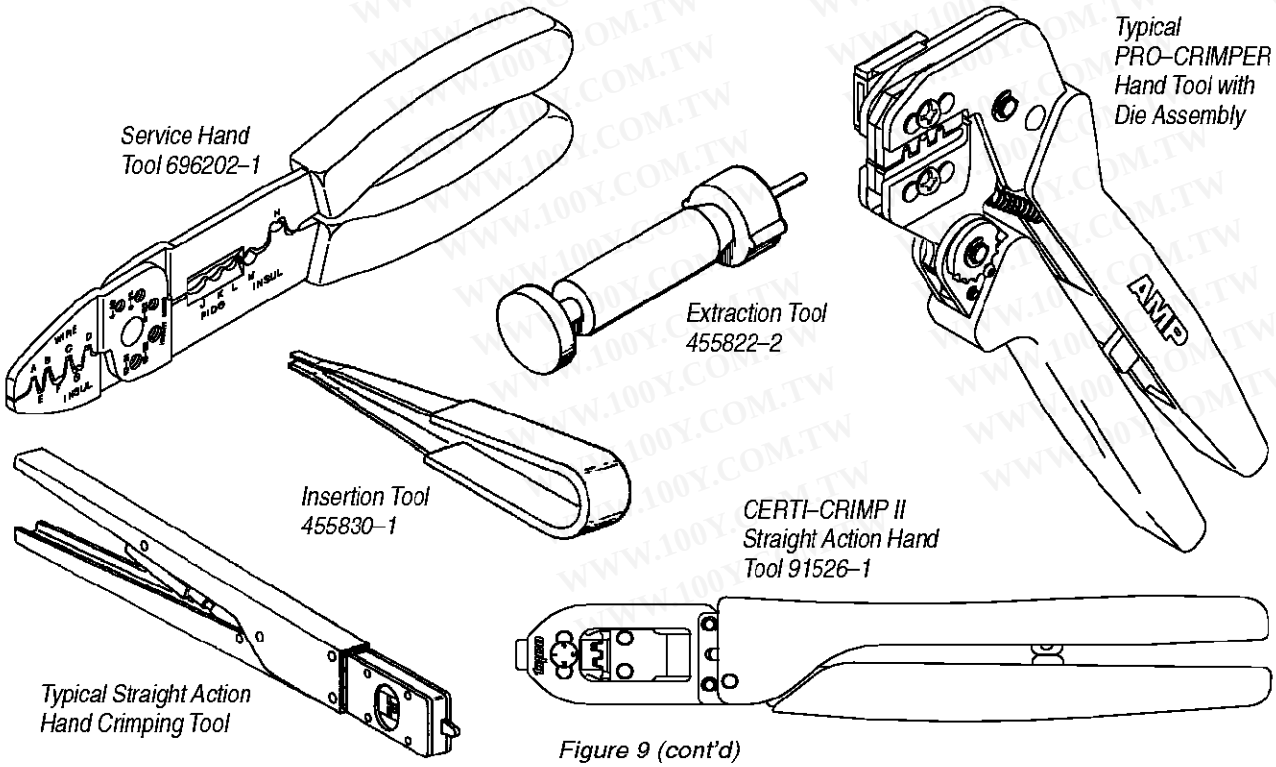
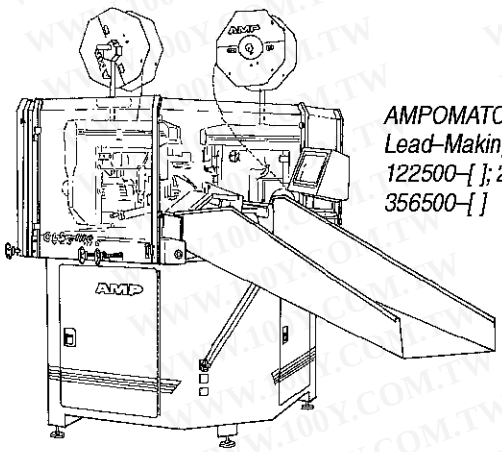
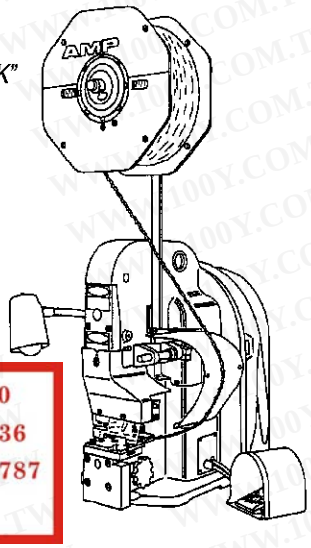


Figure 9 (cont'd)

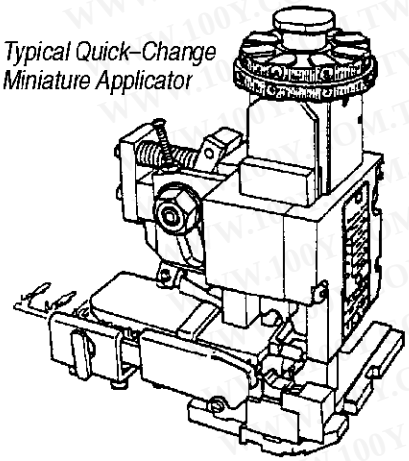


AMPOMATOR CLS
Lead–Making Machines
122500–[ ]; 217500–[ ];
356500–[ ]

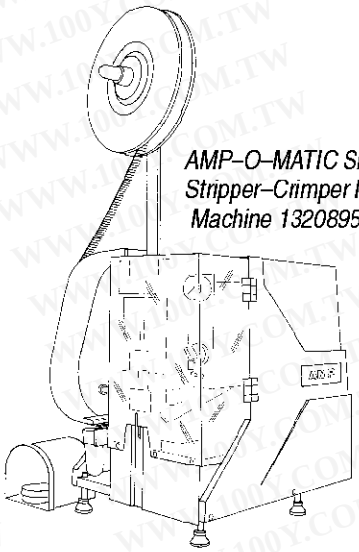
AMP–O–LECTRIC Model "K"
Terminating Unit 565435–5



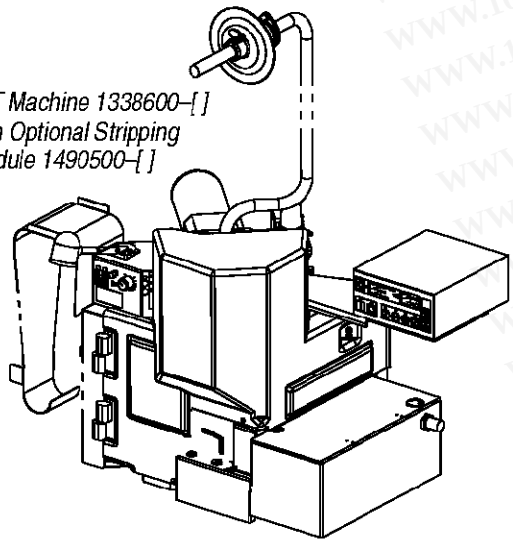
Typical Quick–Change
Miniature Applicator



AMP–O–MATIC Side Feed
Stripper–Crimper II
Machine 1320895–[ ]



ELT Machine 1338600–[ ]
with Optional Stripping
Module 1490500–[ ]



AMP–O–LECTRIC Model "G"
Terminating Machine 354500–[ ]
with Optional Stripping Module
1490501–[ ]

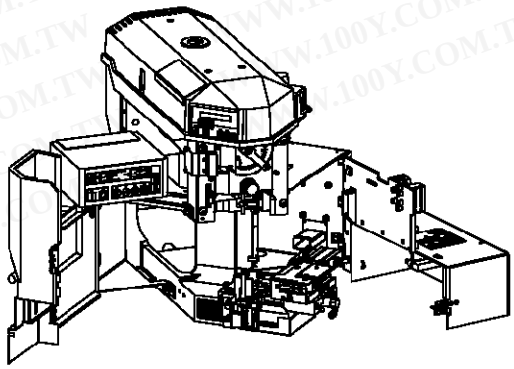


Figure 9 (cont'd)

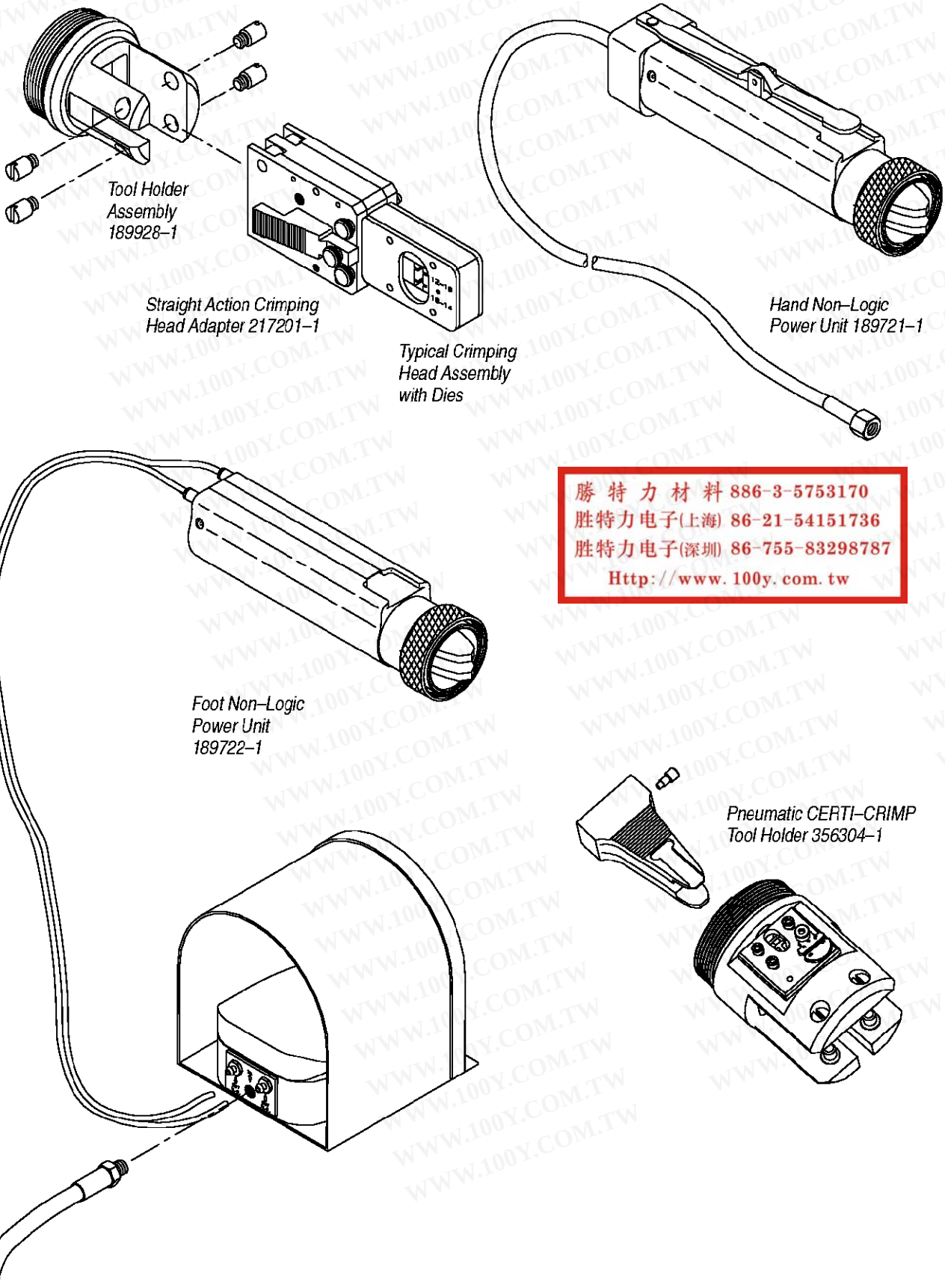


Figure 9 (end)

6. VISUAL AID

Figure 10 shows a typical application of a Miniature Rectangular (MR) Contact and Housing. This illustration should be used by production personnel to ensure a correctly applied product. Applications which DO NOT appear correct should be inspected using the information in the preceding pages of this specification and in the instructional material shipped with the product.

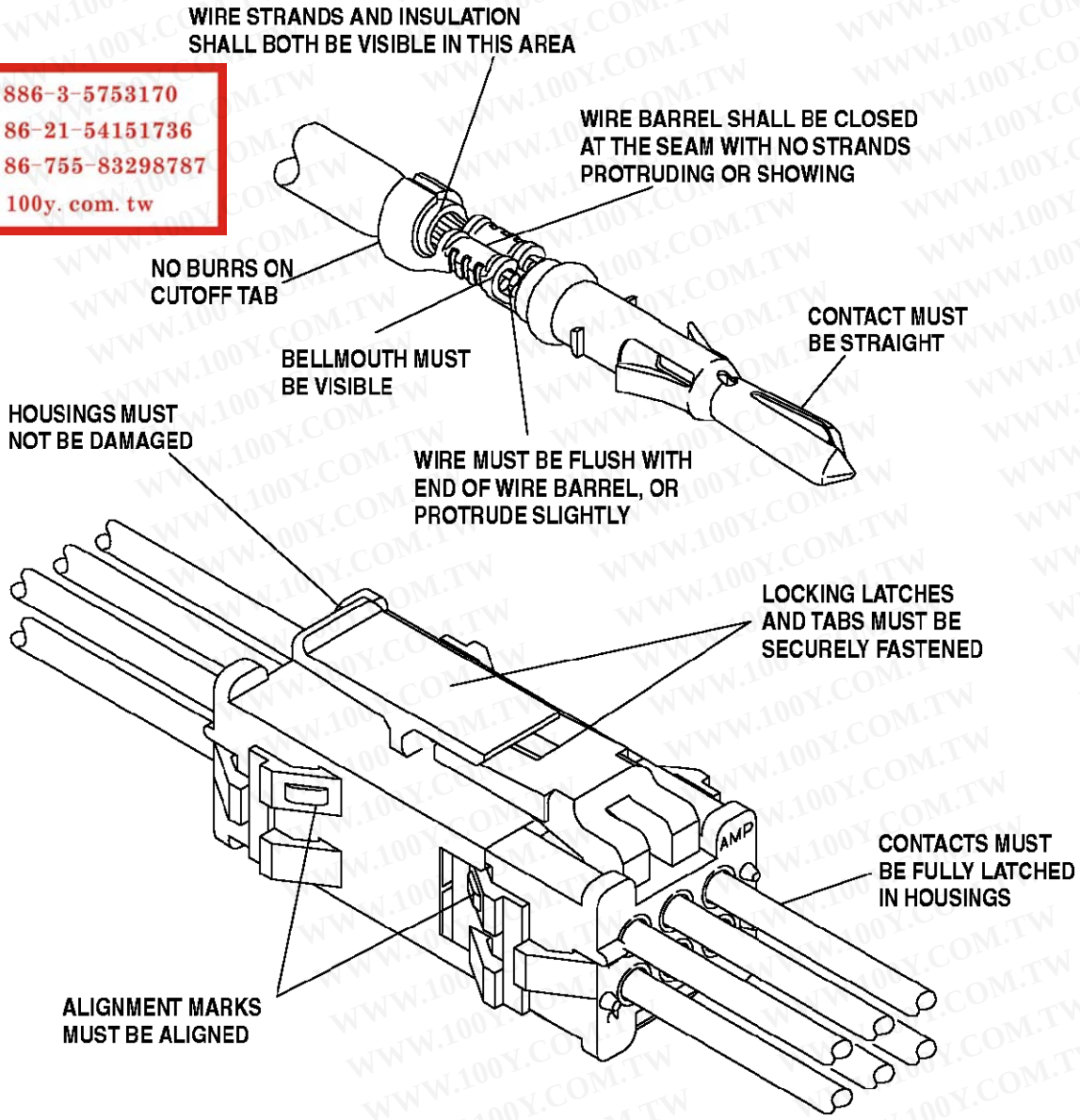


FIGURE 10. VISUAL AID