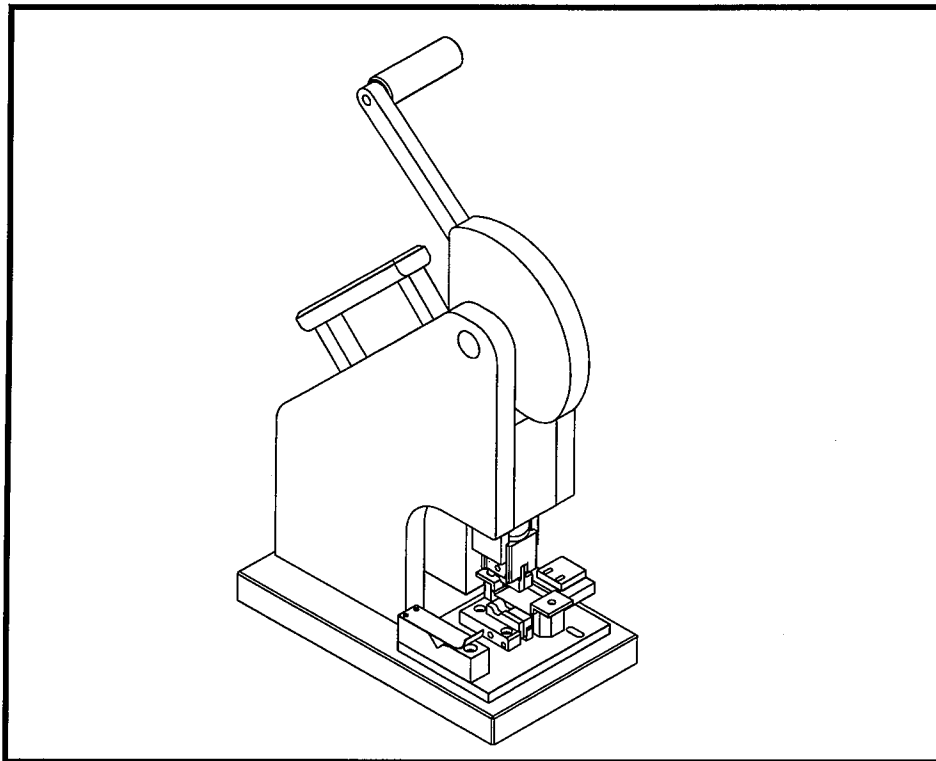




Instruction Manual MICROCROSS FERRULE CRIMP TOOLS

Part No. 62200-4400 & 62201-8000

**For MicroCross™ Ferrules P.N.'s 79901-1116, 73772-0001,
73772-0002, 73772-0003, 73772-0004 & 88789-9376**



***DESCRIPTION**

***OPERATION**

***MAINTENANCE**

Doc. No. 622004410
Release Date 1997/09/24
Revision: C
Revision Date 2000/09/28

WARNING

NEVER OPERATE, SERVICE OR ADJUST THIS DEVICE WITHOUT PROPER INSTRUCTION AND WITHOUT FIRST READING AND UNDERSTANDING THE INSTRUCTIONS IN THIS MANUAL

WORK SAFELY AT ALL TIMES

**FOR SERVICE, CONTACT YOUR
LOCAL MOLEX SALES OFFICE**

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62200-4400 EVC FERRULE CRIMP TOOL & 62201-8000 DVI FERRULE CRIMP TOOL

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SECTION 1

GENERAL DESCRIPTION, INSTALLATION & OPERATION

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1. GENERAL DESCRIPTION

1.1 TOOL DESCRIPTION

The 62200-4400 EVC MicroCross Ferrule Crimp Tool & the 62201-8000 DVI MicroCross Tool are designed to crimp the Molex Ferrules (see below for Part No.'s) to the cable assembly. There are (6+) die sets included with this tool, one set for each ferrule. This tooling works in conjunction with the Molex 11-31-6356 Manual Press (not included with tool kit). The operator takes a partially completed harness, closes the EMI Shield and places the appropriate ferrule over the end of the shield. Then the operator loads this assembly into the crimp tooling and crimps the ferrule by activating the press.

Note: The correct set of dies must be used with the ferrule being crimped, if not, it may result in damage to the tool. The list below shows the die set to use for each ferrule.

Ferrule	Die Set
79901-1116	62200-4402
73772-0001 (.289 - .321 Cable)	62200-4403
73772-0001 (.246 - .288 Cable)	62200-6700
73772-0002	62200-4431
73772-0003	62200-4436
73772-0004	62200-6800
88789-9376 (.189 - .246)	62201-7900

1.2 FEATURES

- * Unique tool configuration performs high strength hex crimp.
- * Die sets are quickly and easily installed or changed
- * Crimp height adjustment on press to avoid over or under crimping.
- * Tooling allows user to crimp both large and small diameters of ferrule in one step.

1.3 TECHNICAL SPECIFICATIONS

1.3.1 Dimensions

Width	12.7cm (5.0in)
Depth	9.5cm (3.75in)
Height	3.4cm (1.38in)

1.3.2 Weight

2.25kg (5.0lbs)

1.3.3 Production Rate

An operator can expect to produce approximately 300 finished assemblies per hour depending on operator skill.

1.4 DELIVERY CHECK

Carefully remove the Crimp Tooling from its shipping container and check to determine if parts are included (See appropriate Parts Lists in Section 3)

1.5 TOOLS

The following may be needed to operate or adjust this tool:

	Qty.
Metric Hex Wrench Set	1
Micrometer or Calipers	1
Set of Feeler Gauges	1

1.6 INSTALLATION

1. Determine what ferrule and cable assembly is to be crimped and locate the correct die set.
2. Install the two (2) upper dies in the upper tooling holder.

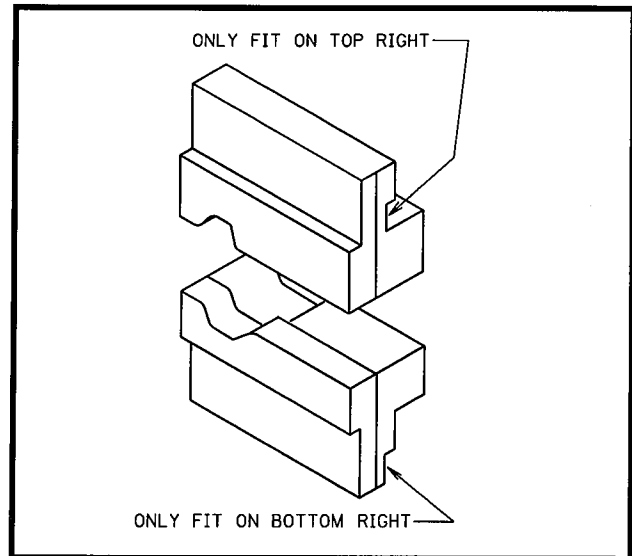
NOTE: The dies are keyed and can only be installed one way. (See Fig. 1-1)

3. Slide the tooling holder (62200-4418) upward, over the bottom of the press ram until it comes to a stop (See Fig. 1-1). Note: slightly lowering the press ram may assist in installing the tooling holder.
4. Push the latch (11-31-7151) slightly backward away from the ram.
5. The tooling holder will now slide up the ram an additional 4.0MM approx.
6. Release the latch so the upper tooling will stay in place on the press.
7. Install the (2) lower dies in the lower tooling holder and tighten with set screw. Note: The dies are keyed and can only be installed one way.
8. Place the lower tooling on the Press Base. Install (2) M5 screws (See Fig. 1- 2).

Do not tighten the screws at this time.

1.7 SET UP

WARNING: Pull force of completed assembly is very sensitive to Setup and cable diameter. Therefore, great care must be taken in completing the instructions in this section.

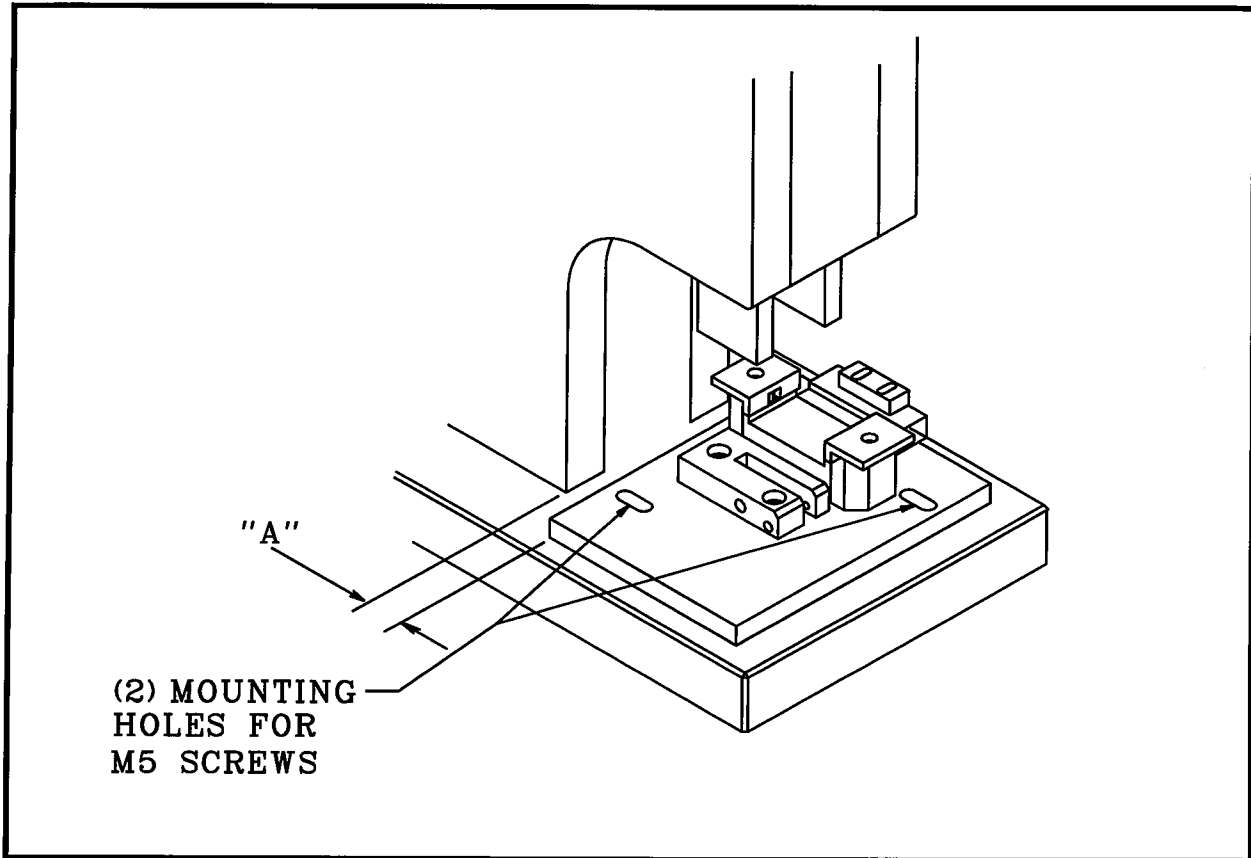


**Fig. 1-1
DIE SET KEYS**

1.7.1 Lower Tooling Positioning

Once the lower tooling is loosely in position, it must be precisely set according to the ferrule to be crimped.

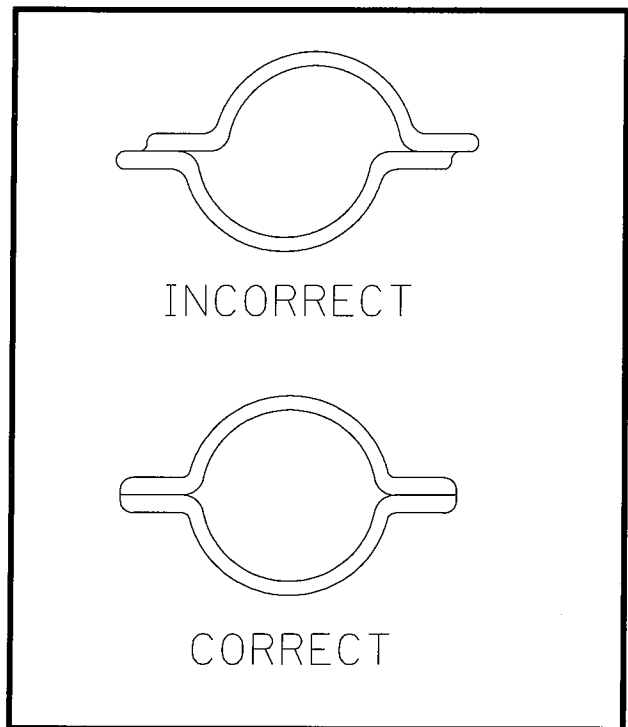
1. Using Table 1.1, select the "A" dimension for the ferrule and die set to be used.
2. Refer to Fig. 1-3 and slide the lower tooling back or forward to meet the required "A" dimension. Use calipers or gauge blocks.
3. The figures given here are a starting point and may possibly have to be further adjusted. To check this alignment, take several plain ferrules and crimp them. Then inspect them per Fig. 1-3.
4. Readjust as required to achieve a good crimp.
5. Tighten the two (2) M5 Screws.



**Fig. 1-2
MOUNTING LOWER TOOLING**

TABLE 1-1

Ferrule No.	Die Set No.	"A"
79901-1116	62200-4402	0.620 in. (15.75mm)
73772-0001	62200-4403	0.620 in. (15.75mm)
73772-0002	62200-4431	0.620 in. (15.75mm)
73772-0003	62200-4436	0.625 in. (15.87mm)
73772-0004	62200-6800	0.620 in. (15.87mm)
73772-0001	62200-6700	0.620 in. (15.75mm)
88789-9376	62201-7900	0.620 in. (15.75mm)



**Fig. 1-3
CRIMP DIE ALIGNMENT**

1.7.2 Crimp Height Adjustment

(See Fig. 1-6 and also Press Instruction Manual, Part No. 11-32-8186) Lower the Press Ram slightly to expose the Adjustment Locking Screw. Loosen this screw until the Crimp Height Adjusting Knob moves freely. To increase the crimp height, turn the height adjusting knob to the right (toward the "+" sign). To decrease the crimp height, turn the crimp height adjusting knob to the left (toward the "-" sign). Be sure to retighten the locking screw before continuing to use the press. For proper crimp height, the closed die gap should be set per TABLE 2.

TABLE 2

Ferrule No.	Die No.	"B"
73772-0001	62200-4403	0.025 in. (0.63mm)
73772-0002	62200-4431	0.025 in. (0.63mm)
73772-0003	62200-4436	0.070 in. (1.78mm)
73772-0004	62200-6800	0.080in. (2.03mm)
73772-0001	62200-6700	0.057 in. (1.45mm)
88789-9376	62201-7900	0.039in. (1.0mm)

Use feeler gauges to measure "B" as shown in Fig. 1-4.

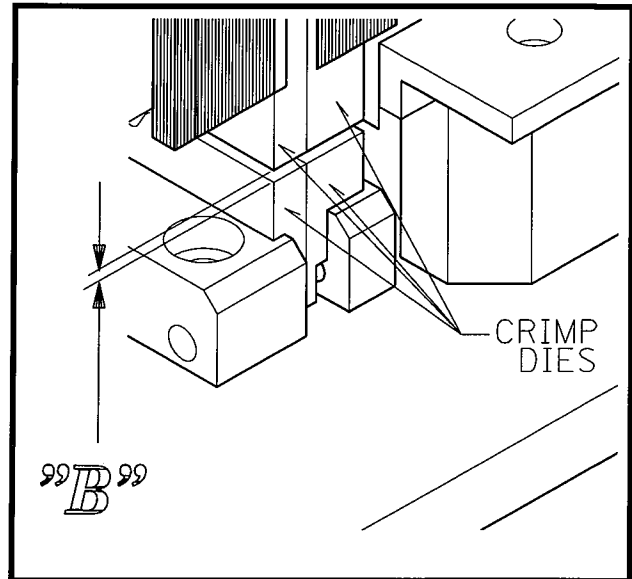


Fig. 1-4
SHUT HEIGHT MEASUREMENT

1.8 OPERATION

CAUTION: Cable diameter is critical to a good crimp so be sure the correct diameter cable is used for the selected ferrule.

1. Snap the EMI Shield closed and place correct ferrule over the back of the EMI Shield as far as it will go.
2. With the ram in the up position, place a cable assembly (with ferrule fit over EMI Shield) into the lower tooling.
3. Slowly lower the ram by pulling the press handle forward and down to crimp ferrule to the cable and EMI Shield. Note: The press handle cannot be returned to the up position until it has been lowered to the full down position.
4. Return the press handle to the up position.

NOTE: In case of a jam or some other problem, the press ram can be returned to the up position

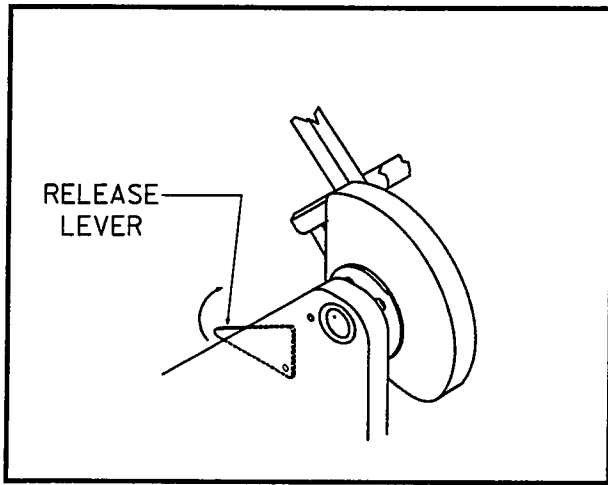


Fig.1-5
FULL STROKE RATCHET RELEASE

on the upper left of the press frame
(See Fig. 1-5).

5. Remove completed cable
assembly with the crimped ferrule.

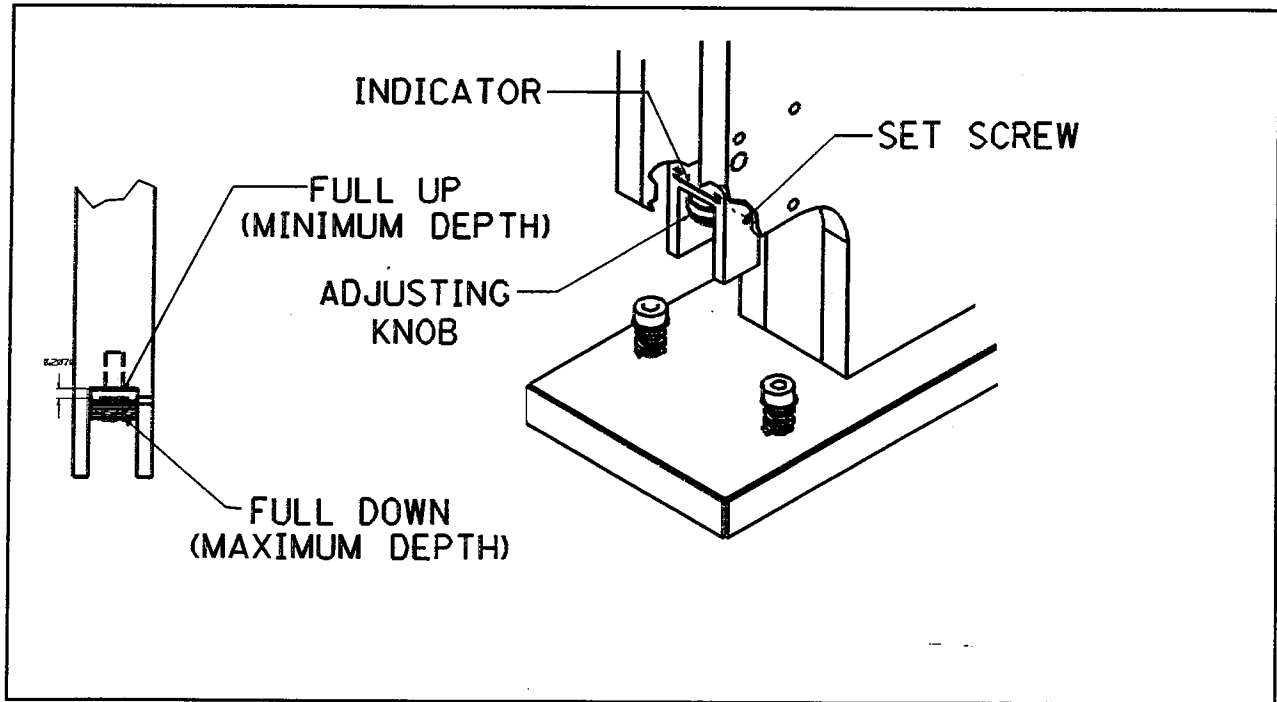


Fig. 1-6
TERMINATION DEPTH ADJUSTMENT

SECTION 2

MAINTENANCE, PERISHABLE PARTS, SPARE PARTS & PROBLEM CHECKLIST

	Page
2.1 MAINTENANCE	11
2.2 PERISHABLE PARTS	11
2.3 SPARE PARTS	11
2.4 PROBLEM CHECKLIST	12

2. MAINTENANCE, PERISHABLE PARTS, SPARE PARTS & PROBLEM CHECKLIST

2.1 MAINTENANCE

2.1.2 Cleaning

Approximately once a day, depending on usage, a soft brush should be used to remove any plating dust or other debris from the tooling.

The use of compressed air to clean the dies is not recommended as it can cause debris to wedge in the tooling and/or come flying out at the operator.

2.1.2 Lubrication

There is nothing on the EVC Ferrule Crimp Tool that needs lubrication. However, the Molex Manual Press needs regular lubrication. Please consult the Press Instruction Manual (P.N. 11-32-8186) for that schedule.

2.2 PERISHABLE PARTS

These are parts that contact the product and wear over time. The customer is responsible for maintaining a set of these parts and Molex recommends that they keep at least one set on hand at all times.

Molex Order No.	Description
62200-4402	Die Ass'y. (Ferrule #79901-1116)
62200-4403	Die Ass'y. (Ferrule #73772-0001 .289 - .312 Cable)

62200-4431	Die Ass'y. (Ferrule #73772-0002)
62200-4436	Die Ass'y. (Ferrule #73772-0003)
62200-6700	Die Ass'y. (Ferrule #73772-0001, .246 - .288 Cable)
62200-6800	Die Ass'y. (Ferrule #73772-0004)
62201-7900	Die Ass'y. (Ferrule #88789-9376)

Please consult the Press Manual for the perishable parts list for the press.

2.3 SPARE PARTS

These are parts that are available to support the tooling in service. They are moving or otherwise functioning that could be damaged or malfunction. It is suggested that the customer may want to keep some or all of these parts on hand to reduce down time. These parts are identified in the Parts List in Appendix A.

PROBLEM CHECKLIST

<u>PROBLEM</u>	<u>CAUSE</u>	<u>SOLUTION</u>
1. Crimp is not to specifications (Too loose or too tight)	1. Press shut height is incorrectly set.	1. Readjust to proper crimp height (See Section 1.7.1)
2. Ferrule sticks in lower tooling after crimping.	2. Worn surface on lower tooling	2. Inspect and replace defective tooling.

SECTION 3

PARTS LISTS AND ASSEMBLY DRAWINGS

The following pages contain the MicroCross Ferrule Crimp Tool Parts Lists and Assembly Drawings. There are several things that will help the reader better understand and use this material.

1. The “**Item**” number in the Parts List matches the number in the bubble on the Assembly Drawing.
2. The “**Order No.**” is the number to use when ordering that particular item.
3. “**RSP**” appearing at the end of the Description column means this item is a **Recommended Spare Part**.
4. The “**Req’d.**” number is the quantity of that item required per assembly. It is also the quantity Molex recommends the user keep on hand if this a **Perishable Part** or a **Recommended Spare Part**
5. An asterisk beside the item number bubble on the Assembly Drawing indicates a **Recommended Spare Part**.

PARTS LIST 62200-4400 (EVC)

Item	Order No.	Description	Req'd.
1	62200-4401	Assembly, Fixture	1
2	62200-4402	Assembly, Ferrule Die	1
3	62200-4003	Assembly, Ferrule Die	1
4	62200-4431	Assembly, Ferrule Die	1
5	62200-4436	Assembly, Ferrule Die	1
6	62200-6700	Assembly, Ferrule Die	1
7	62200-6800	Assembly, Ferrule Die	1
8	62200-4410	Manual, Instruction	1

PARTS LIST 62201-8000 (DVI)

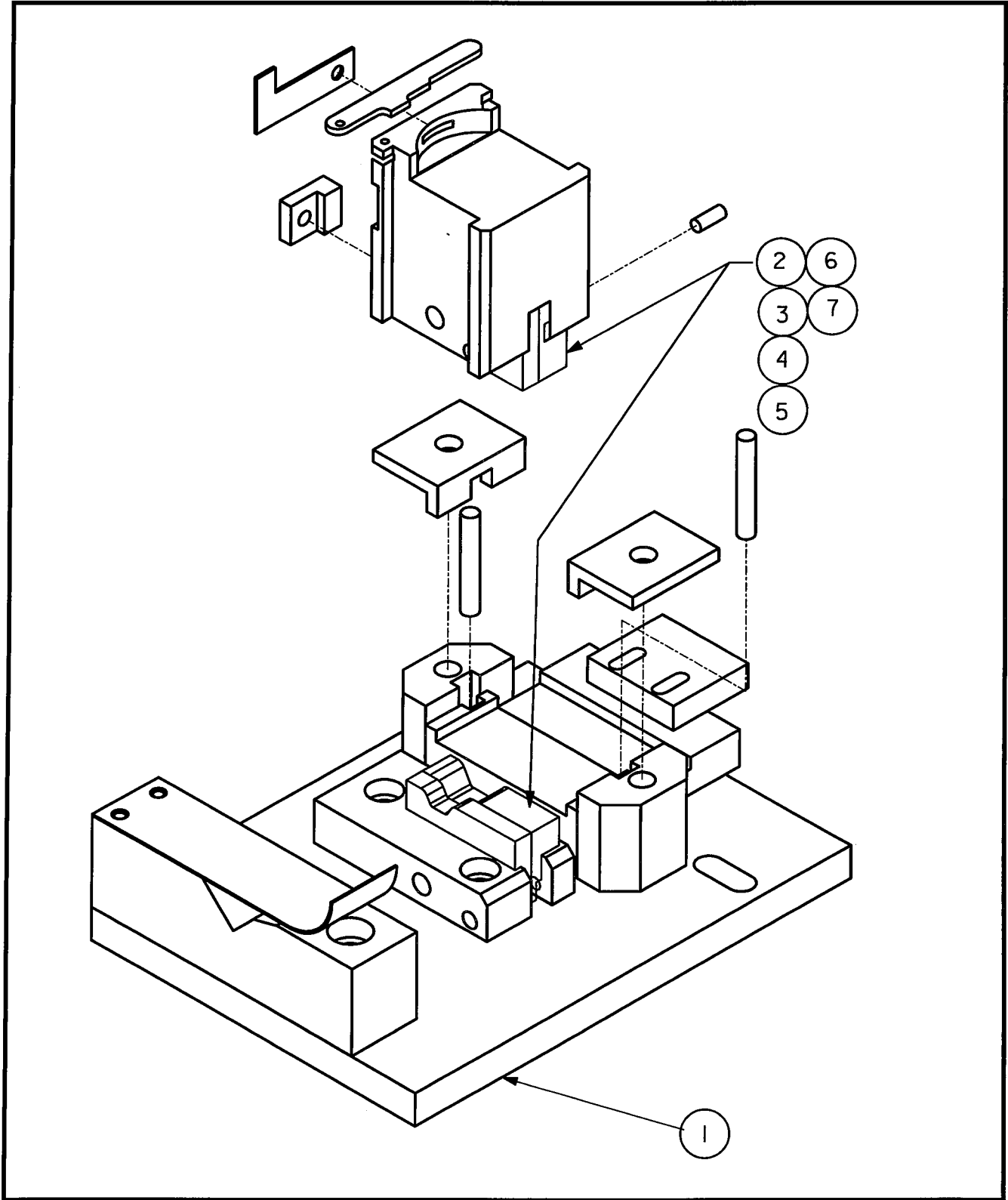
Item	Order No.	Description	Req'd.
1	62200-4401	Assembly, Fixture	1
2	62201-7900	Assembly, Ferrule Die	1

ADDITIONAL DIE ASSEMBLIES REQUIRED FOR DVI

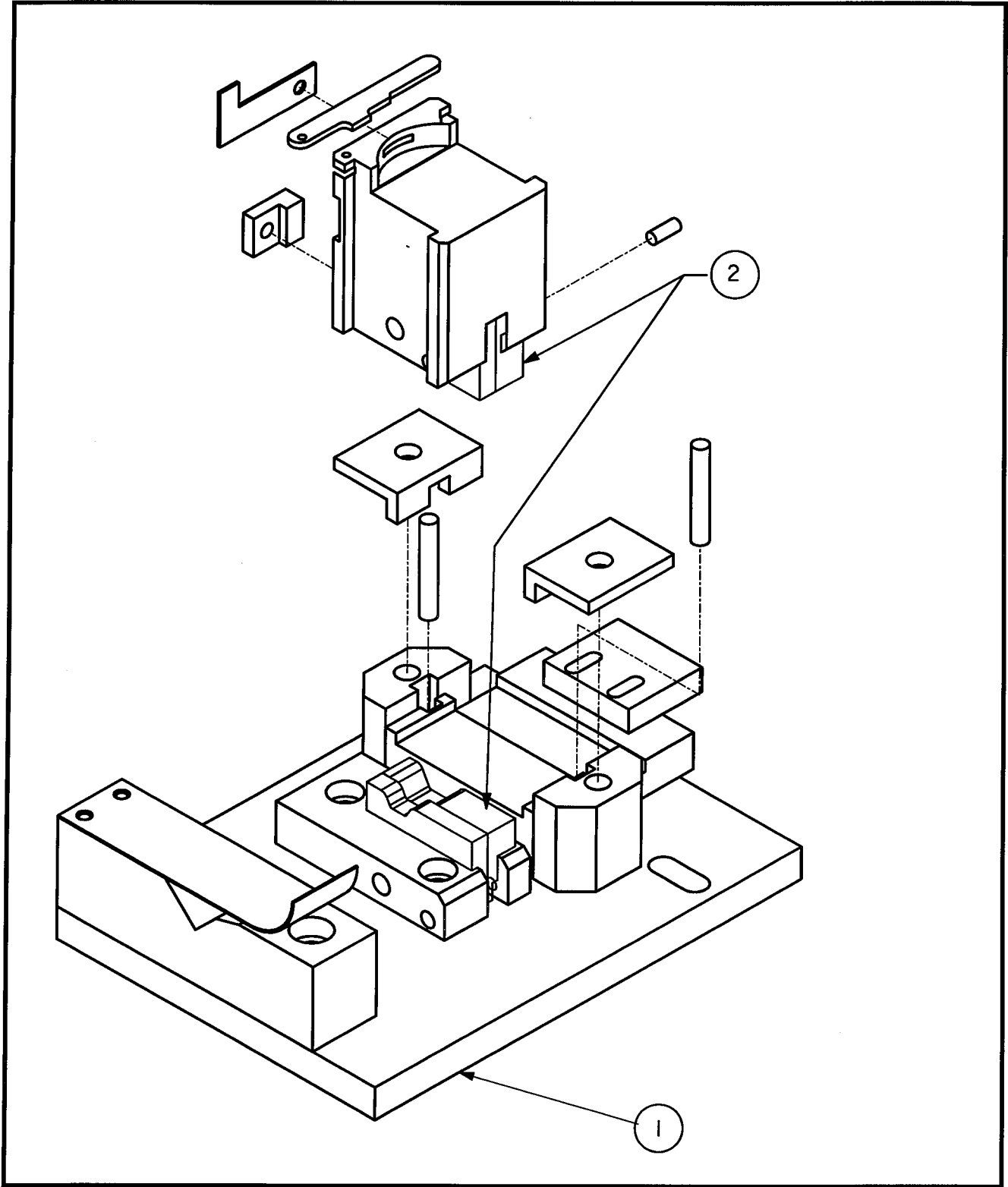
Item	Order No.	Description	Req'd.
	62200-4431	Assembly, Ferrule Die	1
	62200-6700	Assembly, Ferrule Die	1

PARTS LIST 62200-4401

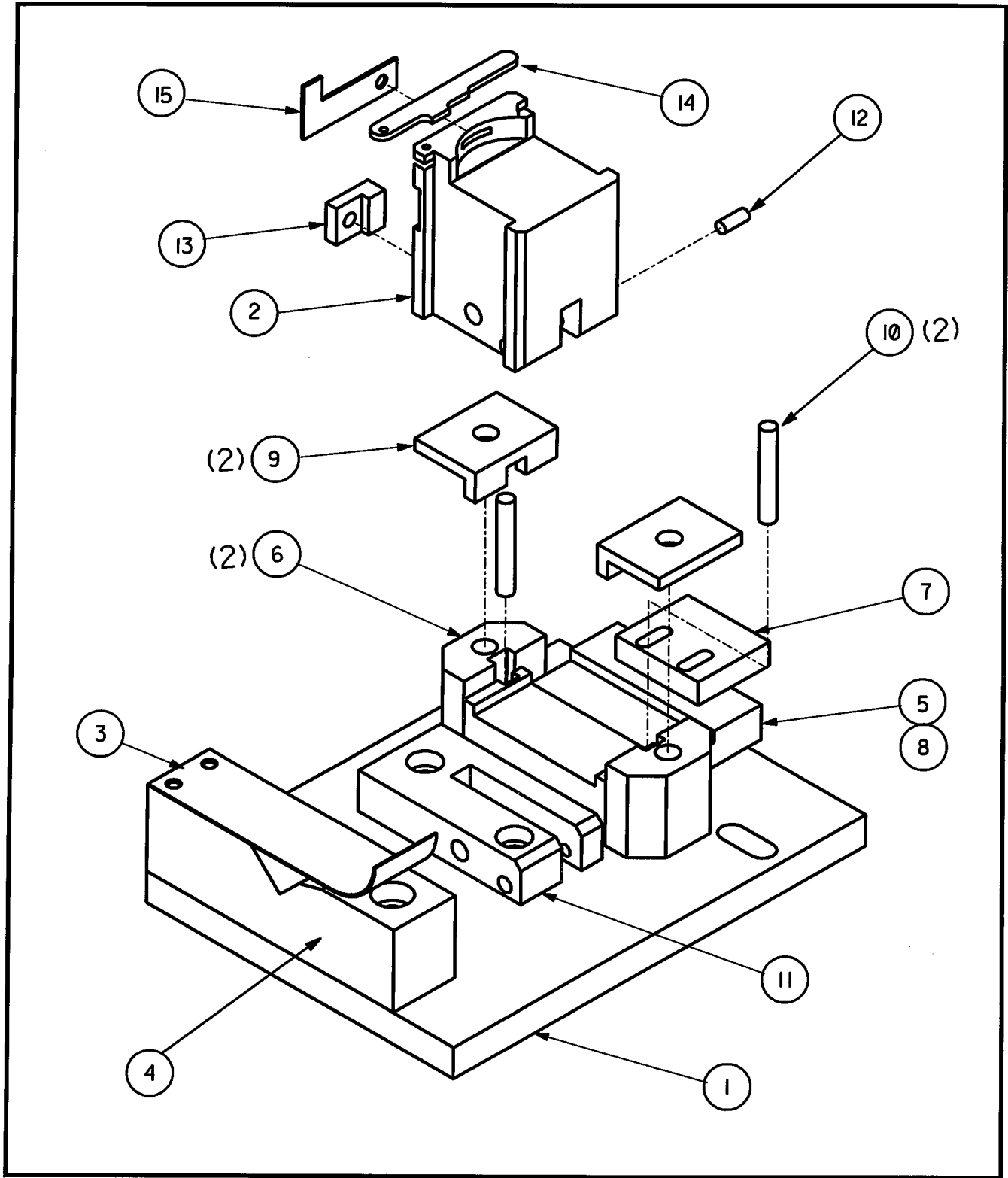
Item	Order No.	Description	Req'd.
1	62200-4417	Fixture, Tooling	1
2	62200-4418	Tooling, Holder	1
3	62200-4419	Retainer, Wire	1
4	62200-4420	Base, Wire Retainer	1
5	62200-4421	Pad, Pressure	1
6	62200-4422	Gib, Pad	2
7	62200-4429	Block, Stop	1
8	63700-2080	Spring, Compression	2
9	62200-4425	Stop, Pad	2
10		Dowel	2
11	62200-4427	Holder, Lower Tooling	1
12		Dowel	2
13	62200-4430	Stop, Upper Die	1
14	11-31-7151	Latch	1
15	11-31-7152	Spring	1



62200-4400
FIXTURE AND EVC DIE ASSEMBLY



62201-8000
FIXTURE AND DVI DIE ASSEMBLY



62200-4401
 ASSEMBLY, CRIMP FIXTURE

PARTS LIST 62200-4402

Item	Order No.	Description	Req'd..
31	62200-4409	Die, Upper Left Half	1
32	62200-4410	Die, Lower Left Half	1
33	62200-4411	Die, Lower Right Half	1
34	62200-4412	Die, Upper Right Half	1

PARTS LIST 62200-4403

Item	Order No.	Description	Req'd.
41	62200-4413	Die, Upper Right Half	1
42	62200-4414	Die, Lower Right Half	1
43	62200-4415	Die, Upper Left Half	1
44	62200-4416	Die, Lower Left Half	1

PARTS LIST 62200-4431

Item	Order No.	Description	Req'd.
51	62200-4432	Die, Upper Left Half	1
52	62200-4433	Die, Lower Left Half	1
53	62200-4434	Die, Lower Right Half	1
54	62200-4435	Die, Upper Right Half	1

PARTS LIST 62200-4436

Item	Order No.	Description	Req'd.
61	62200-4437	Die, Upper Left Half	1
62	62200-4438	Die, Lower Left Half	1
63	62200-4439	Die, Upper Right Half	1
64	62200-4440	Die, Lower Right Half	1

PARTS LIST 62200-6700

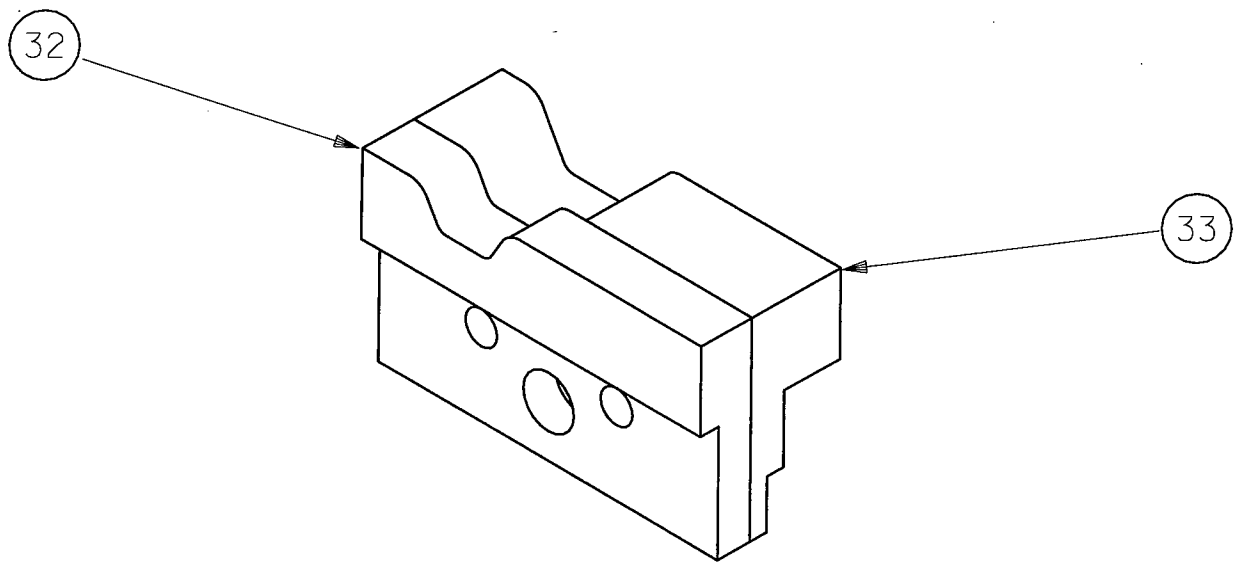
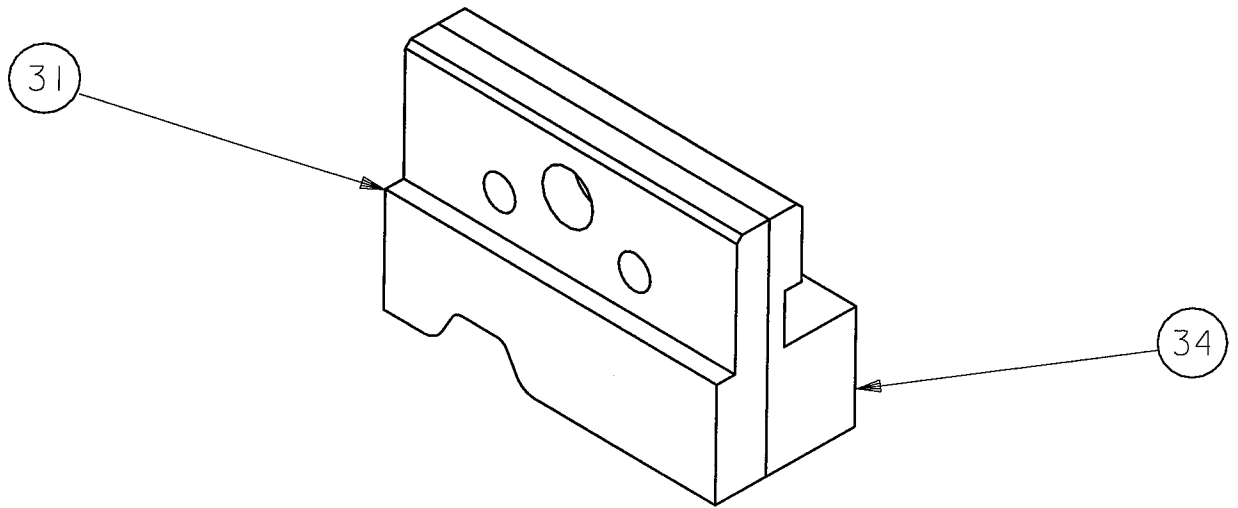
Item	Order No.	Description	Req'd.
71	62200-4413	Die, Upper Right Half	1
72	62200-4414	Die, Lower Right Half	1
73	62200-6715	Die, Upper Left Half	1
74	62200-6716	Die, Lower Left Half	1

PARTS LIST 62200-6800

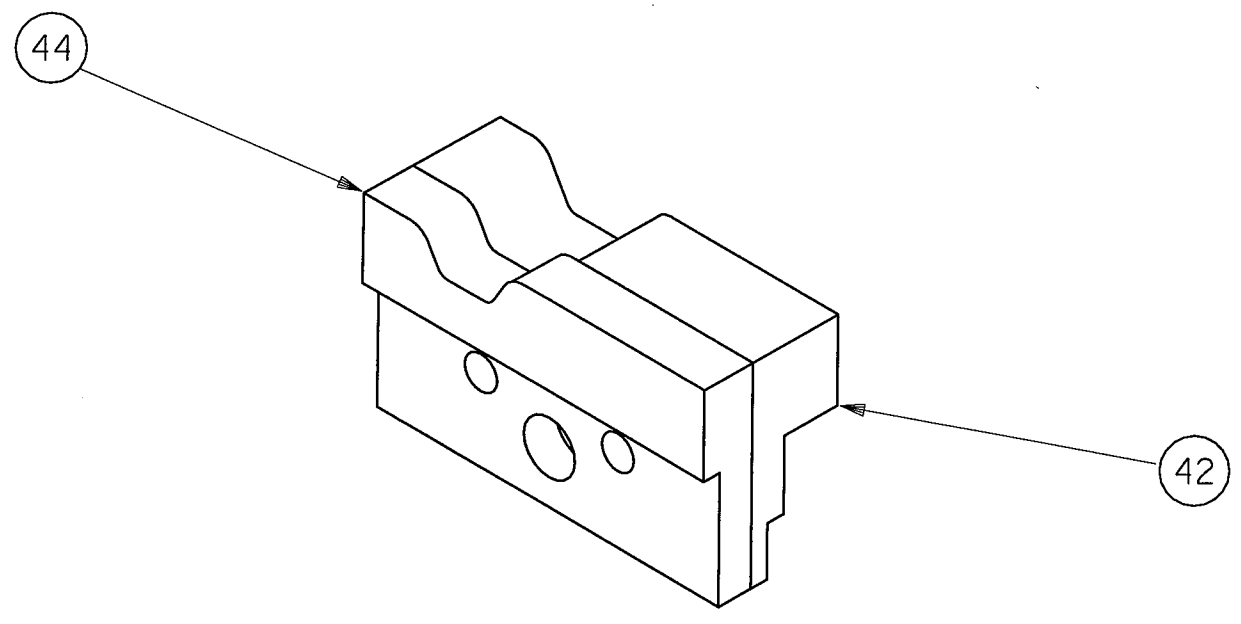
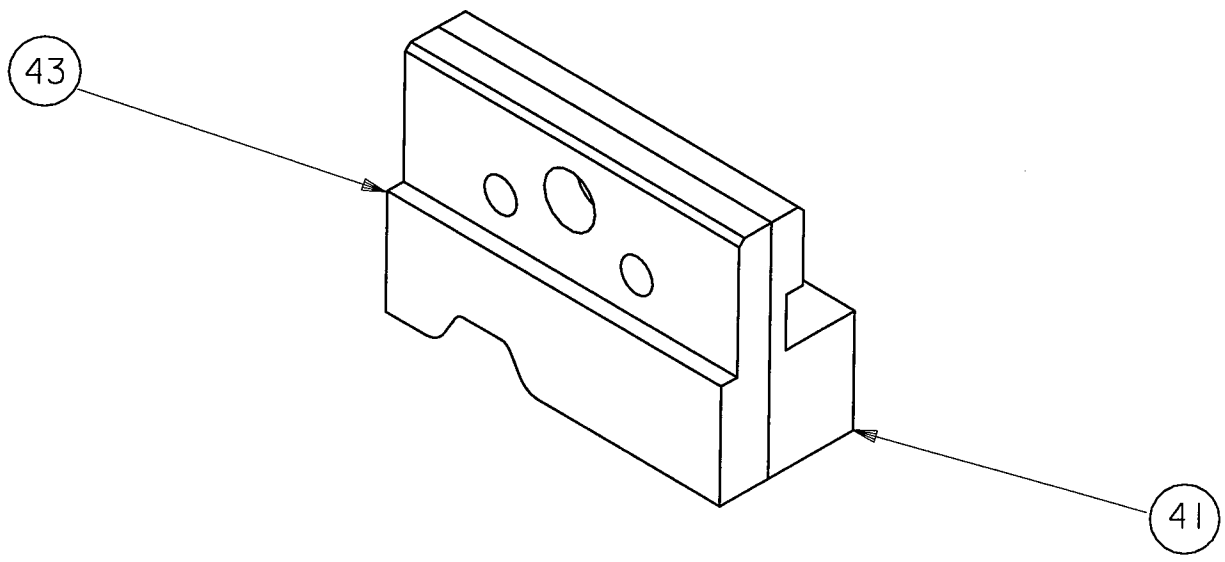
Item	Order No.	Description	Req'd.
81	62200-6837	Die, Upper Left Half	1
82	62200-6838	Die, Lower Left Half	1
83	62200-4439	Die, Upper Right Half	1
84	62200-4440	Die, Lower Right Half	1

PARTS LIST 62201-7900

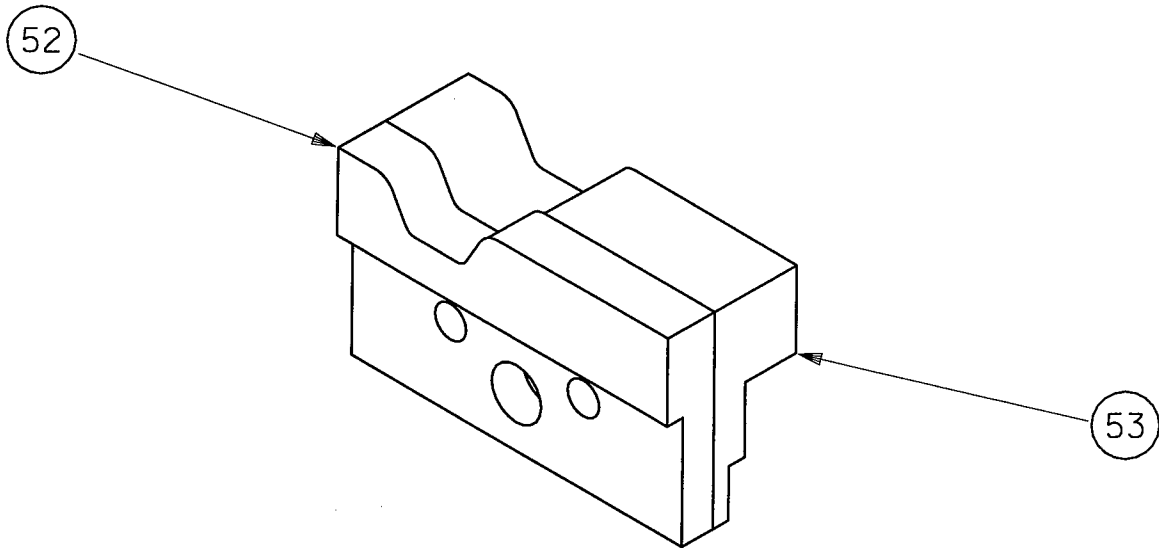
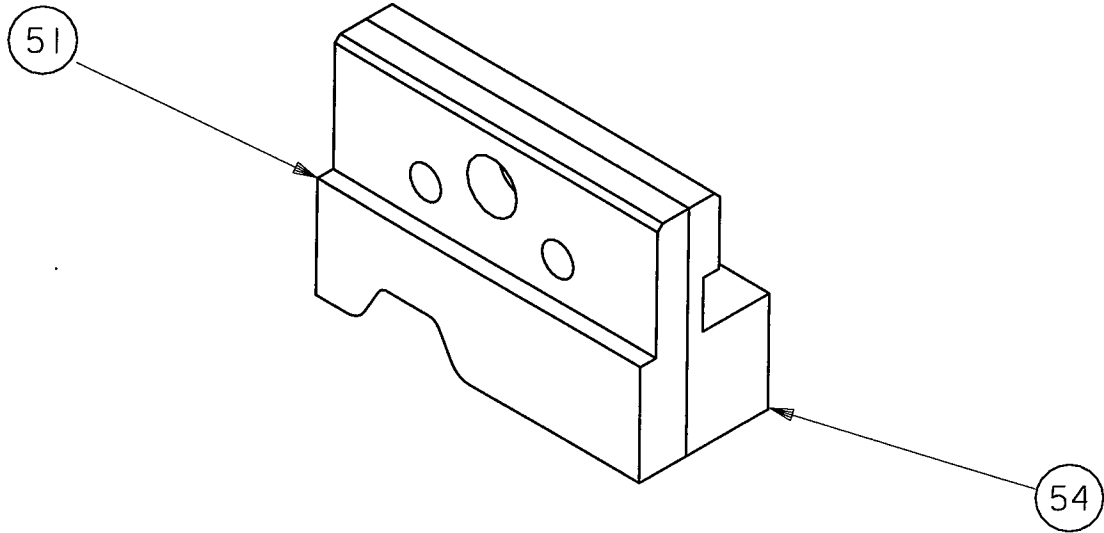
Item	Order No.	Description	Req'd.
91	62201-7901	Die, Upper Left	1
92	62201-7902	Die, Lower Left	1
93	62201-7903	Die, Upper Right	1
94	62201-7904	Die, Lower Right	1



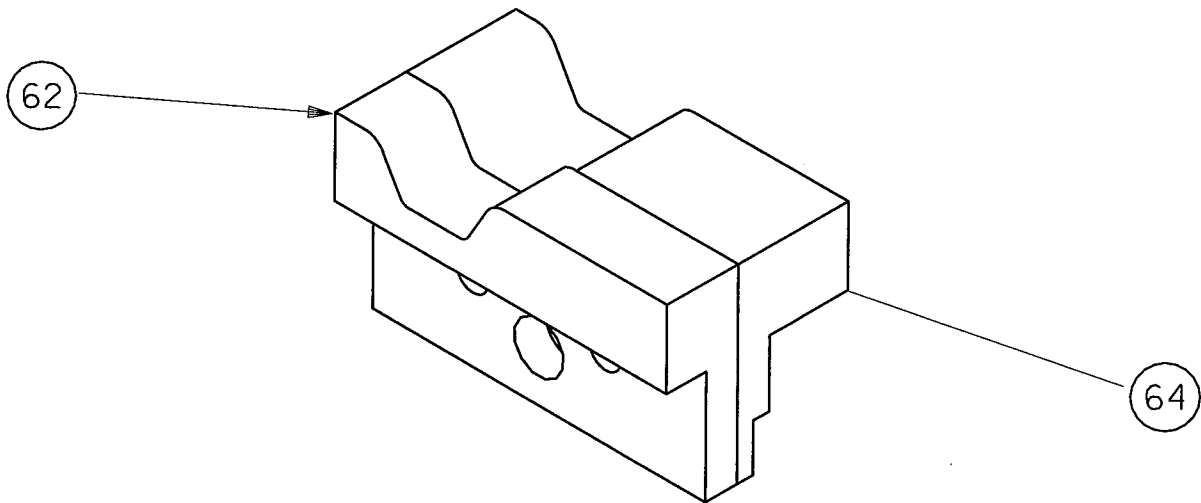
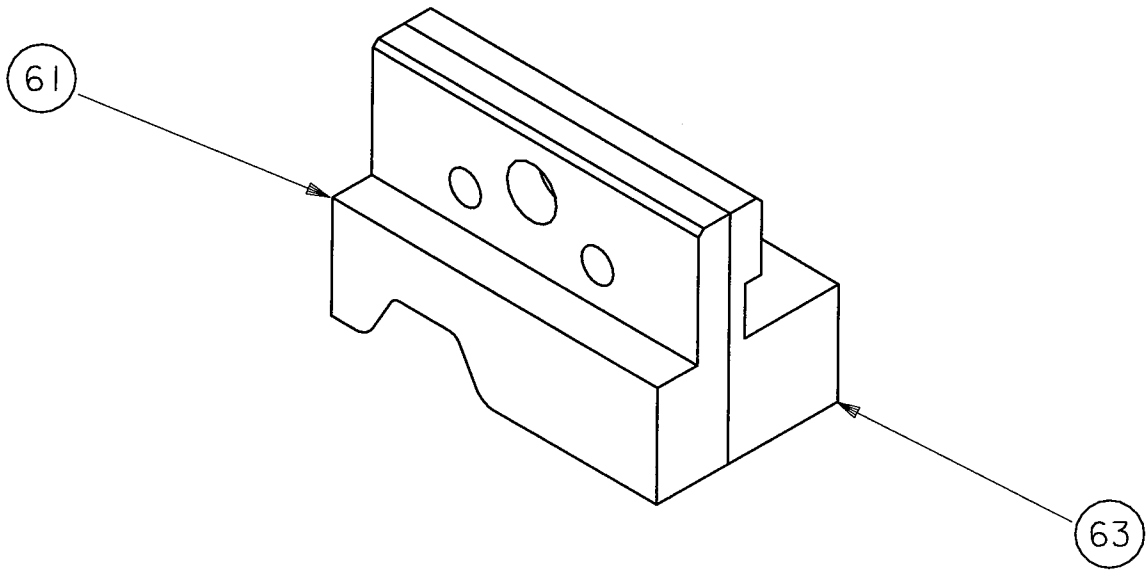
62200-4402
ASSEMBLY, FERRULE CRIMP DIE
(FOR FERRULE #79901-1116)



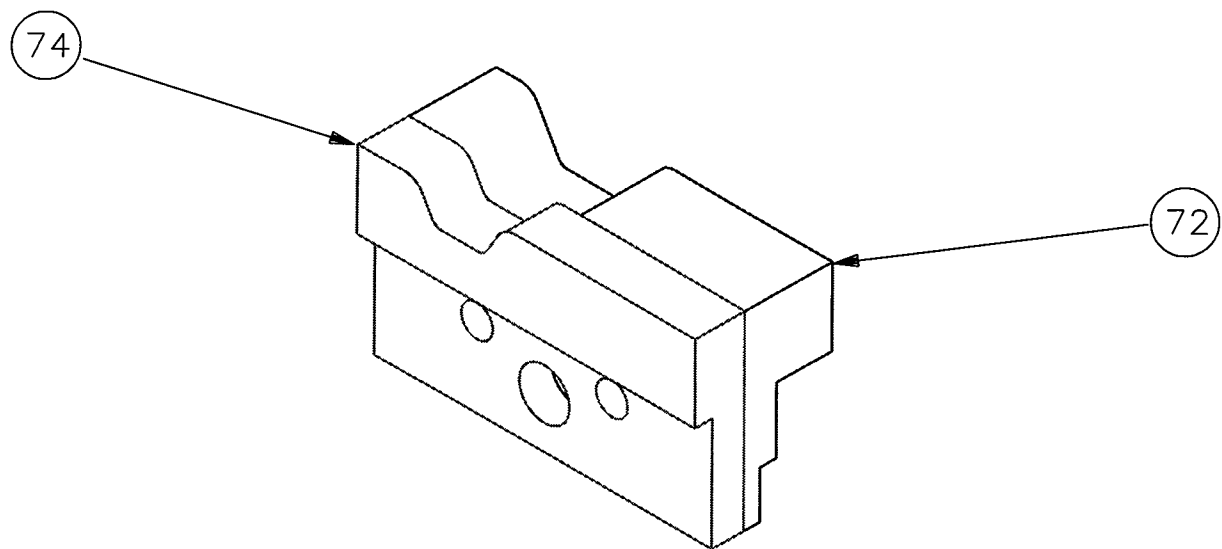
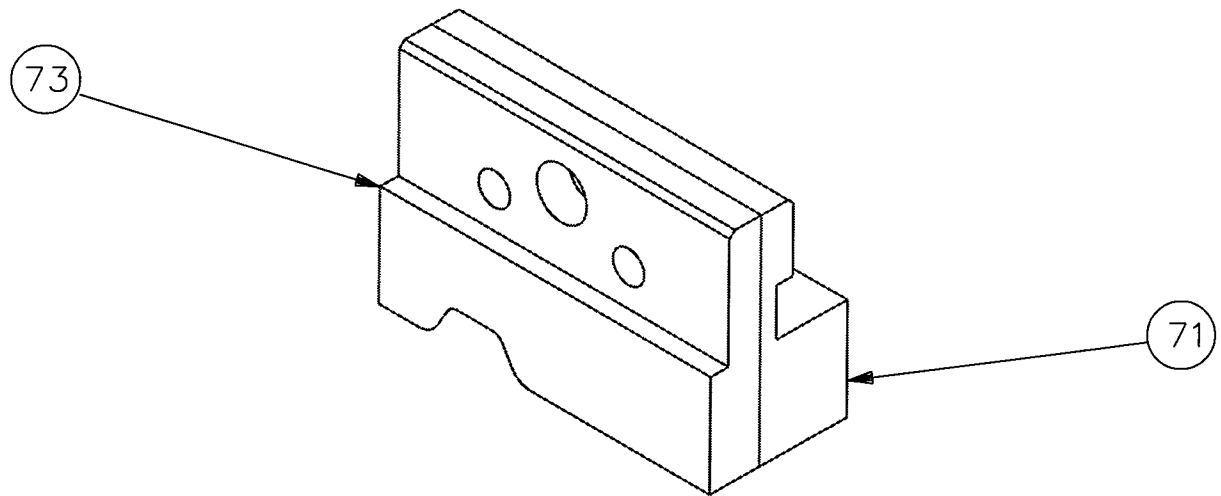
62200-4403
ASSEMBLY, FERRULE CRIMP DIE
(FOR FERRULE #73772-0001)



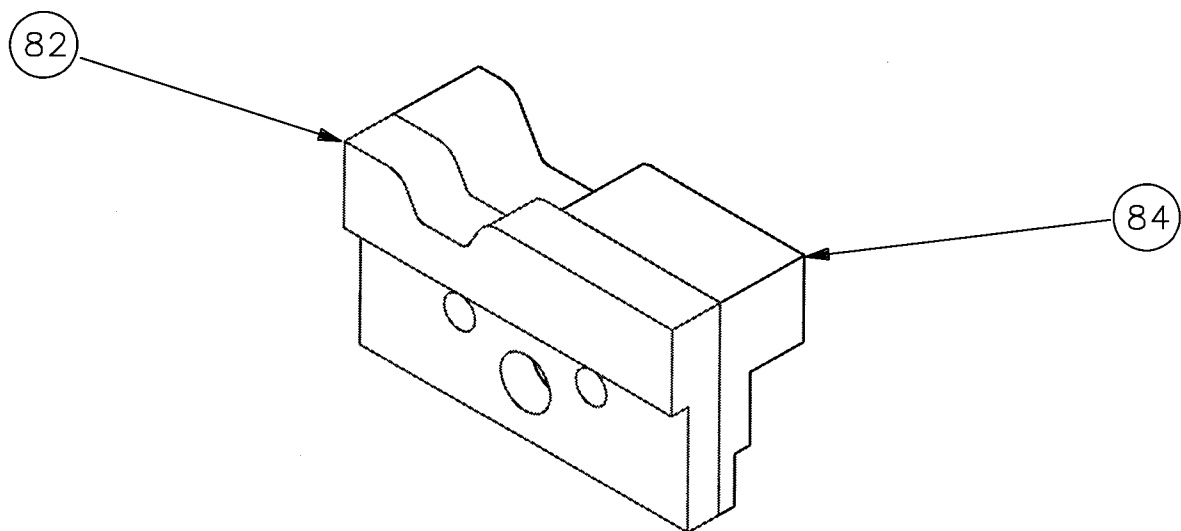
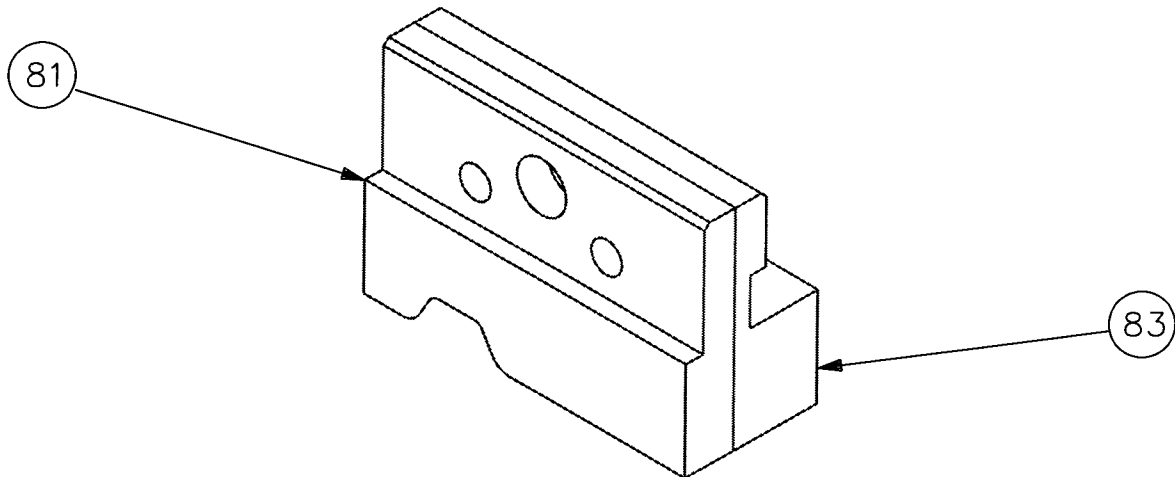
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ASSEMBLY, FERRULE CRIMP DIE
(FOR FERRULE #73772-0002)



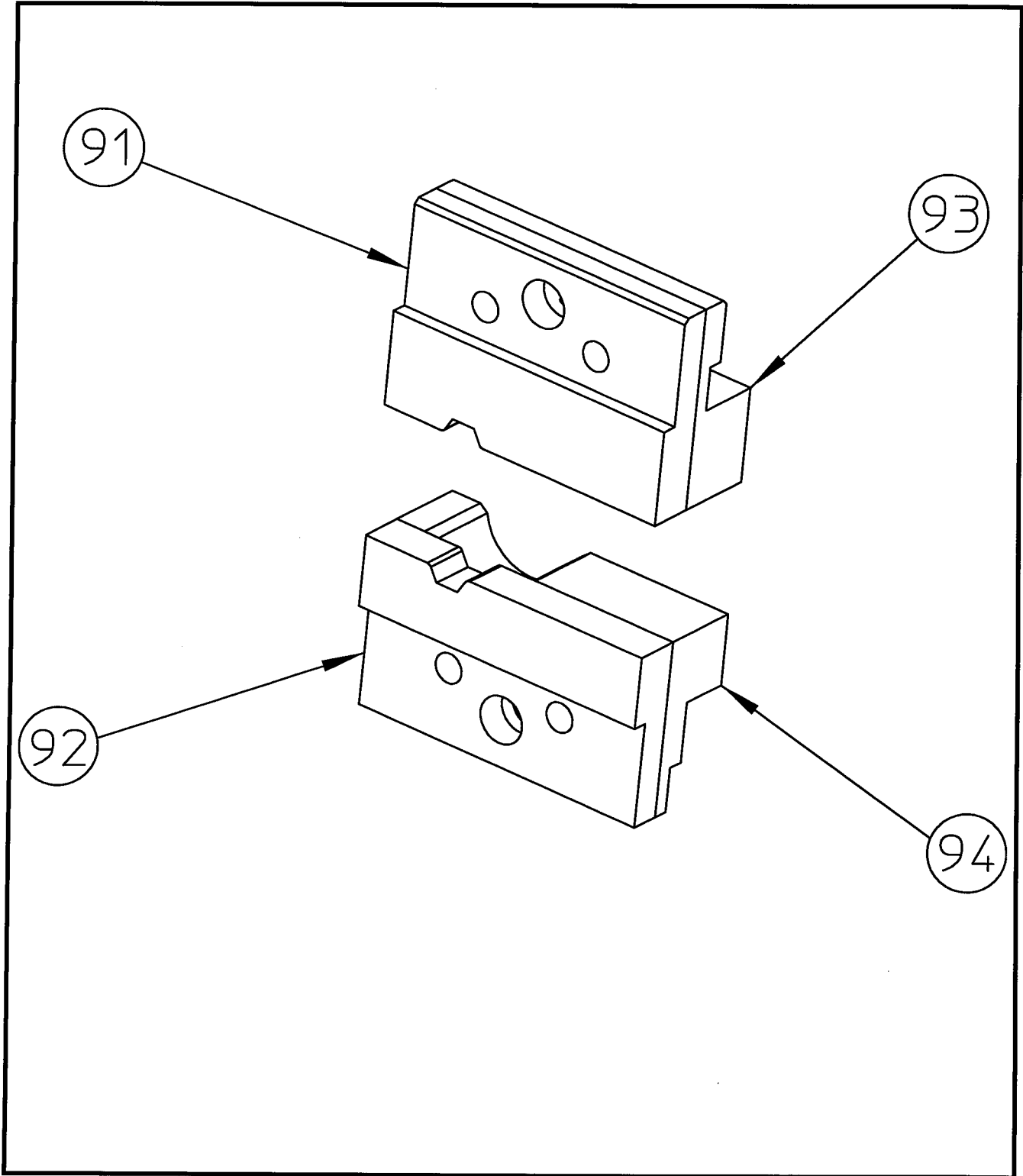
62200-4436
ASSEMBLY, FERRULE CRIMP DIE
(FOR FERRULE #73772-0003)



62200-6700
ASSEMBLY, FERRULE CRIMP DIE
(FOR FERRULE *73772-0001)



62200-6800
ASSEMBLY, FERRULE CRIMP DIE
(FOR FERRULE *73772-0004)



62201-7900
ASSEMBLY, FERRULE CRIMP DIE
(FOR FERRULE # 88789-9376)

APPENDIX A

PRODUCT SPECIFICATIONS AND APPLICATION SPECIFICATIONS

NOTE: The documents included in this section are uncontrolled and therefore may not be the latest revision. Should you desire the latest revision, please contact your local Molex sales representative and ask for the specific document number.



PRODUCT SPECIFICATION



LANGUAGE

ENGLISH

1. General purpose signals:
 Contacts: 30 circuits on a 0.075 inch grid
 Signals: Can include power, grounds, digital signal sets, and low frequency analog signals.

2. MicroCross™:
 - a) EVC plug, EVC receptacle, and P&D - A/D (Analog/Digital) receptacle
 Contacts: 4 circuits on a 0.100 inch grid with a crossing ground plane in between
 Signals: High frequency, 75 ohm, analog video
 - b) P&D plug and P&D - D (Digital) receptacle
 Contacts: A single key on the P&D plug and corresponding slot on the P&D receptacle.
 Signals: The key is used for mechanical polarization only, it does not carry any electrical signals.

Additional general specifications are:

Plug:

- LFH (Low Force Helix) style contacts
- fully shielded RF/EMI can
- grounding detents on mating shell
- solder tails for cable termination
- positive retention jackscrew: thread 4-40 UNC-2A

Receptacle:

- high cycle, dual beam, LFH shrouded contacts
- polarization achieved by a "D" shaped housing/shield
- single piece shield with integral ground leg
- shield protrudes for ESD considerations
- solder tails for thru hole board mount
- plastic retention pegs
- jackposts: thread 4-40 UNC-2A&B

Intermating:

The EVC and P&D connectors are physically very similar but carry different signal sets. The differences between these signal sets require that certain mating combinations be allowed while others be excluded. A matrix of mating configurations and the type of video signal carried between connectors is shown in Figure 2.

REVISE ON PC ONLY		TITLE	MicroCross™ - EVC and P&D I/O Plug and Receptacle Connector System	
F	SEE SHEET 1			
REV	DESCRIPTION	THIS DOCUMENT CONTAINS INFORMATION THAT IS PROPRIETARY TO MOLEX INC. AND SHOULD NOT BE USED WITHOUT WRITTEN PERMISSION		
DOCUMENT NO. PS-71182		FILE NAME PS71182.SAM	SHEET 2	
ES-40000-3996 REV. A SHEET 4 95/MAR/10 EC U5-0926 DCBRD03.SAM				



PRODUCT SPECIFICATION



LANGUAGE

ENGLISH

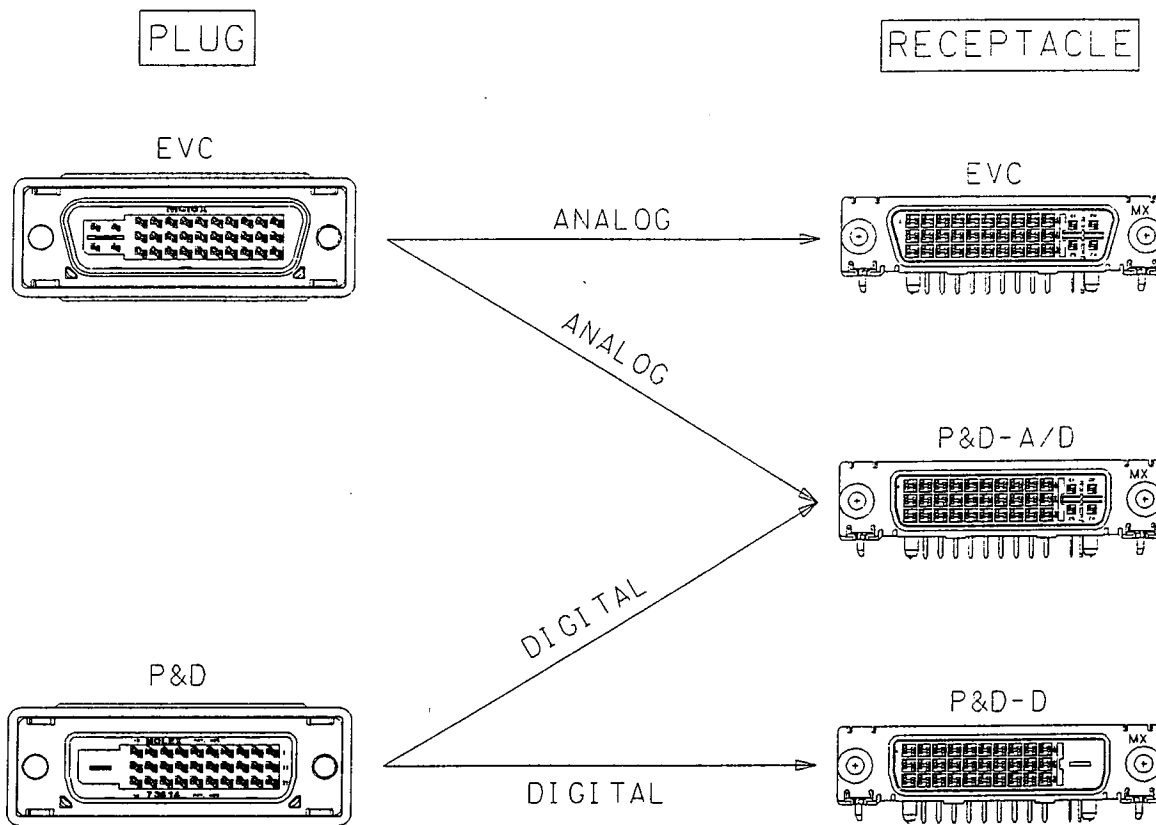


Figure 2: Possible mating configurations.

The table below contains a summary of which mating configurations are possible.

	EVC Receptacle	P&D - A/D Receptacle	P&D - D Receptacle
EVC Plug	Yes - Analog video	Yes - Analog Video	No - Plug groundplane stops on receptacle housing preventing mating
P&D Plug	No - Shield shape prevents mating	Yes - Digital Video	Yes - Digital Video

REVISE ON PC ONLY		TITLE MicroCross™ - EVC and P&D I/O Plug and Receptacle Connector System	THIS DOCUMENT CONTAINS INFORMATION THAT IS PROPRIETARY TO MOLEX INC. AND SHOULD NOT BE USED WITHOUT WRITTEN PERMISSION	
F	SEE SHEET 1			
REV	DESCRIPTION			
DOCUMENT NO. PS-71182			FILE NAME PS71182.SAM	SHEET 3
ES-40000-3996 REV. A SHEET 4 95/MAR/10 EC U5-0926 DCBRD03.SAM				



PRODUCT SPECIFICATION



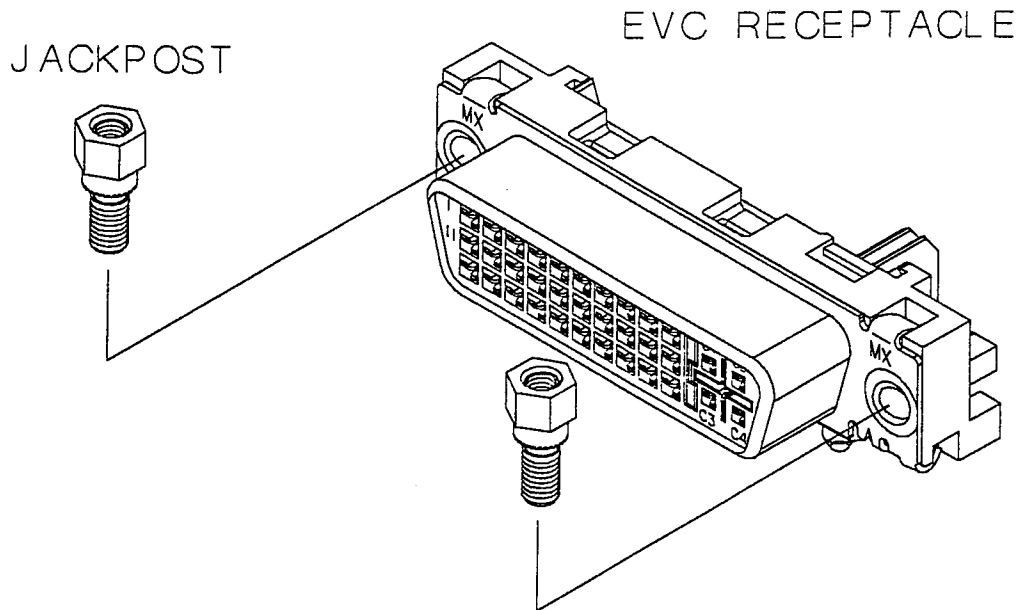
LANGUAGE

ENGLISH

2.1 Product Name and Drawing Numbers

2.1.1 EVC Receptacle

The EVC receptacle is for systems which use analog video only. It will only mate to the EVC plug.



EVC Receptacle Sales Drawings:

<u>Description</u>	<u>Sales Drawing Number</u>
Right Angle	SDA-71182-2***
Vertical	SDA-71182-3***
Jackposts	SD-71781-****

REVISE ON PC ONLY		TITLE	MicroCross™ - EVC and P&D I/O Plug and Receptacle Connector System	
F	SEE SHEET 1			
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REV	DESCRIPTION			
DOCUMENT NO. PS-71182		FILE NAME PS71182.SAM	SHEET 4	
ES-40000-3996 REV. A SHEET 4 95/MAR/10 EC U5-0926 DCBRD03.SAM				



PRODUCT SPECIFICATION

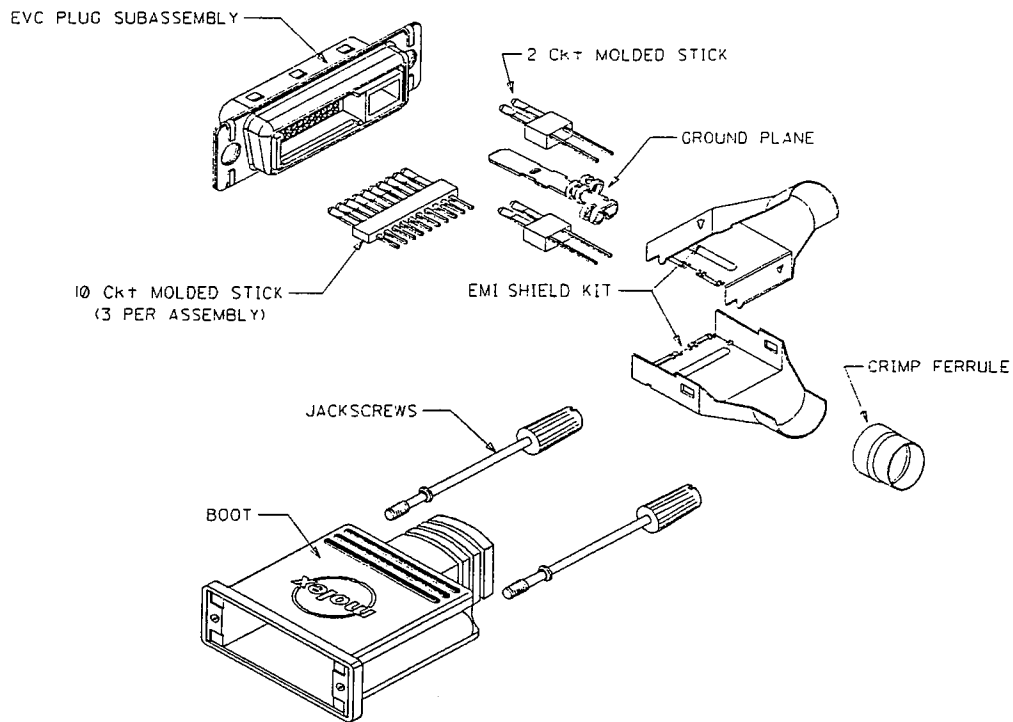


LANGUAGE

ENGLISH

2.1.2 EVC Plug

The EVC plug is used for analog video. It will mate to either the EVC or P&D - A/D receptacles.



EVC Plug Sales Drawings:

Description	Sales Drawing Number
Sub-assembly	SDA-71754-2000
10 ckt Molded Stick	SDA-73623-1***
2 ckt Molded Stick	SDA-71197-9***
Ground Plane	SD-71198-100*
EMI Shield Kit	SDMS-71755-100*
Crimp Ferrules	SD-73772-000
Boots	SD-73784-001
Jackscrew with cap	SD-71757-0002

REVISE ON PC ONLY		TITLE	MicroCross™ - EVC and P&D I/O Plug and Receptacle Connector System	
F	SEE SHEET 1			
REV	DESCRIPTION	THIS DOCUMENT CONTAINS INFORMATION THAT IS PROPRIETARY TO MOLEX INC. AND SHOULD NOT BE USED WITHOUT WRITTEN PERMISSION		
DOCUMENT NO. PS-71182		FILE NAME PS71182.SAM	SHEET 5	
ES-40000-3996 REV. A SHEET 4 95/MAR/10 EC U5-0926 DCBRD03.SAM				



PRODUCT SPECIFICATION

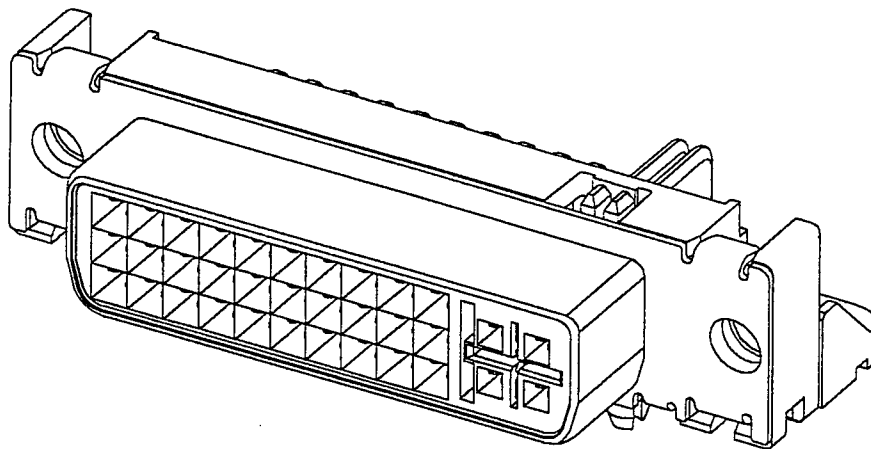


LANGUAGE
ENGLISH

2.1.3 P&D - A/D (Analog/Digital) Receptacle

The P&D-A/D receptacle supports analog video through the MicroCross™ section and digital video through the general circuit pins. It mates with either the EVC or P&D plug.

P&D-A/D RECEPTACLE



P&D-A/D Receptacle Sales Drawings:

<u>Description</u>	<u>Sales Drawing Number</u>
Right Angle	SD-73712-001
Vertical	SD-73712-002
Jackposts*	SD-71781-****

*Note: The jackposts are the same for all versions of the receptacle.

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REV	DESCRIPTION		
DOCUMENT NO. PS-71182		FILE NAME PS71182.SAM	SHEET 6
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PRODUCT SPECIFICATION

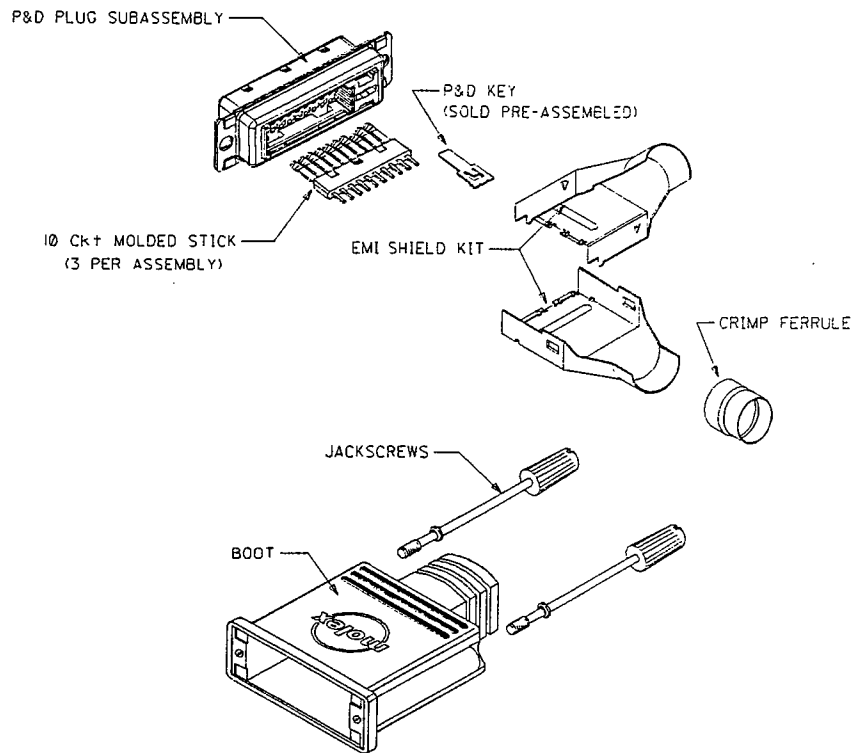


LANGUAGE

ENGLISH

2.1.4 P&D Plug

The P&D plug is used for digital video and so does not contain the MicroCross™ section. Instead, it has a key in the MicroCross™ area to ensure proper mating. This plug will mate to either of the P&D receptacles.



P&D-D Plug Sales Drawings:

Description	Sales Drawing Number
Sub-assembly with key	SD-73814-001
10 ckt Molded Stick**	SDA-73623-1***
EMI Shield Kit**	SDMS-71755-100*
Crimp Ferrules**	SD-73772-000
Boots**	SD-73784-001
Jackscrew with cap**	SD-71757-0002

**Note: These components are the same for both the EVC and P&D-D plugs.

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PRODUCT SPECIFICATION

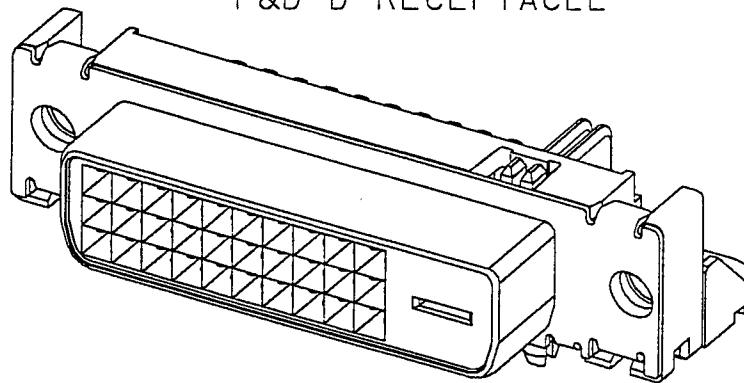


LANGUAGE
ENGLISH

2.1.5 P&D - D (Digital) Receptacle

The P&D-D receptacle supports digital video only. Instead of the MicroCross™ section, it has a slot that allows it to mate with the P&D plug key but will not mate with the EVC plug ground plane.

P&D-D RECEPTACLE



P&D-D Receptacle Sales Drawings:

Description	Sales Drawing Number
Right Angle	SD-73712-003
Vertical	SD-73712-004
Jackposts*	SD-71781-****

*Note: The jackposts are the same for all versions of the receptacle.

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F	SEE SHEET 1			
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PRODUCT SPECIFICATION

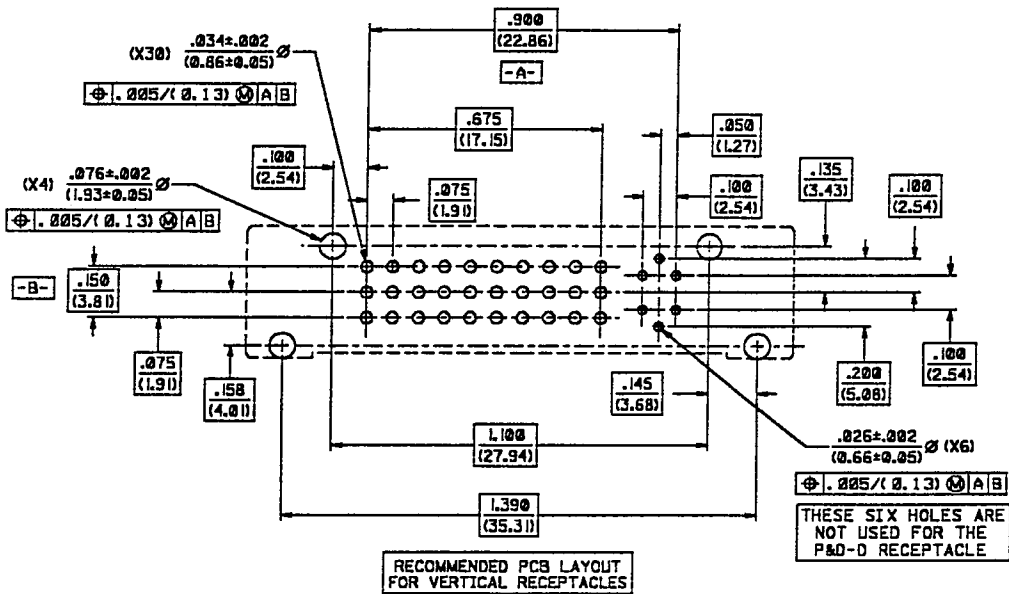
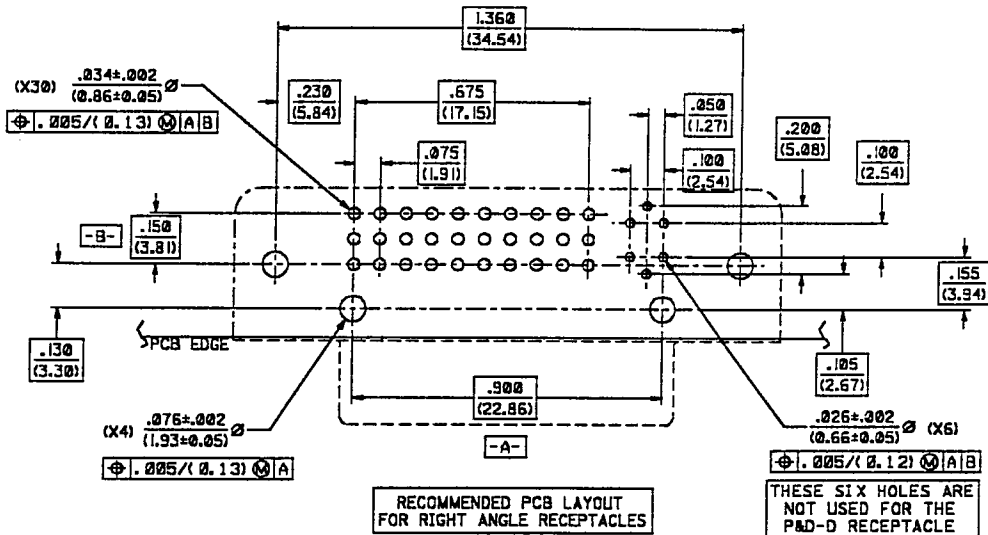


LANGUAGE

ENGLISH

2.2 Dimensions, Materials, Plating, and Markings

2.2.1 Board Layout



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DOCUMENT NO.		FILE NAME	SHEET	
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ES-40000-3996 REV. A SHEET 4 95/MAR/10 EC U5-0926 DCBRD03.SAM				



PRODUCT SPECIFICATION



LANGUAGE

ENGLISH

2.2.2 Materials

Housings: High temp glass-filled thermoplastic, black, UL94 V-0 rated.
 Terminal Sticks: High temp glass-filled thermoplastic, black, UL94 V-0 rated.
 Terminals: Copper alloy.

2.2.3 Plating

Terminals:

Selective Gold (Au) in contact area:
 Thickness: 30 microinch / 0.76 micrometer minimum;
 Selective Tin-Lead (Sn-Pb) Alloy in pc tail area:
 Thickness: 150 microinch / 1.3 micrometer minimum;
 Nickel (Ni) overall.

Shields:

Bright Tin (Sn) overall:
 Thickness: 150 microinch / 1.3 micrometer minimum;
 Nickel (Ni) over Copper Flash (Cu) overall.

Keys:

Selective Gold (Au) in contact area:
 Thickness: 4 microinch / 0.10 micrometer minimum;
 Nickel (Ni) overall.

2.2.4 Markings

All assemblies will contain circuit identification markings as well as the Molex abbreviation 'MX' on the front of the shell. The first five digits of the part number also appears on all housings when possible. Refer to the appropriate sales drawings for specific marking information.

2.3 Safety Agency Approvals

UL File Number E29179
 CSA File Number LR19980

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F	SEE SHEET 1		THIS DOCUMENT CONTAINS INFORMATION THAT IS PROPRIETARY TO MOLEX INC. AND SHOULD NOT BE USED WITHOUT WRITTEN PERMISSION		
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PRODUCT SPECIFICATION



LANGUAGE

ENGLISH

3.0 Applicable Documents and Specifications

3.1 All documents referenced shall be of the latest revision. The order of precedence detailing requirements of this specification is as follows:

1. Product Drawings
2. This specification
3. VESA standards:
 - Enhanced Video Connector
 - Pinout & Signal Standards
 - Physical Connector
 - Plug and Display
4. Reference Documents

3.2 Reference Documents

- 3.2.1 EIA RS-364-(06,09,13,17,18,20,21,23,27,28,31,32,41,46,65,67,70,90) Electronic Industries Association, Recommended Standard
- 3.2.2 IEC-801-2 International Electrotechnical Commission, Electrostatic Discharge Requirements
- 3.2.3 MIL STD-202: Test methods for electronics and electrical component parts
- 3.2.4 Molex PS-71754-9999 Application Specification, EVC Plug Cable Assembly
- 3.2.5 Molex PS-73814-9999 Application Specification, P&D Plug Cable Assembly
- 3.2.6 Molex ES-71754-9998 Termination Specification, EVC Cable Assemblies
- 3.2.7 Molex ES-73814-9998 Termination Specification, P&D Cable Assemblies
- 3.2.8 UL 94: Tests for flammability of plastics materials

4.0 Ratings

4.1 Voltage

40 Volts AC (RMS)

4.2 Current

1.5 Amps per circuit.

30 °C maximum temperature rise and 55 °C maximum ambient per EIA-364-70.

4.3 Temperature

Operating: - 20 °C to + 85 °C

Nonoperating: - 20 °C to + 85 °C

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PRODUCT SPECIFICATION



LANGUAGE

ENGLISH

5.0 Performance

5.1 Electrical Performance

ITEM	TEST CONDITION	REQUIREMENT
Contact Resistance	Bulk resistance measured between plug solder tails and receptacle solder tails	20 milliohm maximum initial
Shell Resistance	Bulk resistance measured between ground leg on receptacle shield and the overall cable braid beyond plug crimp ferrule	50 milliohm maximum initial
Insulation Resistance	500 Volts DC for 1 minute Unmated and Unmounted per EIA 364-21, Method C	1Gigaohm Minimum
Dielectric Withstanding Voltage	500 Volts DC for 1 minute Unmated and Unmounted per EIA 364-20, Method C	No Breakdown
Impedance	TDR method normalized to 1 ns risetime (General and MicroCross™ Lines) or 500 ps risetime (Differential Lines) per EIA 364-67	General Signal Lines: 65 +/- 10 Ohms MicroCross™ Lines: 75 +/- 10% Ohms Differential Lines: 105 +/- 10% Ohms
Bandwidth	Per Bandwidth test method in Appendix E of the VESA Plug and Display Standard; General and Differential Lines tested at 1:1 S:G ratio	General Signal Lines: 0.8 GHz minimum MicroCross™ Lines: 2.4 GHz minimum Differential Lines: 2.4 GHz minimum
Crosstalk	Measure NEXT and FEXT at 1V / 500 ps (General and Differential Lines) or 1V / 1 ns (MicroCross™ Lines) per EIA 364-90	5% Maximum

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REV	DESCRIPTION		
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ES-40000-3996 REV. A SHEET 4 95/MAR/10 EC U5-0926 DCBRD03.SAM			



PRODUCT SPECIFICATION



LANGUAGE
ENGLISH

5.2 Mechanical Performance

ITEM	TEST CONDITION	REQUIREMENT
Mating Force	One pair per EIA 364-13	10.0 lbf (4.5 kgf) maximum
Unmating Force	Mated pair per EIA 364-13	2.2 lbf (1.0 kgf) minimum 8.8 lbf (4.0 kgf) maximum
Plug Stick Retention	Sticks are tested as a group Either the three 10 ckt sticks or MicroCross™ section	20.0 lbf (9.0 kgf) minimum
Receptacle Contact Retention	Individual contact	1.0 lbf (0.45 kgf) minimum
P&D Plug Key Retention	Individual key	10.0 lbf (4.5 kgf) minimum
Durability	500 cycles per EIA 364-09 at 500 +/- 50 cycles per hour	Contact Resistance: 10 milliohm max (change from initial) Shell Resistance: 50 milliohm max (change from initial)
Vibration	15 minutes / axis per EIA 364-28, Method 5A	Contact Resistance: 10 milliohm max (change from initial) Shell Resistance: 50 milliohm max (change from initial) No discontinuities greater than 1 microsecond
Shock (Mechanical)	Per EIA 364-27, Condition A	Contact Resistance: 10 milliohm max (change from initial) Shell Resistance: 50 milliohm max (change from initial) No discontinuities greater than 1 microsecond
Cable Pullout Force	Cable subjected to 25.0 lbf (11.3 kgf) static load for one minute while monitoring continuity	No discontinuities greater than 1 microsecond
Board Insertion Force		10.0 lbf (4.5 kgf) maximum
Cable Flex	100 cycles in each of two planes Dimension X=3.7x Cable Diameter per EIA 364-41, Condition 1	No discontinuities greater than 1 microsecond on contacts or shields
Normal Force	For reference only	.050" pitch terminals: 75 grams typical .075" pitch terminals: 90 grams typical Ground Plane: 100 grams typical
Thread Torque	Mounted to panel; Test to failure; Tighten jackposts with torque gage until threads are stripped and jackpost turns freely	5.0 in-lbs minimum

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	REV	DESCRIPTION		
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PRODUCT SPECIFICATION



LANGUAGE

ENGLISH

5.3 Environmental Performance

ITEM	TEST CONDITION	REQUIREMENT
Thermal Shock	10 cycles of: -55 °C for 30 minutes +25 °C for 30 minutes +85 °C for 30 minutes +25 °C for 30 minutes Mated/Unmated per EIA 364-32, Condition 1	Contact Resistance: 10 milliohm max (change from initial) Shell Resistance: 50 milliohm max (change from initial)
Humidity (Steady State)	90 - 95% Humidity at 40 +/- 2 °C for 240 hours Unmated per EIA 364-31, Method II, Condition B	Contact Resistance: 10 milliohm max (change from initial) Shell Resistance: 50 milliohm max (change from initial)
Humidity (Cyclic)	Mated per EIA 364-31 Condition A - Insulator Integrity Testing Condition C - Mated Environmental Testing Both Tests: Method III, omit 7A and 7B	Contact Resistance: 10 milliohm max (change from initial) Shell Resistance: 50 milliohm max (change from initial)
Thermal Aging	105 °C for 250 hours Mated per EIA 364-17, Condition 4, Method 4.	Contact Resistance: 10 milliohm max (change from initial) Shell Resistance: 50 milliohm max (change from initial)
Corrosive Environment (Flowing Mixed Gas)	Mated: 20 days total Unmated: 1 day total Per EIA 364-65, Class II exposure	Contact Resistance: 10 milliohm max (change from initial) Shell Resistance: 50 milliohm max (change from initial)
Temperature Rise	Per EIA 364-70	30 °C maximum temperature rise
Cold Resistance	-25 °C for 96 hours	Contact Resistance: 10 milliohm max (change from initial) Shell Resistance: 50 milliohm max (change from initial)
Resistance to Solder Heat	Dip connector solder tails to board for 10 seconds Solder Temp = 260 +/- 5 °C	No visual damage to insulator
Solderability	Per MIL-STD-202, Method 208	95% minimum coverage
Electrostatic Discharge	Test unmated from 1 kV to 8 kV in 1 kV steps using 8mm ballprobe per IEC 801-2	No evidence of discharge to any of the 34 contacts

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DOCUMENT NO. PS-71182		FILE NAME PS71182.SAM	SHEET 14	
ES-40000-3996 REV. A SHEET 4 95/MAR/10 EC U5-0926 DCBRD03.SAM				



PRODUCT SPECIFICATION



LANGUAGE

ENGLISH

6.0 Packaging

6.1 Receptacles:

All receptacles are packaged in trays. Refer to appropriate sales drawings for specific packaging information.

6.2 Plugs:

Plug components are packaged separately. Sticks are packaged in trays, groundplanes are on reels, and all other components are packaged in boxes. Refer to appropriate sales drawings for specific packaging information.

7.0 Gages and Fixtures

8.0 Other Information

8.1 Test Sequences

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F	SEE SHEET 1			
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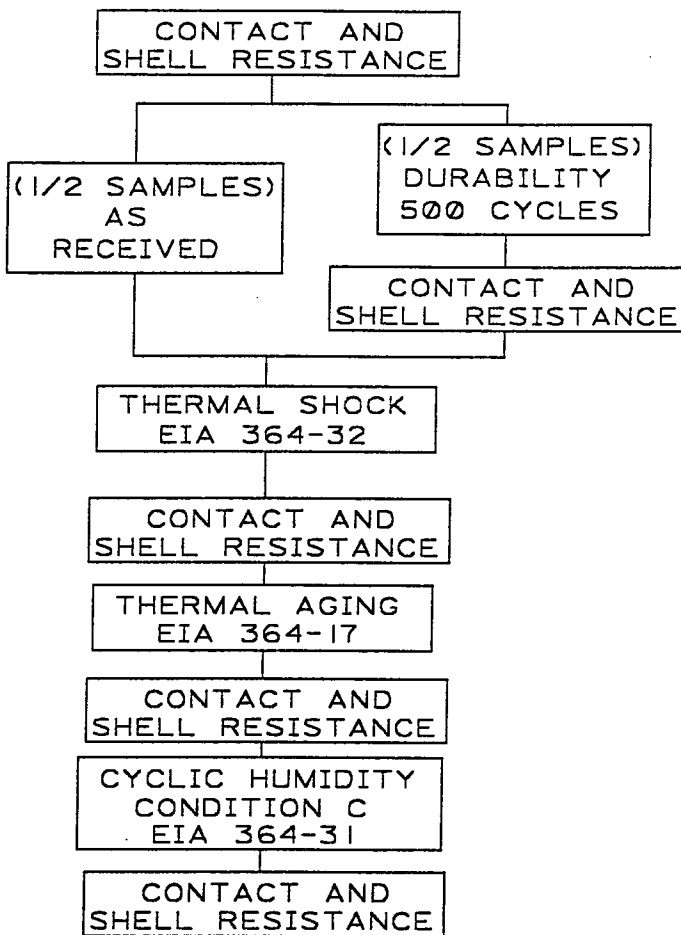
PRODUCT SPECIFICATION



LANGUAGE

ENGLISH

Group 1 : Mated Environmental



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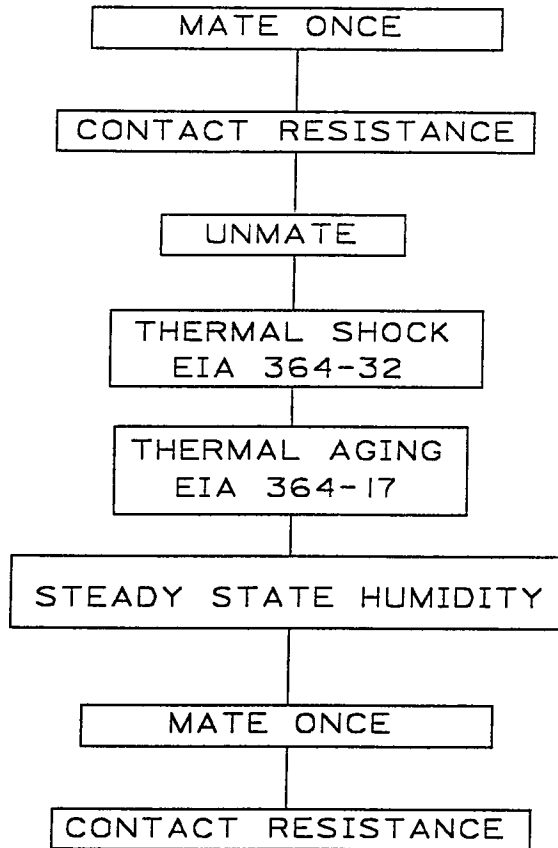
PRODUCT SPECIFICATION



LANGUAGE

ENGLISH

Group 2 : Unmated Environmental



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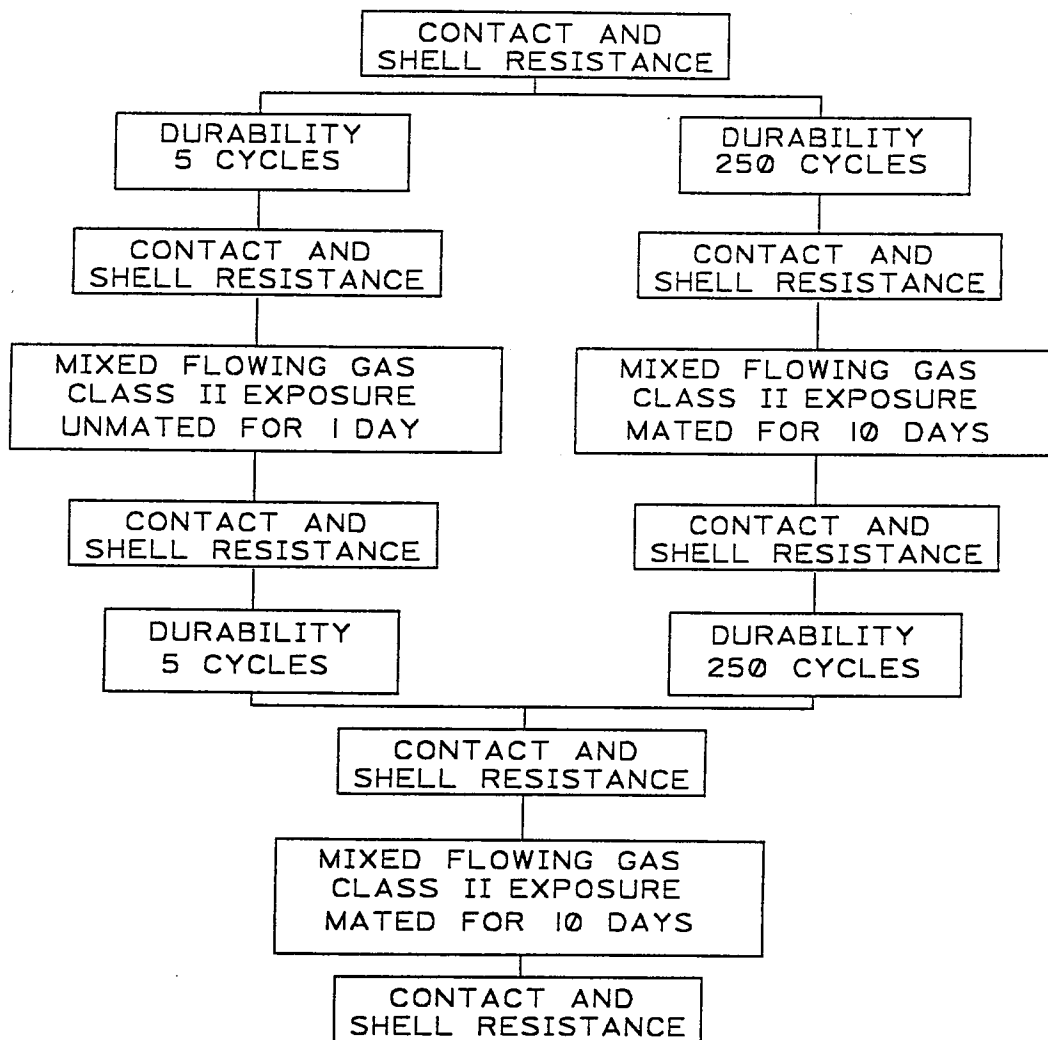
PRODUCT SPECIFICATION



LANGUAGE

ENGLISH

Group 3 : Corrosive Environment



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PRODUCT SPECIFICATION



LANGUAGE

ENGLISH

Group 4 : Mated Mechanical

CONTACT AND SHELL RESISTANCE

VIBRATION
EIA 364-28

CONTACT AND SHELL RESISTANCE

MECHANICAL SHOCK
EIA 364-27

CONTACT AND SHELL RESISTANCE

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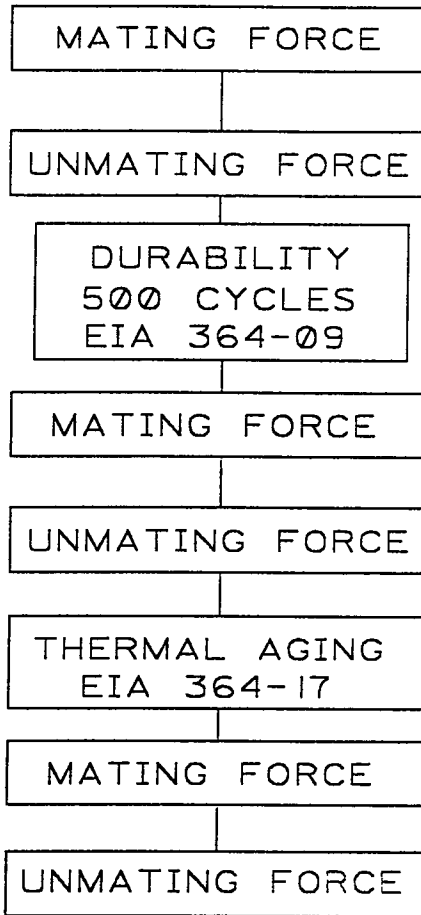
PRODUCT SPECIFICATION



LANGUAGE

ENGLISH

Group 5 : Mechanical Mate / Unmate Forces



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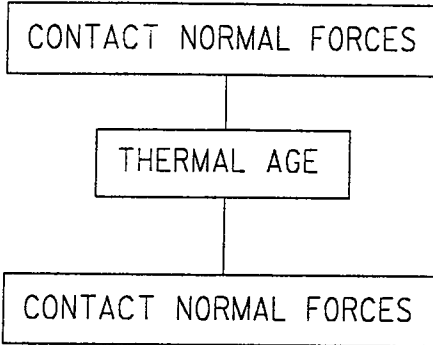
PRODUCT SPECIFICATION



LANGUAGE

ENGLISH

Group 6 : Individual Contact Normal Forces



Group 7 : Miscellaneous Mechanical

RECEPTACLE
PC BOARD INSERTION FORCES

CONTACT AND
STICK RETENTION

RECEPTACLE
THREAD TORQUE

CABLE
PULL OUT FORCE

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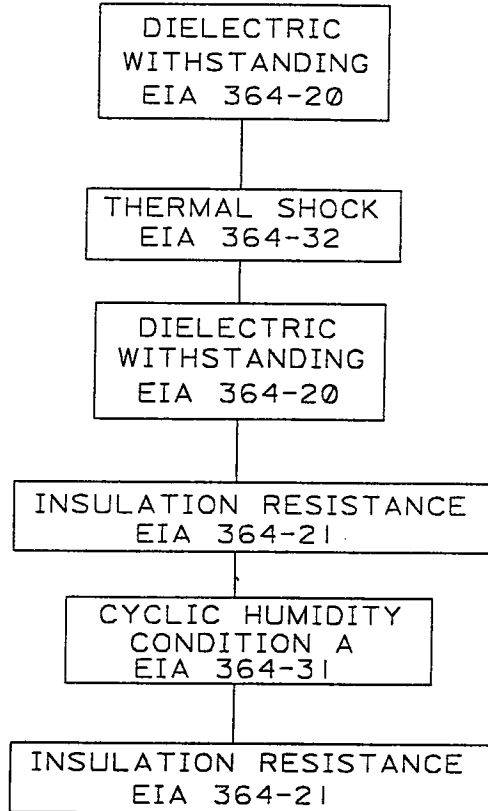
PRODUCT SPECIFICATION



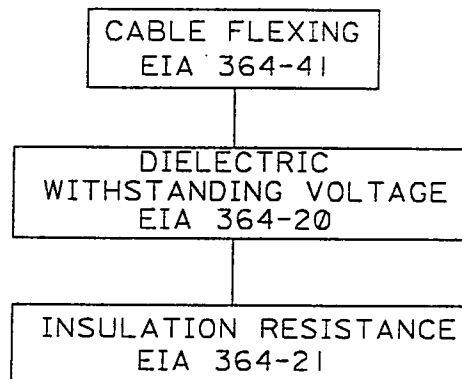
LANGUAGE

ENGLISH

Group 8 : Insulator Integrity



Group 9 : Cable Flexing



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PRODUCT SPECIFICATION



LANGUAGE

ENGLISH

Group 10 : Miscellaneous Environmental

TEMPERATURE RISE

COLD RESISTANCE

SOLDERABILITY

RESISTANCE TO
SOLDER HEAT

ELECTROSTATIC
DISCHARGE

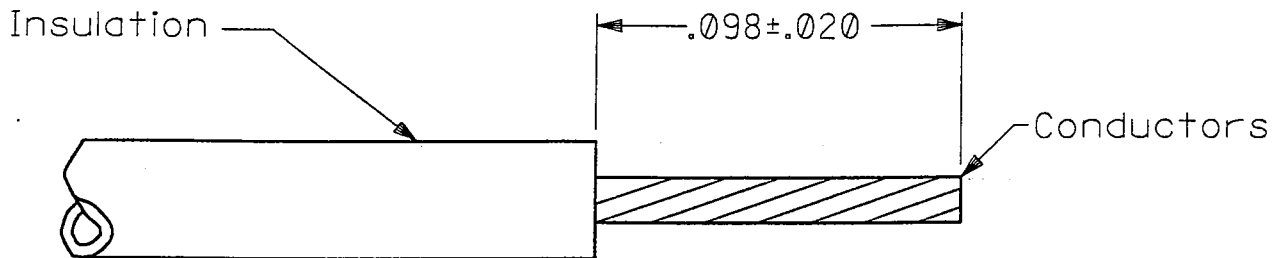
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**TERMINATION SPECIFICATION
EVC CABLE ASSEMBLIES**

3. TERMINATION PROCEDURES

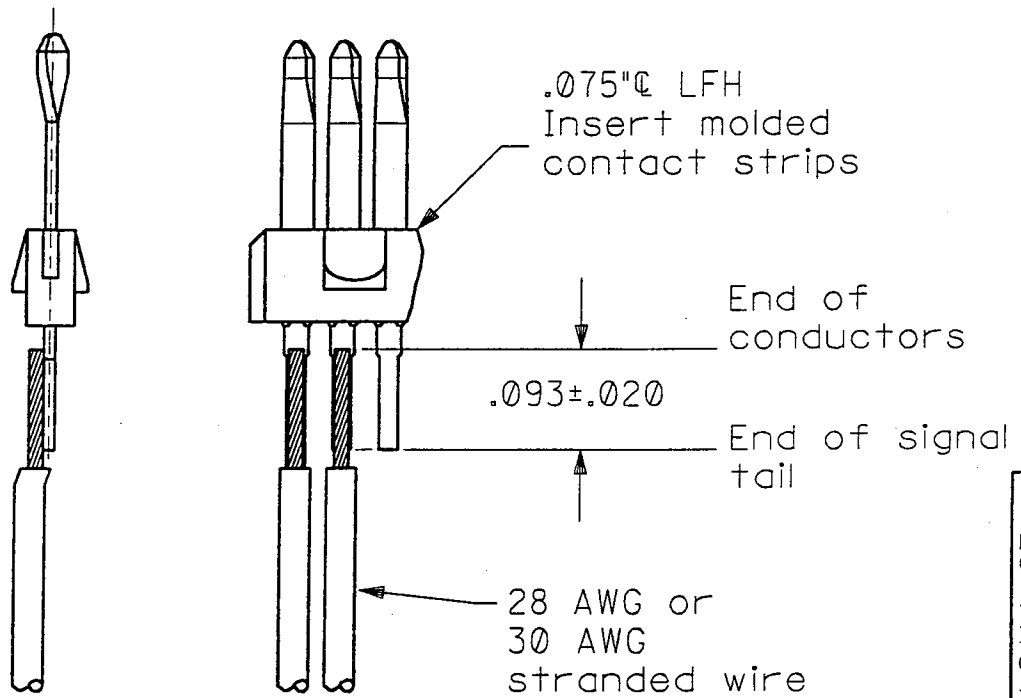
3.1 Wire Stripping Detail 28 and 30 AWG - Finished Strip Length



- (i) Conductors must be tightly wound
- (ii) Nicking of conductors is NOT acceptable

3.2 Welding/Soldering Detail of .075 Inch \varnothing Contacts

**REFERENCE DOCUMENT
NON - CONTROLLED**



DRWG. NO.
ES-71754-9998

REV.
SHT.

FILE NAME
ES71754.S02

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REVISE ONLY ON CAD SYSTEM

REV. B

SHT. 2

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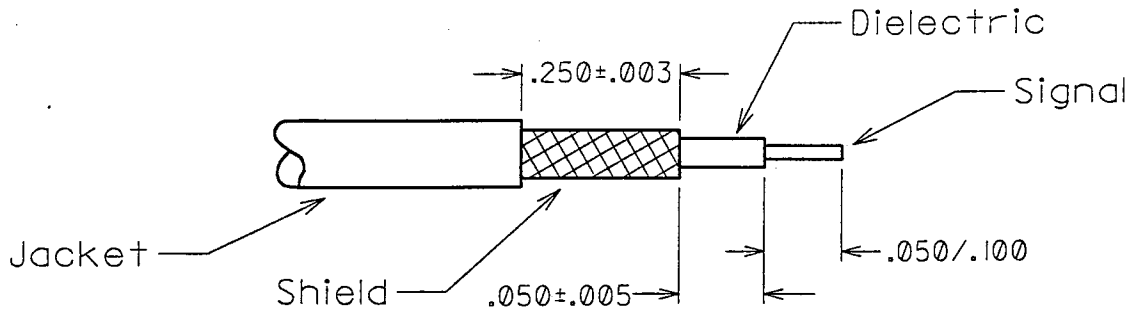


TERMINATION SPECIFICATION
EVC CABLE ASSEMBLIES

3. TERMINATION PROCEDURES (Cont'd)

3.3 Soldering procedure (Microcross only)

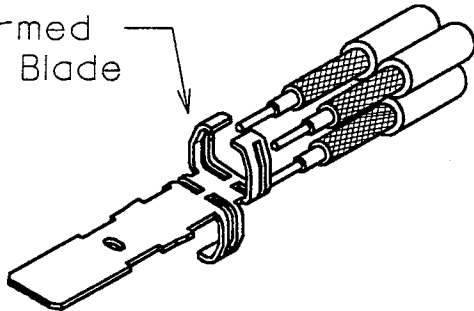
Coaxial Microcross Wire Stripping Detail - Finished Strip Length.



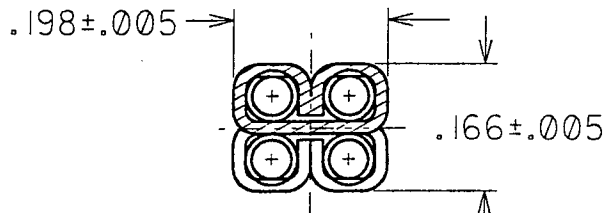
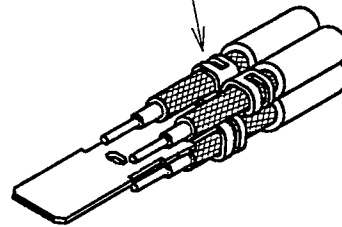
3.4 Assembly procedure (.050 pitch Microcross)

A. Orient stripped coaxial wire in pre-formed ground plane. Form ground blade enough to retain wire.

Pre-formed Ground Blade



Formed Ground Blade



Formed Ground Blade
Cross-section

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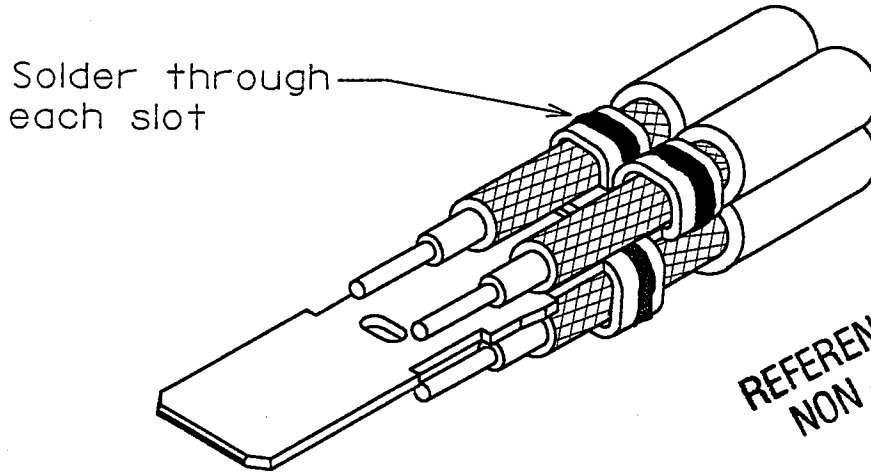


TERMINATION SPECIFICATION
EVC CABLE ASSEMBLIES

3. TERMINATION PROCEDURES (Cont'd)

3.5 Soldering Braid to Ground Detail

A. Using the chart below, solder the braid to the ground blade through each slot. The solder bead should be greater than 180 degrees around the perimeter of the form. The bead should be contained within the slot.



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Note:

1. Solder heat should be sufficient enough to provide a good solder fillet between ground blade and braid, but no scorching of dielectric is allowed. Do not apply solder iron tip directly on braid.

Soldering Parameters	
Temperature	675° F. MAX
Dwell Time	11 SECONDS MAX/SLOT
Applied Solder Volume	T.B.D.

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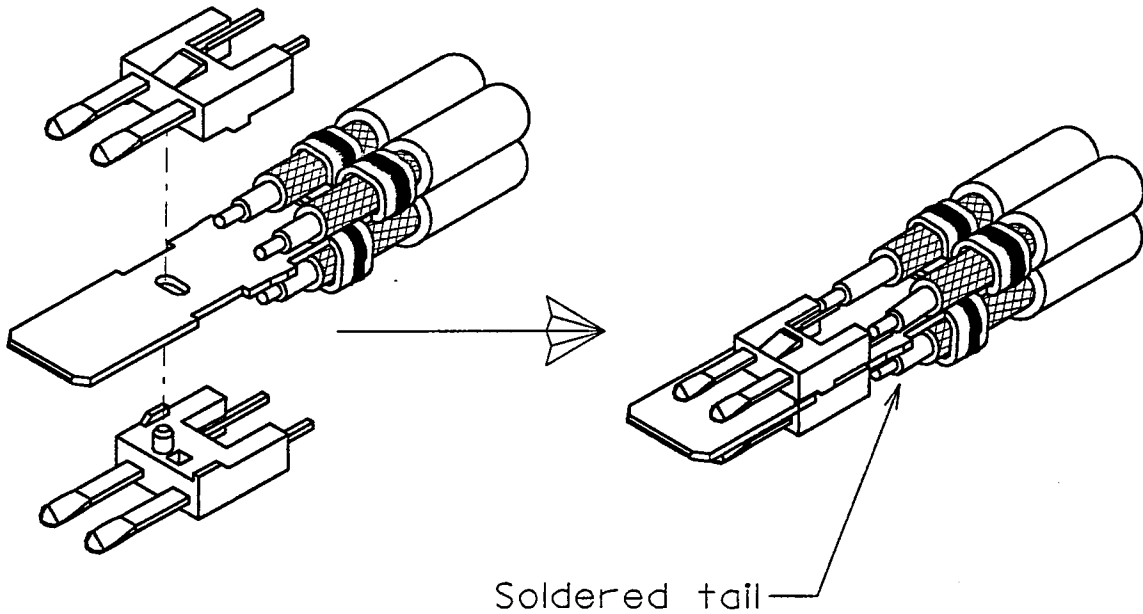


**TERMINATION SPECIFICATION
EVC CABLE ASSEMBLIES**

3. TERMINATION PROCEDURES (Cont'd)

3.6 Soldering Ground Blade Sub-Assembly Signals

- A. Assemble ground blade to .050 pitch contact stick.
Solder coaxial signals to top of corresponding signal contact tail.



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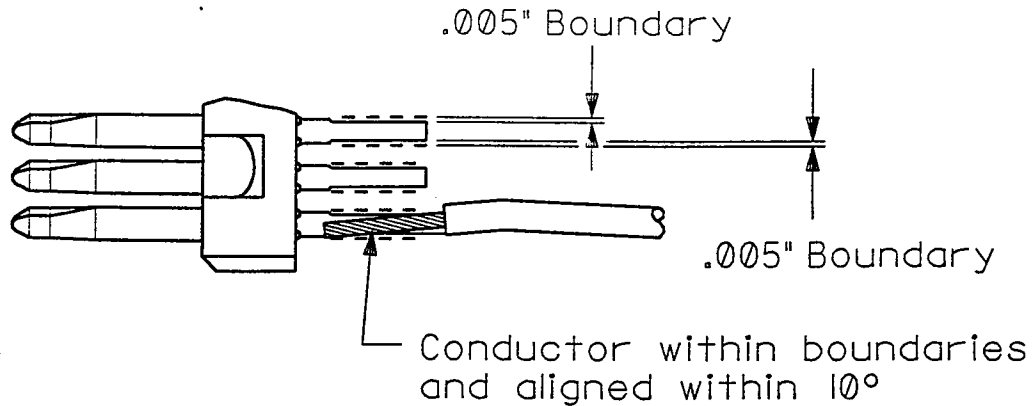
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**TERMINATION SPECIFICATION
EVC CABLE ASSEMBLIES**

4. WELD INSPECTION CRITERIA

- 4.1 There must be no visible separation between the conductors and the contacts.
- 4.2 The conductor must be centered on the contacts. Alignment between the conductor and the contact must be within 10°. Any portion of the conductors extending beyond a .005" boundary of each edge of the contact, is cause for rejection.



- 4.3 The conductor must not be smashed onto the contact. The overall diameter of the conductor bundle after termination should be at least 60% of the original diameter.
- 4.4 The finished weld should be free of deep electrode indentations, electrode deposits, pits, cracks, strand separation or abnormal discoloration around the weld.
NOTE: Surface appearance is not always a good indicator of weld quality. Insufficient heating or inadequate penetration, for example, usually leave no visible effects on the work piece.
- 4.5 Cracks, spitting (forcible ejection of material from the weld), and voids are not permitted.

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**TERMINATION SPECIFICATION
 EVC CABLE ASSEMBLIES**

4. WELD INSPECTION CRITERIA (Cont'd)

4.6 Spikes on the top surface of the wire (evidence of "tip pickup" or welding of the electrode) are cause for rejection.

4.7 PEEL TEST

The peel strength of each conductor bundle must be greater than 75% of the tensile strength of the undisturbed bundle.

$$A_p - (3 \times S_d) \geq 0.75 \times T_w$$

where:

A_p = the average peel test value

S_d = the standard deviation of these values

T_w = the tensile strength of the wire

i.e. The mean tensile strength of the samples must be at least 3 standard deviations greater than 75% of the wire's original tensile strength.

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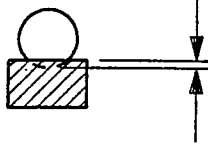


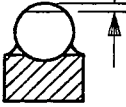

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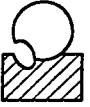
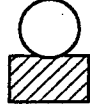

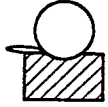
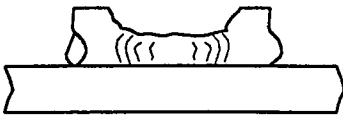
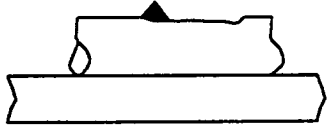
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4. WELD INSPECTION CRITERIA (Cont'd)

4.8 Acceptable Weld Characteristics

<p>A</p> <p>EMBEDMENT</p> 	<p>B</p> <p>EXPULSION</p> 	<p>C</p> <p>FILLETING</p> 
<p>D</p> <p>SHALLOW INDENTATION</p> 	<p>E</p> <p>UNDERCUT</p> 	<p>REFERENCE DOCUMENT NON - CONTROLLED</p>

4.9 Unacceptable Weld Characteristics

<p>A</p>  <p>VOIDS</p>	<p>B</p>  <p>LIGHT WELDS</p>	<p>C</p>  <p>OPEN WELDS</p>
<p>D</p>  <p>SPITTING</p>	<p>E</p>  <p>BLOWN WELD</p>	<p>F</p>  <p>TIP PICKUP</p>

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REV. NOTE: THE LIST OF DIAGRAMS IN SECTIONS 4.8 & 4.9 IS NOT ALL INCONCLUSIVE

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TERMINATION SPECIFICATION
 EVC CABLE ASSEMBLIES

5. SOLDER INSPECTION CRITERIA



5.1 Inspect solder joints per Molex Specification SMES-152.

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TERMINATION SPECIFICATION
EVC CABLE ASSEMBLIES

A	07/05/96		PAM	FIRST RELEASE U70012
B	97/03/05		BMS	REVISED PER EC # U70490

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APPROVED BY	NELLIGAN
DATE	12/12/95

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SOLDERABILITY SPECIFICATIONS

1.0 SCOPE

This standard covers the dip and meniscograph solderability test methods and performance requirements of Preplated material used in the fabrication of terminals, and Preplated and Postplated terminals intended for soldering into plated or etched electrical circuits by automatic equipment.

2.0 PURPOSE

To establish standard test method and evaluation procedures for determining the ability of plated surfaces to accept molten solder. An accelerated aging sequence is included to simulate a minimum of 6 months natural aging under a combination of various storage conditions that have different deleterious effects.

3.0 REFERENCE DOCUMENTS

ANSI/J-STD-002	Solderability Tests for Component Leads, Terminations, Lugs, Terminals and Wires
ASTM-B545	Electrodeposited Coatings of Tin
EIA-364 TP-52	EIA-364 TP-52 Test Procedures for Solderability of Contact Terminations Use in Connector/Sockets
FED SPEC QQ-S-571	"Solder; Tin Alloy; Tin-Lead Alloy; and Lead Alloy"
IEC-68-2-20	Basic Environmental Testing Procedures Part 2: Tests Part T: Soldering
JIS-C-0050	Basic Environmental Testing Procedures Part 2: Tests Part T: Soldering
MIL-F-14256	"Flux, Soldering, Liquid (Rosin Base)"
MIL-STD-202	Method 208 Solderability
MIL-STD-883	Method 2003 Solderability
MIL-STD-883	Method 2022 Meniscograph Solderability

[A summary comparison of worldwide solderability specifications appears in Appendix A.]

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4.0 DEFINITIONS

4.1 SOLDERABILITY

The property of metal to be wetted by solder.

4.2 SPECIMEN

Component under evaluation.

4.3 WETTING

A condition whereby a relatively uniform, smooth, unbroken and adherent film of solder has formed to the surface tested.

4.4 POROSITY

A condition of a solder coating with a spongy and uneven surface appearance that may contain a concentration of small pinholes and pits. See Figure 2.

4.5 NON WETTING

A condition whereby a surface has contacted molten solder, but the solder has not adhered to all of the surface; surface tested remains exposed. See Figure 3.

4.6 PIN HOLES

Small holes occurring as imperfections that penetrate entirely through the solder layer See Figure 4.

4.7 DEWETTING

A condition whereby the molten solder has coated the surface tested and then receded leaving irregularly shaped mounds of solder separated by areas covered with a thin solder film; base metal is not exposed. See Figure 5.

4.8 FOREIGN MATERIAL

A lumpy, irregular coating which has covered, or partially covered, particles of material located on, but different than, the specimen material or coating. See Figure 6.

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5.1 EQUIPMENT

5.1.1 SOLDER POT

A solder pot of sufficient size to contain at least 1000 grams of solder shall be used. The apparatus shall be capable of maintaining the solder at the temperature specified in 5.3.4.

5.1.2 SOLDER MENISCUS FORCE MEASURING DEVICE (MENISCOGRAPH)

A solder meniscus force measuring device, meniscograph, which includes a temperature controlled solder pot containing approximately 750 grams of solder shall be used. This apparatus shall be capable of maintaining the solder at the temperature specified in 5.3.4. The meniscograph apparatus also includes a strip chart recorder which records the force curve for the specimen tested.

5.1.3 DIPPING DEVICE

A mechanical dipping device capable of controlling the rates and angle of immersion of the specimen, and providing a dwell time (time of total immersion to the required depth) in the solder bath as specified in 5.3.4 shall be used.

A mechanical dipping device is incorporated in the meniscograph, and is preset to produce an immersion and removal rate as specified in 5.3.4. The specimen dwell time is operator controlled to the time specified in 5.3.4.

5.1.4 OPTICAL EQUIPMENT

An optical system capable of providing magnification between 10X and 20X shall be used.

5.1.5 CONTAINER AND COVER

A nonmetallic container of sufficient size to allow the suspension of the specimens 38mm (1.5 inches) above the boiling distilled water shall be used (a 2,000ml beaker is one size that has been used satisfactorily for smaller components). The cover shall be one or more stainless steel plates and shall be capable of covering approximately 7/8ths (88%) of the open area of the container so that a more constant temperature may be obtained. A suitable method of suspending the specimens shall be improvised. Perforations or slots in the plates are permitted for this purpose.

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5.2 MATERIALS

5.2.1 FLUX

The flux shall conform to type R or RMA of MIL-F-14256, "Flux, Soldering, Liquid (Rosin Base)".

5.2.1.1 TYPE R (NON-ACTIVATED)

Used for postplated product.

5.2.1.2 TYPE RMA (MILDLY-ACTIVATED)

Used for preplated product with bare edges.

5.2.2 SOLDER

The solder shall conform to type S, composition Sn60 or Sn63, of Federal Specification QQ-S-571, "Solder; Tin Alloy; Lead-Tin Alloy; and Lead Alloy".

5.3 PROCEDURE

The test procedure shall be performed on a number of terminations. During handling, care shall be exercised to prevent the surface to be tested from being abraded or contaminated by grease, perspirants, etc. The test procedure shall consist of the following operations:

- a. Proper preparation of the terminations, see 5.3.1.
- b. Aging of specimens, see 5.3.2 and Table 1.
- c. Application of flux and immersion of the terminations into molten solder and solder temperatures, see 5.3.3 and 5.3.4.
- d. Examination of the tested portions of the terminations upon completion of the solder dip process, see 5.4.1 or interpretation of the recordings upon completion of the meniscograph solder dip process, see 5.4.2.

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5.3.1 PREPARATION OF TERMINATIONS

No wiping, cleaning, scraping or abrasive cleaning of the terminations shall be performed. Any special preparation of the terminations, such as bending or re-orientation prior to the test, shall be specified.

5.3.2 AGING

5.3.2.1 STEAM

Prior to the application of flux and subsequent solder dips, specimens assigned to Categories 2 or 3 shall be subjected to aging exposure of the surfaces to steam in the container specified in 5.1.5. The specimens shall be suspended so that no portion of the specimen is less than 38mm (1.5 inches) above the boiling distilled water with the cover specified in 5.1.5. See Table 1 for categories and duration of steam exposure. If necessary, additional hot distilled water may be gradually added in small quantities so that the water will continue to boil and the temperature will remain essentially constant.

5.3.2.2 DRY HEAT

Prior to the application of flux and subsequent solder dips, specimens assigned to Category 4 shall be subjected to aging exposure in at $155 \pm 5^{\circ}\text{C}$ dry heat. See Table 1 for duration of dry heat exposure.

5.3.3 APPLICATION OF FLUX

Flux, type R or RMA, shall be used as specified in 5.2.1. Specimens shall be immersed in the flux which is at room ambient temperature, to the minimum depth necessary to cover the surface to be tested. The specimens shall be immersed in the flux for a period of 5 to 10 seconds.

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TABLE 1: AGING CATEGORIES FOR COMPONENT LEADS AND TERMINATIONS

Category 1: No Steam Aging Requirements

Minimum Coating Durability

Intended for surfaces which will be soldered within a short period of time (e.g. up to 6 months) from the time of testing and are likely to experience a minimum of thermal exposures prior to soldering (see below).

Category 2: 1 Hour ± 5 Minutes Steam Aging

Typical Coating Durability (for non-tin and non-tin lead finishes)

Intended for surfaces finished with other than Sn or Sn/Pb coatings which will be soldered after an extended time from the time of testing and which may see limited thermal exposures prior to soldering (see below).

Category 3: 8 Hours ± 15 Minutes Steam Aging

Typical Coating Durability (default for tin and tin-lead finishes)

Intended for surfaces finished with Sn or Sn/Pb coatings which will be soldered after an extended storage (e.g. greater than 4 months) from the time of testing and/or which see multiple thermal exposures prior to soldering (see below).

Category 4: 16 Hours ± 15 Minutes Dry Heat

Intended for surfaces finished with Sn or Sn/Pb coatings which will be soldered after an extended time from the time of testing and which may see limited thermal exposure prior to soldering.

The accelerated steam aging of solderable coatings has been, and continues to be, the subject of intense investigation. Compared to other aging methods, steam aging satisfactorily accelerates the degradation of tin and tin/lead surfaces in a manner similar to natural aging. The degradation mechanisms of surface oxidation and Cu-Sn intermetallic growth are both enhanced by the heat and humidity of steam. Properly applied tin and tin-lead coatings can withstand the steam aging environment well beyond the 8 hours specified and may survive natural aging well beyond 12 months. Due to the combined effects of specific geometry, storage environment, and material systems, it is not possible to accurately predict storage life. As a result, this specification indicates a storage life overlap for coating durability Category 1 and Category 3, and an open ended limit for coating durability Category 3. For coatings other than tin or tin-lead, Category 2 data does not exist to support steam aging longer than the 1 hour specified.

Humidity aged samples experience a primary aging mechanism of both oxidation of the Sn/Pb surface and Cu₆Sn₅ intermetallic growth. The primary aging mechanism for dry aged samples tends to be only intermetallic growth.

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5.3.4 SOLDER DIP

The dross and burned flux shall be skimmed from the surface of the molten solder as specified in 5.2.2 (may not require a separate operation in wave flow pots). The molten solder shall be maintained at a uniform temperature of 245 ± 5°C. The surface of the molten solder shall be skimmed again just prior to immersing the specimens in the solder. The parts shall be attached to a dipping device (see 5.1.3) and the flux-covered specimen immersed ONCE in molten solder to the same depth and the same manner as described in 5.3.3. The immersion and removal rates shall be 25 ± 6mm/sec (1 ± .25 inch per second) and the dwell time in the solder bath shall be 5 ± 0.5 seconds, unless otherwise specified. After the dipping process, the part shall be allowed to cool in air. Residual flux shall be removed from the specimen by rinsing in isopropyl alcohol. If necessary, a soft damp cloth or cotton swab moistened with clean 91% isopropyl alcohol shall be used to remove all remaining flux.

5.3.5 EXAMINATION OF SPECIMENS

After each dip coated specimen has been thoroughly cleaned of flux, the entire specimen shall be examined using a magnification between 10X and 20X, see 5.1.4.

5.4 FAILURE CRITERIA

5.4.1 SOLDER DIP METHOD

The criteria for acceptable solderability during evaluation of the specimen are:

- a. The total surface area of the dipped part of the specimen is at least 95% wetted.
- b. That pinholes, voids, porosity, nonwetting or dewetting are not concentrated in one area and do not exceed 5% of the total metallized area.
- c. That there shall be no solder bridging between any metallized area and any other metallized area not connected to it by design. In the event that the solder dipping has caused bridging, the test shall be considered a failure provided that a local application of heat (i.e. gas, soldering iron or redipping) results in solder pullback and no wetting of the dielectric area as indicated by microscopic examinations at a magnification of between 10X and 20X.

The area of the surface to be tested as specified in 5.3.3 shall include all sides of the specimen surface. In case of dispute, the percentage of coverage with pin holes or voids shall be determined by actual measurement of these areas, as compared to the total area.

- d. New solder should not be easily lifted nor peeled from the surface of the tested sample with a razor blade.

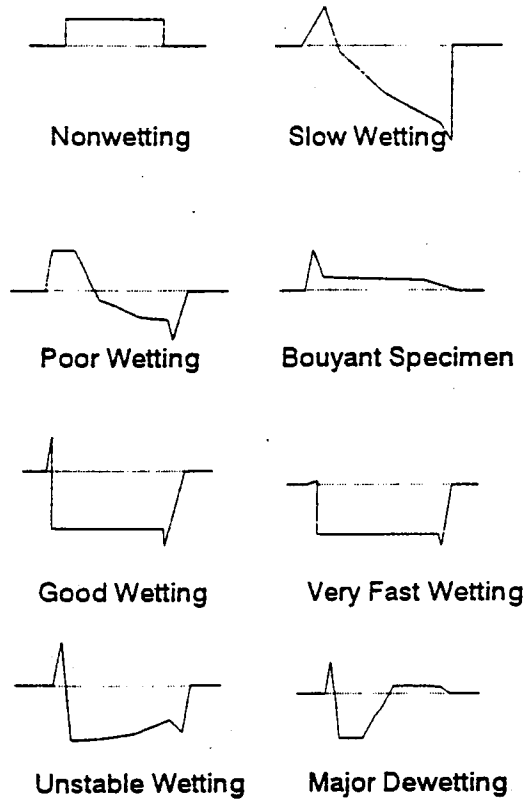
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5.4.2 MENISCOGRAPH

The criteria for acceptable solderability using the Meniscograph has not been established. This method should be used for evaluation only.

5.4.2.1 MENISCOGRAPH

The criteria for acceptable solderability during evaluation of the recordings are subject to much debate. Possible interpretations of the Meniscograph Curves are shown in Figure 1.



TYPICAL WETTING CURVES
FIGURE 1

5.4.3 VISUAL INSPECTION

To be used in conjunction with the meniscograph or to be used if the wetting curve was not generated, see 5.4.1.

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6.0 DETAILS TO BE SPECIFIED

The following information must be specified on the Engineering drawings:

- a. Area of examination
- b. Flux used (if other than Type R)
- c. Immersion time in solder (if other than 5.0 ± 0.5 secs)
- d. Aging Category (if other than Category 1)
- e. Solder temperature (if other than $245^\circ \pm 5^\circ\text{C}$)
- f. Pass/fail criteria (if other than specifications listed in 5.4)

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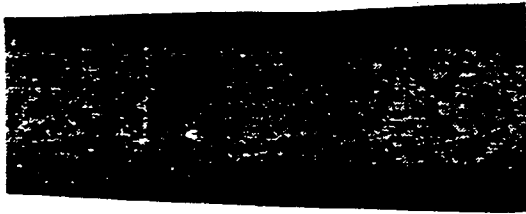


ENGINEERING STANDARD



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POROSITY
FIGURE 2



NONWETTING
FIGURE 3



PINHOLES
FIGURE 4



DEWETTING
FIGURE 5



FOREIGN MATERIAL
FIGURE 6

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B	SEE SHEET 1				
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APPENDIX A

REVISE ON PC ONLY		TITLE	SOLDERABILITY SPECIFICATIONS		152
B	SEE SHEET 1				
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		ES15211	11		
BORDER FILENAME: DCBRD06.WK1 [40000-3997] REV.A PAGE 6					



ENGINEERING STANDARD



LANGUAGE

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	SMES-152 Solderability Rev. B	MIL-STD-202 Method 208 Rev. G Notice 93/7/12	ILC-68-2-20 Solderability Rev. 1992	ANSI-J-SID-002 Solderability Rev. April 1992
Flux Type	MIL-F-14256 Type R or RMA	MIL-F-14256 Type R	25% Rosin in 75% isopropanol or ethyl alcohol, Non-Activated flux up to 0.5% chloride added.	MIL-F-14256 Type R or RMA or Type LR3CN per IPC-51-818 25% WW rosin in solvent of 99% isopropyl alcohol with a specific gravity of 0.845±0.005 @ 25°C
Flux Dwell	5-10 seconds	5-10 seconds	Not Specified	5-10 seconds
Flux Drain	Not Specified	10 to 20 seconds	1 min±5 seconds	5-20 seconds
Solder Type	Sn60 or Sn63 Type S Fed Spec 00-S-571	Sn60 or Sn63 Type S Fed Spec 00-S-571	59-61% Sn Containment List	Sn60 or Sn63 Fed Spec 00-S-571
Solder Temperature	245±5°C	245±5°C	235±5°C	245±5°C
Solder Dwell	5.0±0.5 seconds	5.0±0.5 seconds	2.0±0.5 seconds or 5.0±0.5 seconds or longer based on thermal capacity	5.0 seconds or longer by agreement
Immersion Rate	25±6 mm/sec	25±6 mm/sec	25±2.5 mm/sec	25±6 mm/sec
Steam Aging	Category 1: None Category 2: 1 hr±5 min Category 3: 8 hrs±15 min. Category 4: 16 hrs dry heat	8 hrs±30 min	None Ageing 1a: 1 hr Ageing 1b: 4 hrs Ageing 2: 10 days 55 humidity Ageing 3: 16 hrs dry heat	None 1 hr±5 min. 8 hrs±15 min.
Failure Criteria	95% min new coverage. 5% max pinholes and voids not in one concentrated area.	5% max dewetted, nonwelled or with pinholes	Smooth and bright solder with no more than small amounts of pin holes, wetted, or dewetted areas not in one concentrated area.	95% min new coverage anomalies other than pin holes, dewetting and nonwetting are not cause for rejection.
Rinse	Isopropyl Alcohol	Isopropyl Alcohol	Isopropanol or Ethyl Alcohol	Isopropyl Alcohol. Note on Safety Data Sheet

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	MIL-STD-883D Method 2003.7	ASTM B-678 Solderability Rev. 1986	EIA-364 TP-52 Solderability Rev. Aug. 1993	JIS-C-0050 Solderability Rev. April 1992
Flux Type	MIL-STD-14256 Type R (RMA optional)	25±mass % WW rosin 99 mass% Isopropyl Alcohol (mildly or activated if specified)	25% WW rosin in 99% isopropyl alcohol with a Specific Gravity of 0.838±0.005 Class 1: Type R Class 2: Type RMA (Alpha 611) Class 3: Type RA (Alpha 711)	25% rosin in 75% isopropanol or ethyl alcohol; non-activated has up to 0.5% chloide added
Flux Dwell	5-10 seconds	Not Specified	5-10 seconds	Not Specified
Flux Drain	10-60 seconds	30-60 seconds	5-20 seconds	60±5 seconds
Solder Type	Sn60 or Sn63 Type 5 Fed Spec 00-5-571	60 mass % Tin 40 mass % lead (alloy grade 60A)	60/40 SnPb-Contaminant list	59-61% Sn Contaminant list H60A, H60S, H63A per JIS-7-3282
Solder Temperature	245±5°C	245±5°C	245±5°C	235±5°C
Solder Dwell	5±0.5 seconds or 7±0.5 seconds	5±0.5 seconds	4-5 seconds	2.0±0.5 seconds or 5.0±0.5 seconds or longer based on thermal capacity
Immersion Rate	25±5 mm/sec	25±5 mm/sec	25±6 mm/sec	25±2.5 mm/sec
Steam Aging	8±0.5 hrs	24 hrs	Category 1: None Category 2: 1 hr±5 min. Category 3: 8 hrs±5 min. Category 4: 16 hrs±1 hr.	None 1 hr 4 hrs 10 days 55 humidity 16 hrs dry heat
Failure Criteria	95% new solder coating pinholes, voids, porosity, nonwetting or dewetting. 5% max total area.	Adherent, bright, smooth and uniform over at least 95% of tested area. 5% may contain pinholes, dewetted areas, and roughness.	95% min new coverage pinholes acceptable but not concentrated in an area smaller than 5%; acceptable pinholes, dewetting, nonwetting	Smooth and bright with no more than small amount of pinholes, wetted or dewetted areas not concentrated in one area.
Rinse	Isopropyl Alcohol	Isopropyl Alcohol	Isopropyl Alcohol	Isopropanol or Ethyl Alcohol

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SMES-152

FILE NAME

ES15213

SHEET

13



PRODUCT SPECIFICATION



LANGUAGE
ENGLISH

1.0 Scope

This specification covers the Molex MicroCross™ - Digital Visual Interface (DVI) system which includes cable plugs and board mount receptacles (Right Angle and Vertical).

The Digital Visual Interface connector system supports both analog and digital video transmission.

This specification covers the DVI cable to board, I/O connector system with requirements as set forth by Molex Incorporated.

2.0 Product Description

The MicroCross™ DVI system is designed to meet the industry's requirements for analog and digital computer monitors. There are (2) different receptacle connectors which correspond to the video support present on the host system (mother board/graphics cards). The DVI-D (Digital) receptacle connector supports hosts systems that transmit digital video. The DVI-I (Intergrated) receptacle connector supports host systems that are enabled to transmit both analog and digital video. This is achieved by utilizing two different sets of contacts as shown in Figure 1 below:

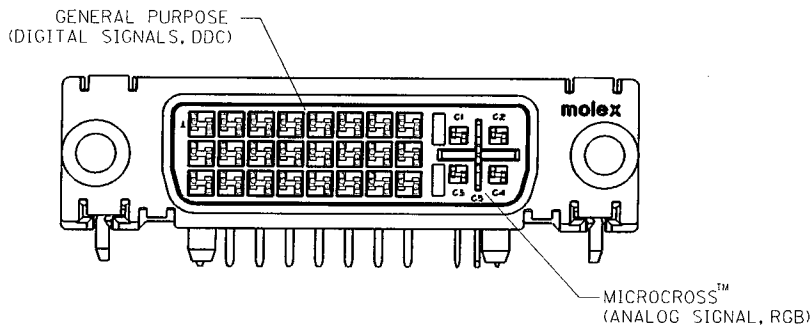


Figure 1: Two sets of contacts (DVI-I Shown)

REV	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	
SHT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	
REVISE ON PC ONLY								TITLE															
G REVISED PER EC# UDT2001-0322 TMCLELL 00/09/18								MicroCross™ - DVI I/O Plug and Receptacle Connector System															
REV DESCRIPTION								THIS DOCUMENT CONTAINS INFORMATION THAT IS PROPRIETARY TO MOLEX INC. AND SHOULD NOT BE USED WITHOUT WRITTEN PERMISSION															
DESIGN CONTROL UDT				STATUS M				WRITTEN BY: SCHMIDGA		CHECKED BY: NELLIGAN		APPROVED BY: NELSON		DATE: YR / MO / DAY 99 / 07 / 05									
DOCUMENT NO. PS-74320-001								FILE NAME PS74320.LWP								SHT NO 1 OF 22							
ES-40000-3996 REV. A SHEET 3 95/MAR/10 EC U5-0926 DCBRD03.SAM																							



PRODUCT SPECIFICATION



LANGUAGE

ENGLISH

1. General purpose signals:

Terminals: 24 circuits on a 0.075 inch/1.91 mm grid

Signals: Includes power, grounds, digital and video signals, analog synch lines and DDC (Display Data Channel) signals.

Pin	Signal Assignment	Pin	Signal Assignment	Pin	Signal Assignment
1	T.M.D.S. Data2-	9	T.M.D.S. Data1-	17	T.M.D.S. Data 0-
2	T.M.D.S. Data2+	10	T.M.D.S. Data1+	18	T.M.D.S. Data 0+
3	T.M.D.S. Data2/4 Shield	11	T.M.D.S. Data 1/3 Shield	19	T.M.D.S. Data 0/5 Shield
4	T.M.D.S. Data 4-	12	T.M.D.S. Data 3-	20	T.M.D.S. Data 5-
5	T.M.D.S. Data 4+	13	T.M.D.S. 3+	21	T.M.D.S. Data 5+
6	DDC Clock	14	+5 V Power	22	T.M.D.S. Clock Shield
7	DDC Data	15	Ground (for +5V)	23	T.M.D.S. Clock+
8	No Connect	16	Hot Plug Detect	24	T.M.D.S. Clock-

Table 1: Digital-Only Connector Pin Assignments
 Source: Digital Visual Interface Specification, Revision 1.0

2. MicroCross™:

a) Plug and Receptacle - I - Intergrated analog/digital - see figure 3, sheet 4

Terminals: 4 circuits on a 0.100 inch/2.54 mm grid with a crossing ground plane in between.

Signals: High frequency, 75 ohm, analog video

b) Plug and Receptacle - D - Digital Version

Terminals: A single key on the plug and corresponding slot on the receptacle.

Signals: The key is used for mechanical polarization only, it does not carry any electrical signals.

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G	SEE SHEET 1		
REV	DESCRIPTION		
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ES-40000-3996 REV. A SHEET 4 95/MAR/10 EC U5-0926 DCBRD03.SAM			



PRODUCT SPECIFICATION



LANGUAGE

ENGLISH

Pin	Signal Assignment	Pin	Signal Assignment	Pin	Signal Assignment
1	T.M.D.S. Data 2-	9	T.M.D.S. Data 1-	17	T.M.D.S. Data 0-
2	T.M.D.S. Data 2+	10	T.M.D.S. Data 1+	18	T.M.D.S. Data 0+
3	T.M.D.S. Data 2/4 Shield	11	T.M.D.S. Data 1/3 Shield	19	T.M.D.S. Data 0/5 Shield
4	T.M.D.S. Data 4-	12	T.M.D.S. Data 3-	20	T.M.D.S. Data 5-
5	T.M.D.S. Data 4+	13	T.M.D.S. Data 3+	21	T.M.D.S. Data 5+
6	DDC Clock	14	+5V Power	22	T.M.D.S. Clock Shield
7	DDC Data	15	Ground (return for +5V, HSync, and VSync)	23	T.M.D.S. Clock+
8	Analog Vertical Sync	16	Hot Plug Detect	24	T.M.D.S. Clock-
C1	Analog Red	C2	Analog Green	C3	Analog Blue
C4	Analog Horizontal Sync	C5	Analog Ground (analog R, G, & B return)		

Table 2: Combined Analog and Digital Connector Pin Assignments

Source: Digital Visual Interface, Revision 1.0

Additional general specifications are:

Plug:

- LFH (Low Force Helix) style contacts
- fully shielded RFI/EMI can
- grounding detents on mating shell
- solder tails for cable termination
- positive retention jackscrew: thread 4-40 UNC-2A

Receptacle:

- high cycle, dual beam, LFH shrouded contacts
- polarization achieved by a "D" shaped housing/shield
- single piece shield with integral ground leg
- shield protrudes for ESD considerations
- solder tails for thru hole board mount
- plastic retention pegs
- jackposts: # 4-40 UNC-2A&B threads. The recommended application torque setting is 4 lbf in maximum. To prevent stripping the shield threads while installing the jackposts, it is recommended the jackposts are started by hand or with a lower initial torque driver setting. The engaged threads are rated to hold a minimum of 5 lbf in of torque.

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G	SEE SHEET 1		
REV	DESCRIPTION		
DOCUMENT NO. PS-74320-001		FILE NAME PS74320.LWP	SHEET 3
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PRODUCT SPECIFICATION



LANGUAGE

ENGLISH

2.1 Product Drawing Numbers

2.1.1 Receptacle:

The DVI receptacle is for systems which support digital video (DVI-D) or both analog and digital video (DVI-I).

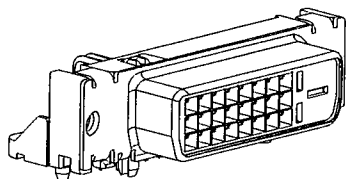


Figure 2:
Right Angle DVI-D version
(Digital)

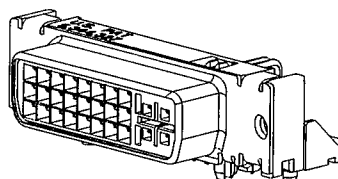


Figure 3:
Right Angle DVI-I version
Intergrated(Analog/Digital)

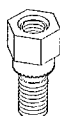


Figure 4: Jackpost

Receptacle Sales Drawings:

Description	Sales Drawing Number
Right Angle DVI-I version	SD-74320-001
Vertical DVI-I version	SD-74320-002
Right Angle DVI-D version	SD-74320-003
Vertical DVI-I version	SD-74320-004
Right Angle DVI-D/ATX Forklock version.....	SD-74320-009
Vertical DVI-A version.....	SD-74320-016
Right Angle DVI-A version.....	SD-74320-017
Right Angle DVI-I/ATX Forklock version.....	SD-74320-009
Jackposts	SD-71781-****

REVISE ON PC ONLY		TITLE	MiroCross™ - DVI I/O Plug and Receptacle Connector System	
G	SEE SHEET 1			
REV	DESCRIPTION			
DOCUMENT NO. PS-74320-001		THIS DOCUMENT CONTAINS INFORMATION THAT IS PROPRIETARY TO MOLEX INC. AND SHOULD NOT BE USED WITHOUT WRITTEN PERMISSION		
		FILE NAME	SHEET	
		PS74320.LWP	4	
ES-40000-3996 REV. A SHEET 4 95/MAR/10 EC U5-0926 DCBRD03.SAM				



PRODUCT SPECIFICATION



LANGUAGE

ENGLISH

2.1.2 DVI Plug

The DVI plug is for systems which use analog or digital video. The analog DVI plug shown below supports analog video transmission from the host to the display.

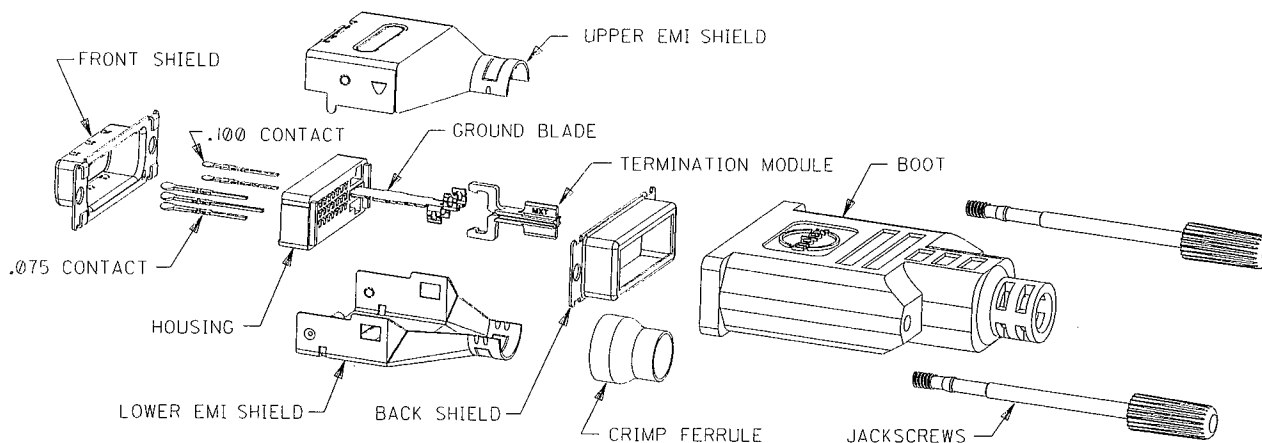


Figure 5:
Analog Version

DVI Plug Sales Drawings (Analog version):

<u>Description</u>	<u>Sales Drawing Number</u>
Plug Subassembly	SD-74323-003
EMI Can Kit.....	SD-88789-9333
(Kit includes upper and lower shields)	
Crimp Ferrule	SD-73772-000
Boot	SD-888743-230X
Jackscrew with cap	SD-88780-6005

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G	SEE SHEET 1		
REV	DESCRIPTION		
DOCUMENT NO. PS-74320-001		FILE NAME PS74320.LWP	SHEET 5
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PRODUCT SPECIFICATION

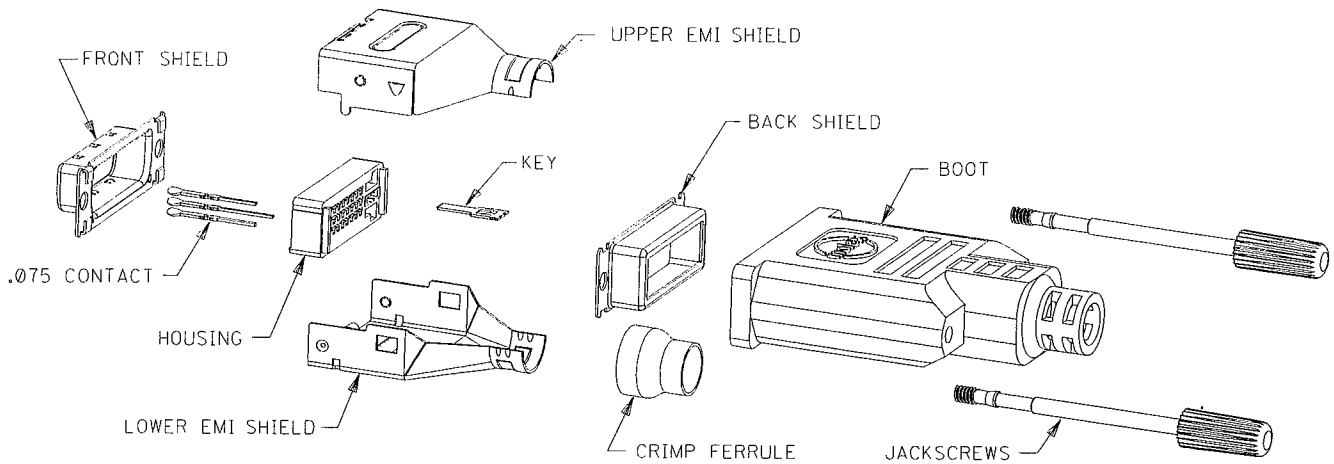


LANGUAGE

ENGLISH

2.1.3

The digital DVI plug shown below supports digital video transmission from the host to the display.



*Figure 6:
Digital Version*

DVI Plug Sales Drawings (Digital Version):

<u>Description</u>	<u>Sales Drawing Number</u>
Plug Subassembly	SD-74323-003
EMI Can Kit	SD-88789-9332
(Kit includes upper and lower shields)	
Crimp Ferrule	SD-73772-000
Boot	SD-88743-220X
Jackscrew with cap	SD-88780-6006

REVISE ON PC ONLY		TITLE	MiroCross™ - DVI I/O Plug and Receptacle Connector System		
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REV	DESCRIPTION				
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PRODUCT SPECIFICATION



LANGUAGE
ENGLISH

2.2 Dimensions, Materials, Plating, and Markings 2.2.1 Board Layout

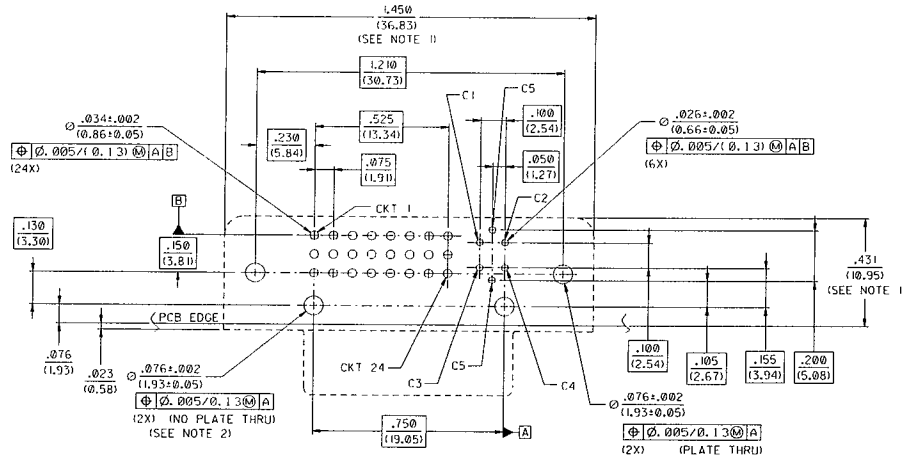
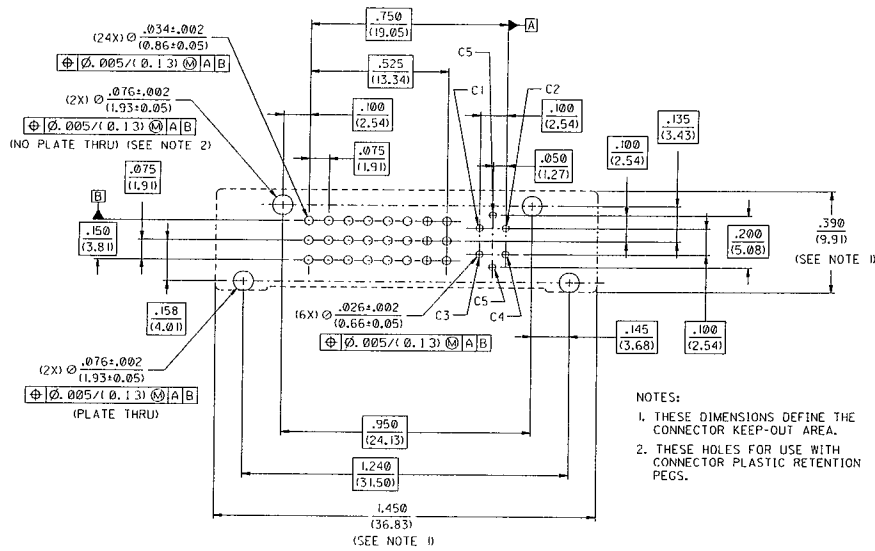


Figure 7: Recommended PCB Layout for Right Angle DVI-I Receptacle



NOTES:
 1. THESE DIMENSIONS DEFINE THE CONNECTOR KEEP-OUT AREA.
 2. THESE HOLES FOR USE WITH CONNECTOR PLASTIC RETENTION PECS.

Figure 8: Recommended PCB Layout for Vertical DVI-I Receptacle

REVISE ON PC ONLY		TITLE	MiroCross™ - DVI I/O Plug and Receptacle Connector System	
G	SEE SHEET 1			
REV	DESCRIPTION			
DOCUMENT NO. PS-74320-001		THIS DOCUMENT CONTAINS INFORMATION THAT IS PROPRIETARY TO MOLEX INC. AND SHOULD NOT BE USED WITHOUT WRITTEN PERMISSION		FILE NAME PS74320.LWP
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PRODUCT SPECIFICATION



LANGUAGE

ENGLISH

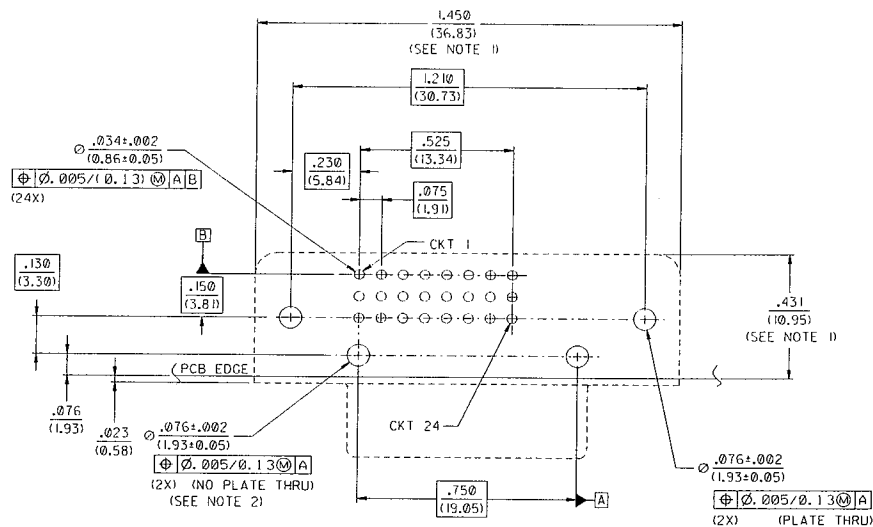
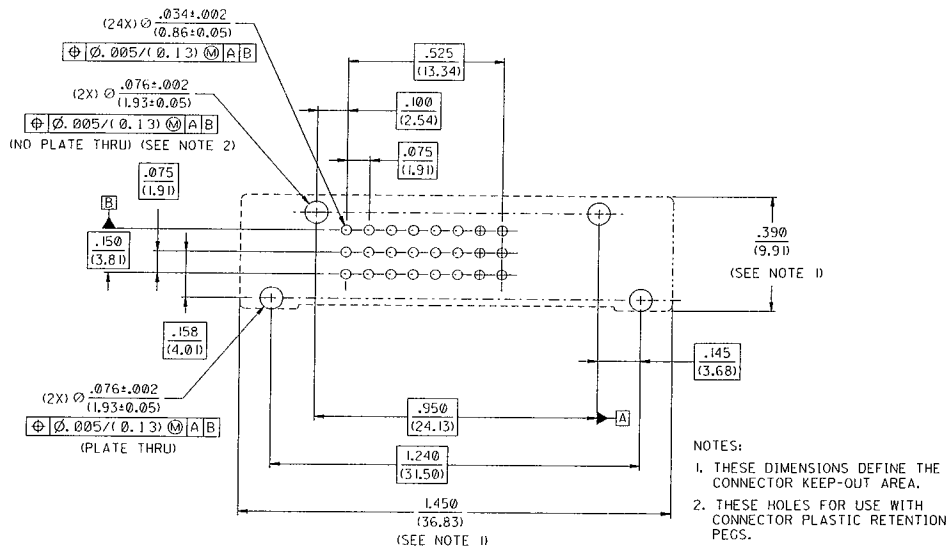


Figure 9: Recommended PCB Layout for Right Angle DVI-D Receptacle



- NOTES:
1. THESE DIMENSIONS DEFINE THE CONNECTOR KEEP-OUT AREA.
 2. THESE HOLES FOR USE WITH CONNECTOR PLASTIC RETENTION PEGS.

Figure 10: Recommended PCB Layout for Vertical DVI-D Receptacle

REVISE ON PC ONLY		TITLE	MiroCross™ - DVI I/O Plug and Receptacle Connector System		
G	SEE SHEET 1				
REV	DESCRIPTION				
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PS-74320-001				PS74320.LWP	8
ES-40000-3996 REV. A SHEET 4 95/MAR/10 EC U5-0926 DCBRD03.SAM					



PRODUCT SPECIFICATION



LANGUAGE

ENGLISH

2.2.4 Recommended Spacing for Two or More Connectors on a P.C.B.

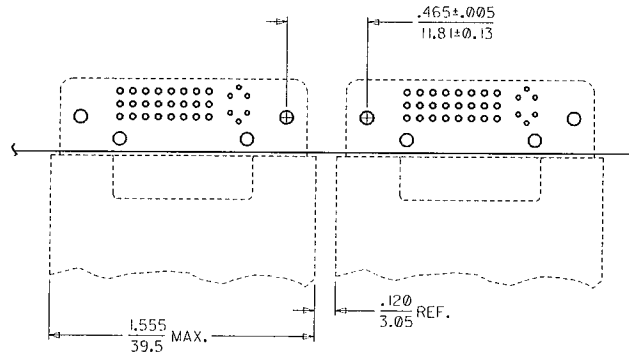


Figure 13: Spacing for Two or More DVI Connectors with Cable Assembly Applications

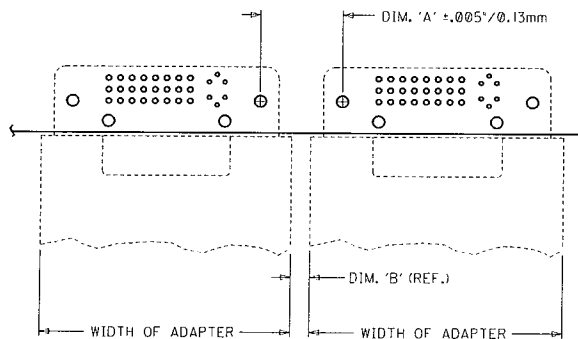


Figure 14: Spacing for Two or More DVI Connectors with Adapter Assembly Applications

Adapter Combination	Width of Adapter	Dim. 'A'	Dim. 'B'
DVI-A (plug) to VGA (rec.)	1.614/(41.0) max.	.525/(13.34)	.120/(3.05)
DVI-D (plug) to DFP (rec.)			
DVI-D (plug) to P&D-D (rec.)	1.890/(48.0) max.	.800/(20.32)	.120/(3.05)
DVI-D (plug) to DVI-I (rec.)	1.693/(43.0) ref.	.600/(15.24)	.117/(2.97)

Table 3: Possible Combinations for Adapter and Cable Applications for P.C.B. Layout

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				SHEET 10
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PRODUCT SPECIFICATION



LANGUAGE

ENGLISH

2.2.4 Materials

Housings: High temp glass-filled thermoplastic, black or white/natural, UL94 V-0
 Tail Aligner: High temp glass-filled thermoplastic, black or white/natural, UL94 V-0
 Receptacle Terminals: Copper alloy.
 Plug Terminals: Brass.
 Receptacle Ground Terminal: Copper Alloy
 Plug Key: Copper Alloy
 Plug Ground Blade: Brass
 Shields: Steel

2.2.4 Plating

Terminals (0.075inch/1.91mm and 0.050inch/2.54mm grid):

Option #1 - Select gold flash in contact area and 100 microinch / 2.50 micrometer minimum select tin/lead in solder tail area over 50 microinch / 1.27 micrometer nickel overall.

Option #2 - 30 microinch / 0.75 micrometer minimum select gold and 100 microinch / 2.50 micrometer minimum select tin/lead in solder tail area over 50 microinch / 1.27 micrometer nickel overall.

Microcross Ground:

30 microinch / 0.75 micrometer minimum select gold in contact area and; 100 microinch / 2.50 micrometer minimum select tin-lead in solder tail area over 50 microinch / 1.27 micrometer minimum nickel overall.

Key:

Select gold flash over 40 microinch / 1.00 micrometer nickel overall.

Ground Blade:

Select gold flash over 50 microinch / 1.27 micrometer nickel overall in contact area and 150 microinch / 3.75 micrometer tin/lead solder area.

Shields:

150 microinch / 3.75 micrometer minimum bright tin over;
 50 microinch / 1.27 micrometer nickel; over copper flash overall.

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G	SEE SHEET 1		
REV	DESCRIPTION		
DOCUMENT NO. PS-74320-001		FILE NAME PS74320.LWP	SHEET 11
ES-40000-3996 REV. A SHEET 4 95/MAR/10 EC U5-0926 DCBRD03.SAM			



PRODUCT SPECIFICATION



LANGUAGE

ENGLISH

2.2.5 Markings

All assemblies will contain circuit identification markings as well as the "Molex" or "Mlx" on the front of the shell. Refer to the appropriate sales drawings for specific marking information.

2.3 Safety Agency Approvals

UL File Number E29179, Volume 10, Section 12

CSA File Number LR19980

3.0 Applicable Documents and Specifications

3.1 All documents referenced shall be of the latest revision. The order of precedence detailing requirements of this specification is as follows:

1. Product Drawings
2. This specification

3.2 Reference Documents

3.2.1 EIA RS-364-(06,09,13,17,18,20,21,23,27,28,31,32,41,46,65,67,70,90) Electronic Industries Association, Recommended Standard

3.2.2 IEC-801-2 International Electrotechnical Commission, Electrostatic Discharge Requirements

3.2.3 MIL STD-202: Test methods for electronics and electrical component parts

3.2.4 Molex PS-74320-9999 Application Specification, DVI Plug Cable Assembly

3.2.5 Molex ES-74320-9998 Termination Specification, DVI Cable Assemblies

3.2.6 Molex PS-74320-9997 Cable Assembly Specification

3.2.7 UL 94: Tests for flammability of plastics materials

4.0 Ratings

4.1 Voltage

40 Volts AC (RMS)

4.2 Current

3.0 Amps per circuit.

30 °C maximum temperature rise and 55 °C maximum ambient per EIA-364-70.

4.3 Temperature

Operating: - 20 °C to + 85 °C

Nonoperating: - 20 °C to + 85 °C

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PRODUCT SPECIFICATION



LANGUAGE

ENGLISH

5.0 Performance

5.1 Electrical Performance

ITEM	TEST CONDITION	REQUIREMENT
Contact Resistance	Bulk resistance measured between plug solder tails and receptacle solder tails per ANSI/EIA-364-23	20 milliohm maximum, initial per contact mated pair 10 milliohm maximum change from initial reading per contact mated pair
Shell Resistance	Bulk resistance measured between ground leg on receptacle shield and the plug cable braid. Test current=100mA; Test voltage=5 Volts DC open circuit maximum per ANSI/EIA-364-06A-83	50 milliohm maximum initial 50 milliohm maximum change from initial reading
Insulation Resistance	Test voltage = 500 Volts DC +/- 50 V Unmated and Unmounted per ANSI/EIA 364-21, Method C	1Gigaohm Minimum between adjacent contacts and contacts and shell
Dielectric Withstanding Voltage	Test voltage = 500 Volts DC +/-50 V Unmated and Unmounted per ANSI/EIA 364-20, Method C Barometric pressure of 15 psi	No flashover, No sparkover, No excess leakage, No Breakdown
Contact Current Rating	Maximum ambient = 55 degree C Maximum temperature change = 85 degree C per ANSI/EIA-364-70, TP-70	3.0 A maximum
Applied Voltage Rating		40 Volts AC (rms) continuous maximum, on any signal pin with respect to the shield
Electrostatic Discharge	Test unmated from 1 kV to 8kV in 1 kV steps using 8mm ball prob per IEC 801-2 Contact discharge to shell Air discharge perpendicular to shell Air discharge at angle to shell	No evidence of discharge to contacts at 8kV. Discharge to the shell is acceptable.
T.M.D.S. Signals Time Domain Impedance	Risetime = 330 pS (10%-90%) S:G ratio per DVI pin designation Differential Measurement Specimen Environment Impedance = 100 ohm differential Source-side receptacle connector mounted on a controlled impedance pcb fixture per ANSI/EIA-364-108 draft Proposal	100 ohms +/-15%

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PRODUCT SPECIFICATION



LANGUAGE

ENGLISH

<p>T.M.D.S. Signals Time Domain Crosstalk: FEXT</p>	<p>Risetime = 330 pS (10%-90%) S:G ratio per DVI pin designation Differential Measurement Specimen Environment Impedance = 100 ohm differential Source-side receptacle and the load side plug connector are mounted on a controlled impedance pcb fixture (1) Driven pair and (1) victim pair per ANSI/EIA-364-90 Draft Proposal</p>	<p>5% Maximum</p>
<p>T.M.D.S. Signals Rise Time Degradation</p>	<p>S:G ratio per DVI pin designation Differential Measurement Specimen Environment Impedance = 100 ohm differential Source-side receptacle and the load side plug connector are mounted on a controlled impedance pcb fixture per ANSI/EIA-364-102 Draft Proposal</p>	<p>160 pS Maximum (Note: Converted bandwidth using BW=0.35/t rise yields 2.2 GHz)</p>
<p>Analog RGB Coaxial Signals Time Domain Impedance</p>	<p>Risetime = 700 pS (10%-90%) S:G ratio per DVI pin designation Single-ended Measurement Specimen Environment Impedance = 75 ohm single-ended Source-side receptacle connector mounted on a controlled impedance pcb fixture per ANSI/EIA-364-108 Draft Proposal</p>	<p>75 ohms +/-10%</p>
<p>Analog RGB Coaxial Signals Time Domain Crosstalk: (FEXT)</p>	<p>Risetime = 700 pS (10%-90%) S:G ratio per DVI pin designation Single-ended Measurement Specimen Environment Impedance = 75 ohm single-ended Source-side receptacle connector is mounted on a controlled impedance pcb fixture and the load side plug connector is terminated to semi-rigid coax. (1) Driven line and (1) victim line per ANSI/EIA-364-90 Draft Proposal</p>	<p>3% Maximum</p>
<p>Analog RGB Coaxial Signals Rise Time Degradation</p>	<p>S:G ratio per DVI pin designation Single-ended Measurement Specimen Environment Impedance = 75 ohm single-ended Source-side receptacle connector is mounted on a controlled impedance pcb fixture and the load side plug connector is terminated to semi-rigid coax. per ANSI/EIA-364-102</p>	<p>140pS Maximum (Note: Converted bandwidth using BW=0.35/t rise yields 2.5 GHz)</p>

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PRODUCT SPECIFICATION



LANGUAGE

ENGLISH

5.2 Mechanical Performance

ITEM	TEST CONDITION	REQUIREMENT
Mating Force	One pair per ANSI/EIA 364-13 Insertion speed: 1inch (25mm) per minute	10.0 lbf (4.5 kgf) maximum
Unmating Force	Mated pair per ANSI/EIA 364-13 Withdraw speed: 1inch (25mm) per minute	2.2 lbf (1.0 kgf) minimum 8.8 lbf (4.0 kgf) maximum
Receptacle Contact Retention	Individual contact	2.0 lbf (0.90 kgf) minimum
Receptacle Key Retention	Individual key	2.0 lbf (0.90 kgf) minimum
Plug Contact Retention	Push out from mating face; Individual contact	10 lbf (4.5 kgf) minimum
Plug Key Retention	Push out from mating face; Individual key	10 lbf (4.5 kgf) minimum
Durability	Automatic cycling: 100 cycles per ANSI/EIA 364-09 at 100 +/- 50 cycles per hour	Contact Resistance per EIA 364-23: 10 milliohm maximum change from initial per contact pair All samples to be mated Shell Resistance: 50 milliohm maximum (change from initial reading)
Vibration	15 minutes / axis per ANSI/EIA 364-28, Method 5A	No discontinuities at 1 microsecond or longer (each contact) when continuity is tested per EIA-364-46
Shock (Mechanical)	Per ANSI/EIA 364-27, Condition A (specified pulse)	No discontinuities at 1 microsecond or longer (each contact) when continuity is tested per EIA-364-46
Cable Pullout Force	Test for cable strain relief & termination integrity. Cable subjected to 25.0 lbf (11.3 kgf) static load for one minute while monitoring continuity. Isolate plug & receptacle interface from load.	No discontinuities greater than 1 microsecond
Board Insertion Force		10.0 lbf (4.5 kgf) maximum
Cable Flex	100 cycles in each of 2 planes Dimension X=3.7x Cable Diameter per ANSI/EIA 364-41, Condition I	No discontinuities greater than 1 microsecond allowed during flexing on contacts or shields per EIA-364-46 Dielectric Withstanding Voltage and Insulation Resistance tested per requirements of section 5.1
Normal Force	For reference only	.050" pitch terminals: 75 grams typical .075" pitch terminals: 90 grams typical Ground Plane: 100 grams typical
Thread Torque	Mounted to panel; Test to failure; Tighten jackposts with torque gage until threads are stripped and jackpost turns freely	5.0 lbf in (5.76 kgf cm) minimum

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PRODUCT SPECIFICATION



LANGUAGE

ENGLISH

5.3 Environmental Performance

ITEM	TEST CONDITION	REQUIREMENT
Thermal Shock	10 cycles Mated/Unmated per ANSI/EIA 364-32, Condition I	Contact Resistance: 10 milliohm maximum change from initial per contact pair All samples to be mated Shell Resistance: 50 milliohm maximum change from initial per EIA-364-23
Humidity (Cyclic)	ANSI/EIA 364-31, Conditions A and B Method III, omit 7A and 7B	Contact Resistance: 10 milliohm maximum change from initial per contact pair All samples to be mated Shell Resistance: 50 milliohm maximum change from initial per EIA-364-23
Thermal Aging	105 °C for 250 hours Mated per ANSI/EIA 364-17, Condition 4, Method A.	Contact Resistance: 10 milliohm maximum change from initial per contact pair All samples to be mated Shell Resistance: 50 milliohm maximum change from initial per contact pair per EIA-364-23
Temperature Rise	Per ANSI/EIA 364-70	30 °C maximum temperature rise
Resistance to Solder Heat	Dip connector solder tails to board for 10 seconds Solder Temp = 260 +/- 5 °C	No visual damage to insulator
Solderability	Per MIL-STD-202, Method 208	95% minimum coverage
Temperature Rating	Operating	-20 degree C to +85 degree C
Temperature Rating	Non-Operating	-20 degree C to +85 degree C

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PRODUCT SPECIFICATION



LANGUAGE

ENGLISH

6.0 Packaging

6.1 Receptacles:

All receptacles are packaged in trays. For specific packaging information, refer to PK-74320-001 for right angle receptacles and PK-74320-002 for vertical receptacles.

7.0 Other Information

7.1 Test Sequences

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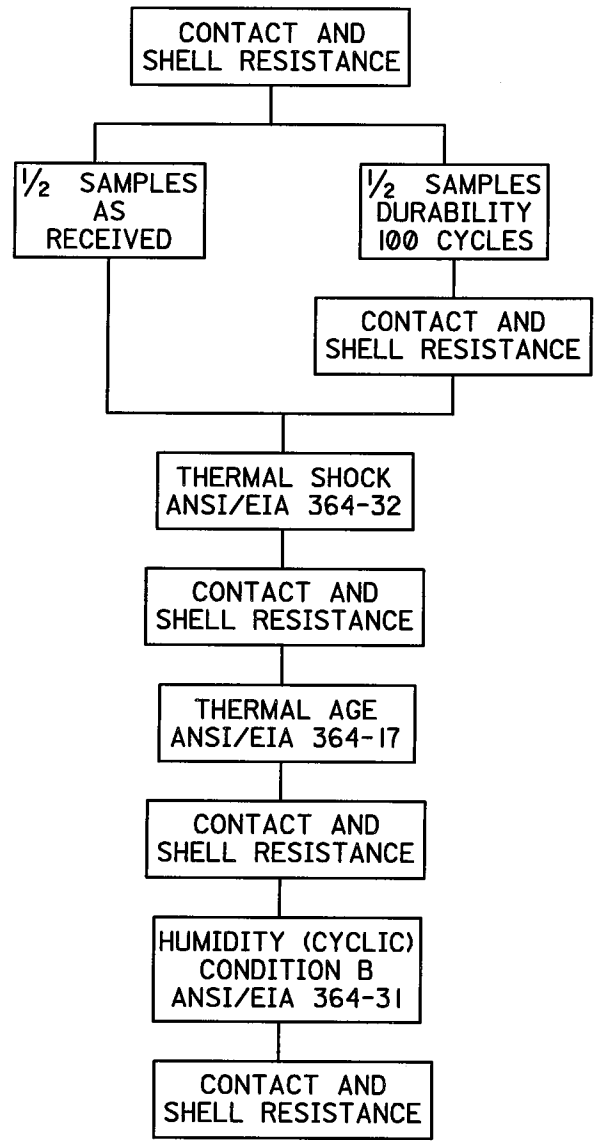
PRODUCT SPECIFICATION



LANGUAGE

ENGLISH

Group 1 : Mated Environmental



Number of samples

(5) Receptacle assembled to printed circuit board.

(5) Cable assemblies with a plug assembled to one end, 10 inch/25.4 cm long

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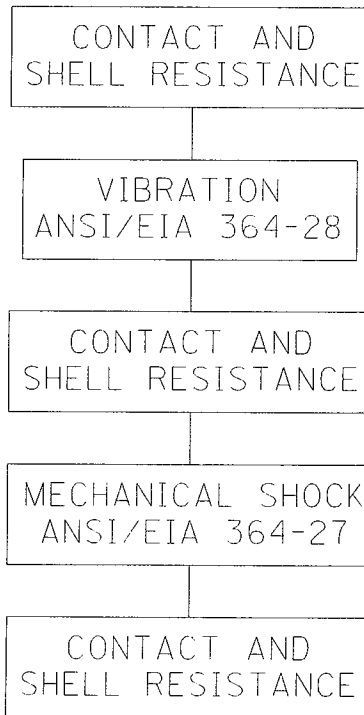
PRODUCT SPECIFICATION



LANGUAGE

ENGLISH

Group 2 : Mated Mechanical



Number of Samples:

(2) Receptacles, assembled to printed circuit board.

(2) Cable assemblies with a plug assembled to one end, 10 inch/25.4 cm long.

Note: Connector is to be mounted on a fixture that simulates the typical application. The receptacle connector shall be mounted to a panel, per the receptacle panel cutout shown in Figure 12, which is permanently affixed to the fixture. The plug shall be mated to the receptacle with jackscrews fully engaged and the other end of the cable shall be permanently clamped to the fixture, 3 inches from connector face.

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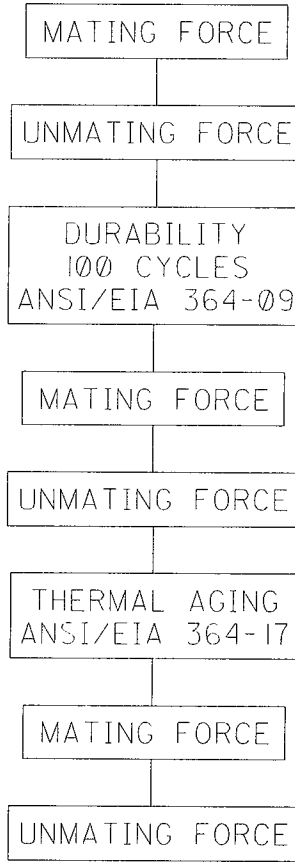
PRODUCT SPECIFICATION



LANGUAGE

ENGLISH

Group 3 : Mated Mechanical



Number of Samples:

- (2) Receptacles, assembled to printed circuit board.
- (2) Cable assemblies with a plug assembled to one end, 10 inch/25.4 cm long.

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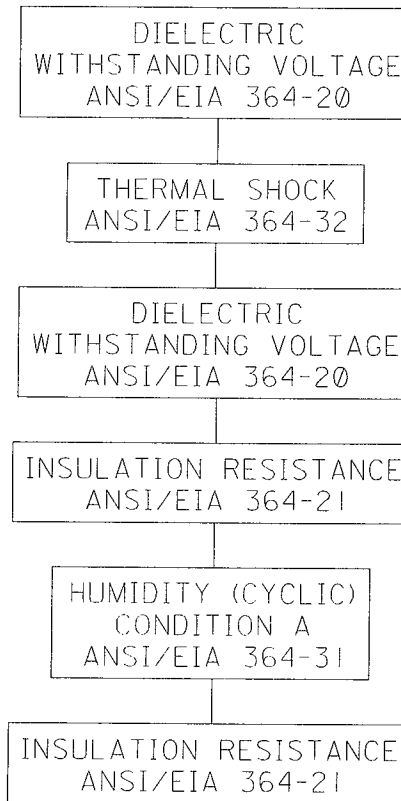
PRODUCT SPECIFICATION



LANGUAGE

ENGLISH

Group 4 : Insulator Integrity



Number of Samples:

- (2) Receptacles, assembled to printed circuit board.
- (2) Cable assemblies with a plug assembled to one end, 10 inch/25.4 cm long

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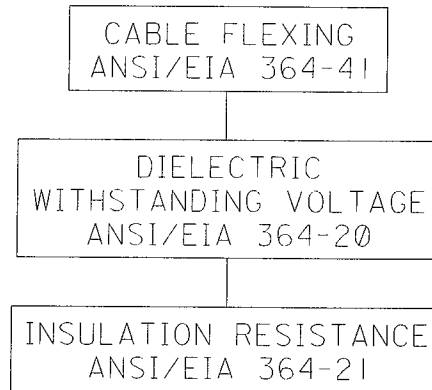
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LANGUAGE

ENGLISH

Group 5 : Cable Flexing



Number of Samples:
(2) Cable assemblies

Group 6: Electrostatic Discharge



Number of Samples:
(1) Receptacle connector

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VIDEO CABLE SPECIFICATION



LANGUAGE

English

Cable Markings

All cables must be marked in light gray ink and contain the following information:

1. Manufacturer identification
2. Underwriters Symbol
3. AWM Style Number
4. Temperature rating
5. Voltage rating
6. Text "DVI" and cable description

Example: Molex AWM STYLE 20276 60°C 30V VW-1 --- DVI ANALOG

Individual Wire Color Coding

Comp. Number	Comp. Type	Conductor Jacket Color				Signal Assignment
		#1	#2	#1 (5.5mm O.D.)	#2 (5.5mm O.D.)	
1	A	Blue ¹				Blue Video
2	A	Red ¹				Red Video
3	A	Green ¹				Green Video
4	B	Yellow	Black	Yellow	Black	+5V/DDC Return
5	C	Red				H Svc
6	C	Orange / Black		Violet		DDC Data
7	C	Brown/Yellow		Red		DDC Clock
8	C	Green				Svc Return
9	C	Brown				V Svc
10	C	White		White		Sense
11	D	Red / White	Red	White	Red	TMDS Data 2
12	D	Green / White	Green	White	Green	TMDS Data 1
13	D	Blue / White	Blue	White	Blue	TMDS Data 0
14	D	Brown / White	Brown	White	Brown	TMDS Clock
15	E	Orange / White	Orange			TMDS Data 5
16	E	Violet / White	Violet			TMDS Data 4
17	E	Gray / White	Gray			TMDS Data 3
18	E	Red / White	Red			TMDS Data 2
19	E	Green / White	Green			TMDS Data 1
20	E	Blue / White	Blue			TMDS Data 0
21	E	Brown / White	Brown			TMDS Clock

Notes: ¹ Coax lines can either be the solid color or be stripped with the color listed.

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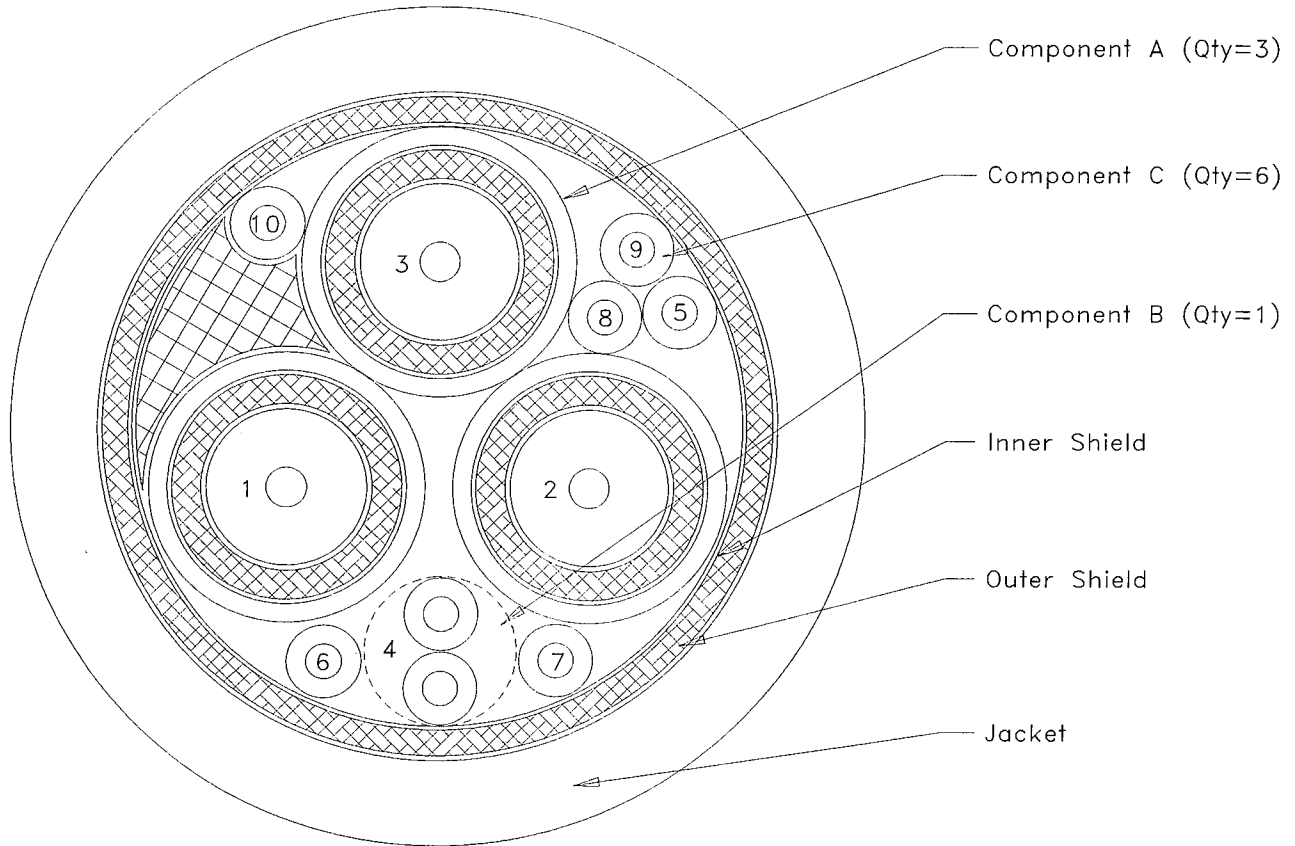
VIDEO CABLE SPECIFICATION



LANGUAGE

English

DVI ANALOG



Cable Construction:

1. 3 Component A (#1 - #3), 1 Component B (#4), and 6 Component C (#5 - #10) cabled together
2. Inner Shield (Type A)
3. Outer Shield
4. Jacket

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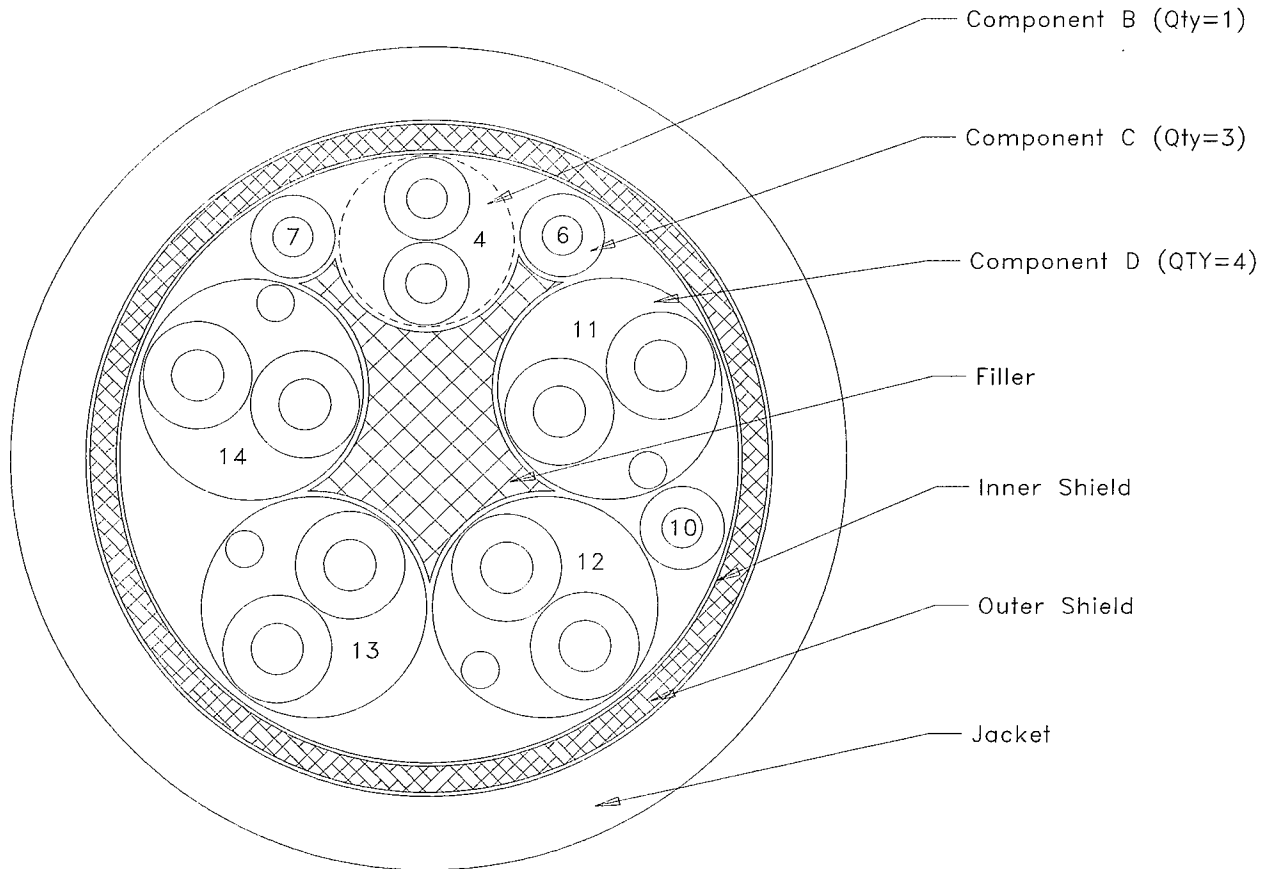
VIDEO CABLE SPECIFICATION



LANGUAGE

English

DVI SINGLE LINK (7.0mm O.D.)



Cable Construction:

1. 1 Component B (#4), 3 Component C (#6, #7, #10), and 4 Component D (#11 - #14) cabled together around a core of filler material
2. Inner Shield (Type B)
3. Outer Shield
4. Jacket

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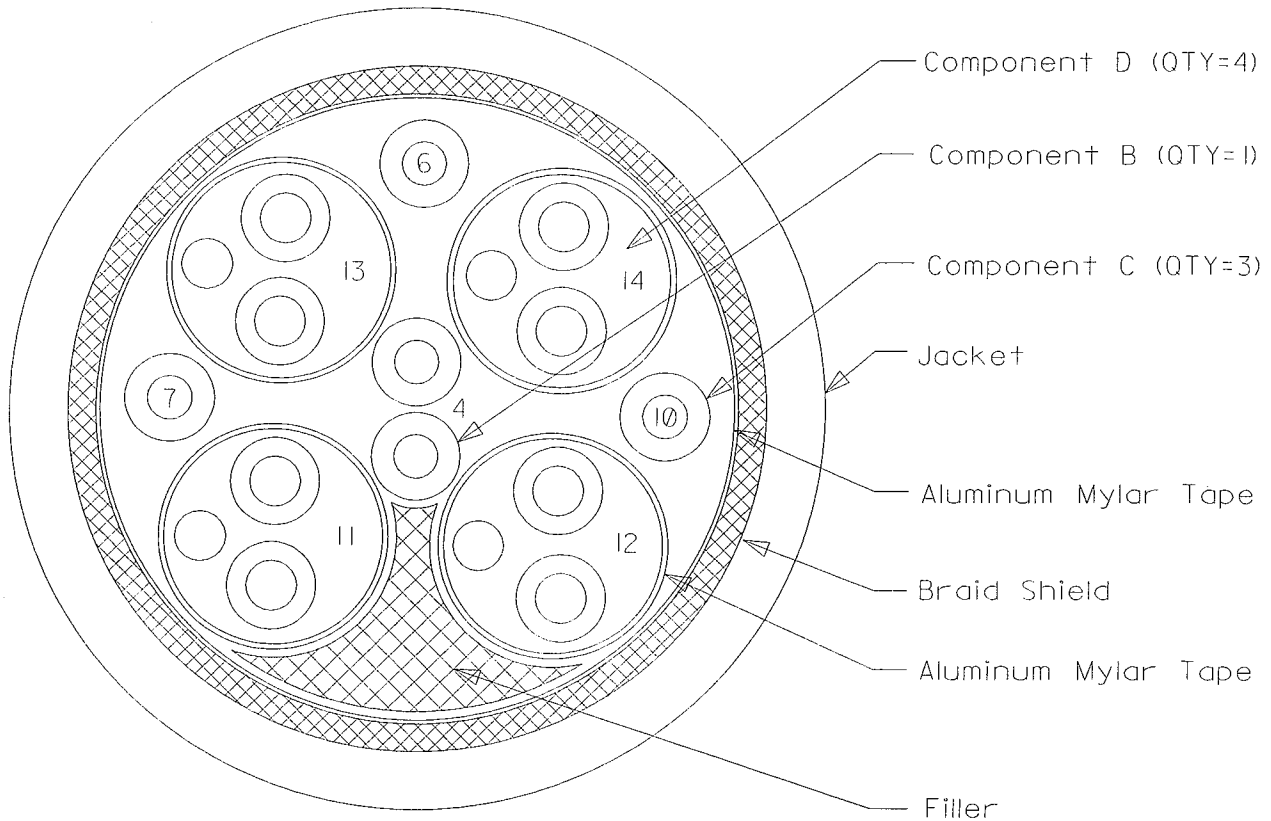
VIDEO CABLE SPECIFICATION



LANGUAGE

English

DVI SINGLE LINK (5.5mm O.D.)



Cable Construction:

1. 1 Component B (#4), 3 Component C (#6, #7, #10), and 4 Component D (#11 - #14) cabled together with filler material
2. Inner Shield (Type B)
3. Outer Shield
4. Jacket

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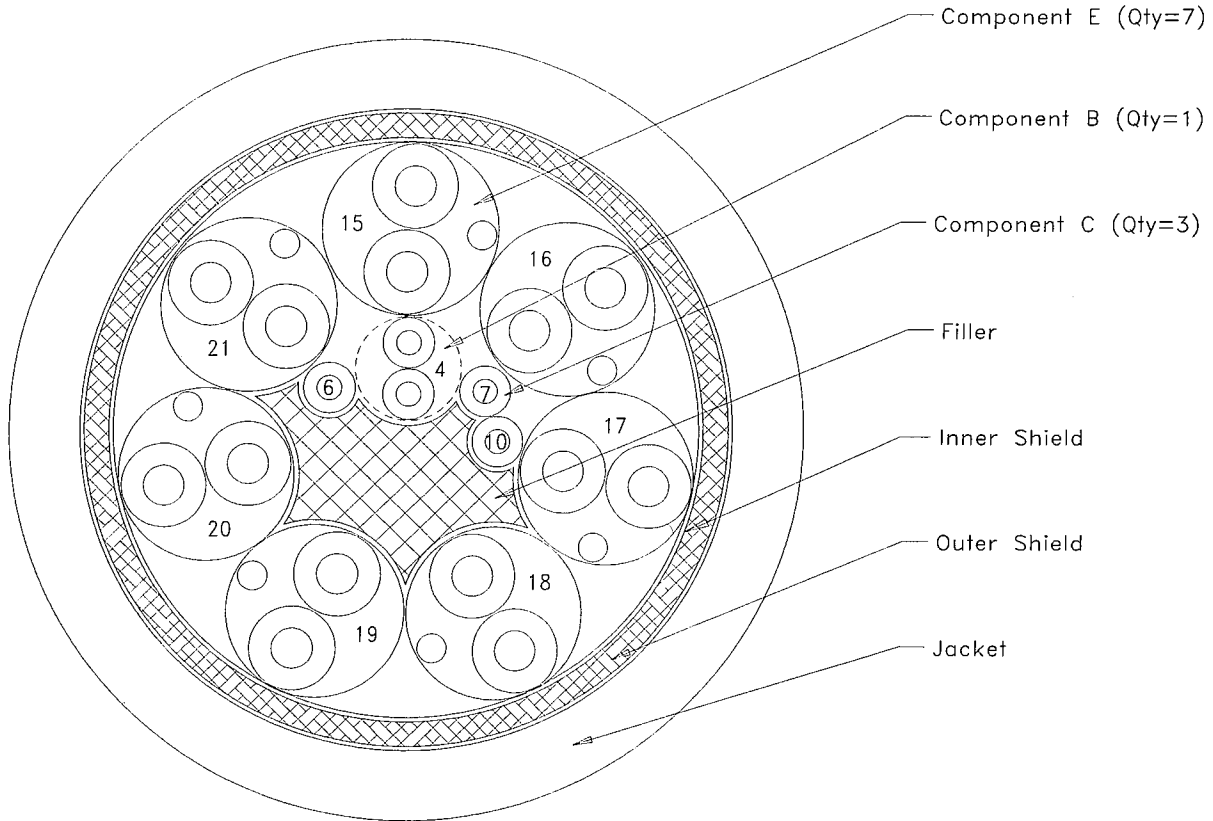
VIDEO CABLE SPECIFICATION



LANGUAGE

English

DVI DUAL LINK



Cable Construction:

1. 1 Component B (#4) cabled together with filler material to form core
2. 3 Component C (#6, #7, #10) and 7 Component E (#15 - #21) cabled around core
3. Inner Shield (Type B)
4. Outer Shield
5. Jacket

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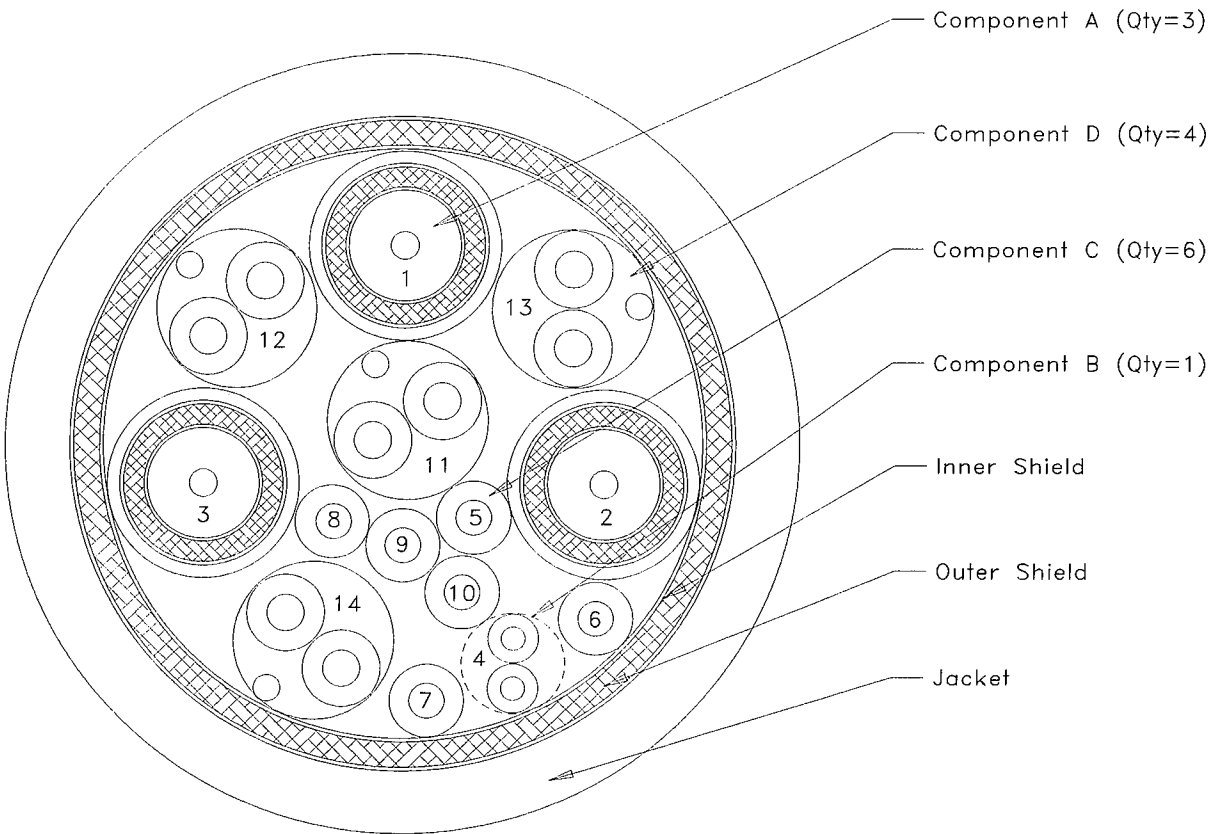
VIDEO CABLE SPECIFICATION



LANGUAGE

English

DVI ANALOG & DIGITAL



Cable Construction:

1. 1 Component D (#11) and 4 Component C (#5, #8 - #10) cabled together to form core
2. 3 Component A (#1 - #3), 1 Component B (#4), 3 Component D (#12 - #14), and 2 Component C (#6, #7) cabled around core
3. Inner Shield (Type A)
4. Outer Shield
5. Jacket

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VIDEO CABLE SPECIFICATION



LANGUAGE

English

Cable Sizes

The outer diameter of all DVI cables must meet the following two requirements:

1. The outer diameter tolerance shall not be greater than $\pm .015"$ (± 0.38) for any cable.
2. The entire tolerance range must fall within one of the ranges shown below:
(i.e. it should not straddle two ranges)

Cable Types	Acceptable Cable Range O.D.	
	Inch	mm
DVI Analog	.255 - .285	6.48 - 7.24
DVI Single Link	.260 - .290	6.60 - 7.37
DVI Single Link	.209 - .224	5.31 - 5.69
DVI Dual Link	.315 - .345	8.00 - 8.76
DVI Analog & Digital	.330 - .360	8.38 - 9.14

Miscellaneous

Cable Types	Minimum Bend Radius Inch (mm)
DVI Analog	1.0 (25.4)
DVI Single Link (7.0mm O.D.)	1.0 (25.4)
DVI Single Link (5.5mm O.D.)	.75 (19.05)
DVI Dual Link	1.2 (30.48)
DVI Analog & Digital	1.3 (30.02)

Component Construction

Component A - Coax

Item	Material	Size	O.D.
Conductor	Tin Plated Copper	30 AWG (7/38)	.012" (0.30) Nom.
Insulation	Foamed Polypropylene or High Density Polyethylene	.0195" (0.50) Min. average thickness	.051" (1.30) Typ.
Shield	Tin Plated Copper	36 AWG	
	Braid Construction. 90% Min. Coverage		
Jacket	PVC	.009" (0.229) thick Min.	.089" (2.26) Typ.

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VIDEO CABLE SPECIFICATION



LANGUAGE

English

Component Construction (Continued)

Component B - Pair

Item	Material	Size	O.D.
Conductor	Tin Plated Copper	28 AWG (7/36)	.015" (0.38) Nom.
Insulation	Semi-Rigid PVC	.006" (0.15) Min. average thickness	.027" (0.69) Typ.
Pair	Two insulated conductors twisted together		

Component B - Pair (5.5mm O.D.)

Item	Material	Size	O.D.
Conductor	Tin Plated Copper	30 AWG (7/38)	.012" (0.31) Nom.
Insulation	Polypropylene	.005" (0.12) Nom. thickness	.020-.022" (0.52-0.56)
Pair	Two insulated conductors twisted together		

Component C - Single

Item	Material	Size	O.D.
Conductor	Tin Plated Copper	28 AWG (7/36)	.015" (0.38) Nom.
Insulation	Foamed Polypropylene or High Density Polyethylene	.006" (0.15) Min. average thickness	.027" (0.69) Typ.

Component C- Single (5.5mm O.D.)

Item	Material	Size	O.D.
Conductor	Tin Plated Copper	28 AWG (7/36)	.015" (0.38) Nom.
Insulation	Polyethylene	.004" (0.11) Nom. thickness	.023-.024" (0.58-0.62)

Additional Requirements:

DDC: Consists of components #4, #6, #7. The twisted pair (Component B) must lay between the two single wires (#6 and #7).

H/V Sync: Consists of components #5, #8, #9. These three wires must be bundled together inside the cable with the sync return (#8) in the middle most position.

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VIDEO CABLE SPECIFICATION



LANGUAGE

English

Component Construction (Continued)

Component D & E - Shielded Pairs (Standard Construction)

Item	Material	Size	O.D.
Conductor	Tin Plated Copper	28 AWG (7/36)	.015" (0.38) Nom.
Insulation	Foamed Polypropylene or High Density Polyethylene	.0125" (0.32) Min. average thickness	.040" (1.02) Typ.
Shield	Aluminum/Polyester Tape with Foil-Free edge, aluminum side facing in 25% overlap		
Pair	Two insulated conductors twisted together		
Drain Wire	Tin Plated Copper	28 AWG (7/36)	.015" (0.38) Nom.

Component D & E - Shielded Pairs (5.5mm O.D.)

Item	Material	Size	O.D.
Conductor	Tin Plated Copper	30 AWG (7/38)	.012" (0.31) Nom.
Insulation	Foamed Polypropylene or High Density Polyethylene	.010" (0.25) Min. average thickness	.031" (0.80) Typ.
Shield	Aluminum/Polyester Tape with Foil-Free edge, aluminum side facing in 25% overlap		
Pair	Two insulated conductors twisted together		
Drain Wire	Tin Plated Copper	30 AWG (7/38)	.012" (0.31) Nom.

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VIDEO CABLE SPECIFICATION



LANGUAGE

English

Filler -Used as required to maintain concentricity of cable

Material	Polypropylene Fibers
----------	----------------------

Inner Shield (Type A)

Material	Aluminum / Polyester Tape
Thickness	.00035" / .001" (.009 / .025) typical
Direction	Aluminum side facing in
Coverage	25 % Overlap

Inner Shield (Type B)

Material	Aluminum (optional) / Polyester / Aluminum Tape
Thickness	.00035" / .001" / .00035" (.009 / .025 / .009) typical
Coverage	25 % Overlap

Outer Shield - For all cables

Type	Braid
Material	Tin Plated Copper
AWG	36
Coverage	80% Minimum

Outer Jacket - For all cables

Material	Super Flexible PVC
Thickness	.030 ±.005" (0.76 ±0.13)
Outer Diameter	See section titled Cable Sizes

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VIDEO CABLE SPECIFICATION



LANGUAGE

English

Electrical Requirements

Item	Units	Components	Requirement	
Dielectric Strength	VDC	All	500	For 1 minute
Insulation Resistance	M Ω - 1000 ft (M Ω - km)	A (Coax)	3300/(1000)	Minimum
		B-E	50/(15)	Minimum
Conductor DC Resistance	Ω /ft (Ω /m)	A	.100 (.328)	Typical @20°C
		B - E	.065 (.213)	Typical @20°C
Current Rating	Amps	A-E (30 & 28 AWG)	1.5	Minimum
Impedance	Ω	A	75 \pm 5	Typical @ TDR
Differential Impedance	Ω	D & E	100 \pm 5	@ TDR
Capacitance	pF/ft (pF/m)	A	18.0 (59.1)	Typical
Mutual Capacitance	pF/ft (pF/m)	D & E	14.0 (45.9)	Typical
Time Delay	ns/ft (ns/m)	A	1.30 (4.27)	Typical
		D	1.43 (4.69)	Typical
Time Delay Skew	ns/ft (ns/m)	D & E	0.026 (.085)	Maximum between pairs
			0.010 (.033)	Maximum within a pair
Far End Crosstalk	%	D & E	1.0	Maximum in 10 meters @ 300 ps rise-time

Component Key:

A - Coax
 B - Twisted Pair
 C - Single
 D & E - Shield Twisted Pair

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VIDEO CABLE SPECIFICATION



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Electrical Requirements (Continued)

Attenuation: Component A - Standard Construction

Frequency MHz	Maximum Attenuation	
	dB/100 ft	dB/100 m
1	0.8	2.6
10	2.6	8.5
50	5.8	19.0
100	8.2	26.9
200	12.0	39.4
400	17.0	55.8
700	24.0	78.7
900	28.0	91.9
1000	30.0	98.4

Differential Attenuation: Component D & E - Standard Construction

Frequency MHz	Maximum Attenuation	
	dB/100 ft	dB/100 m
1	1.00	3.30
10	4.00	13.10
50	8.00	26.20
100	10.00	32.80
200	15.00	49.20
400	21.00	68.90
600	26.00	85.30
800	30.00	98.40

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VIDEO CABLE SPECIFICATION



LANGUAGE

English

Electrical Requirements (Continued)

Attenuation: Component A - 5.5mm O.D.

Frequency MHz	Maximum Attenuation	
	dB/100 ft	dB/100 m
1	0.9	3.0
10	3.0	9.8
50	6.7	21.9
100	9.4	30.9
200	13.8	45.3
400	19.6	64.2
700	27.6	90.5
900	32.2	105.7
1000	34.5	113.2

Differential Attenuation: Component D & E - 5.5mm O.D.

Frequency MHz	Maximum Attenuation	
	dB/100 ft	dB/100 m
1	1.20	3.90
10	4.60	15.10
50	9.20	30.20
100	11.50	37.70
200	17.30	56.80
400	24.20	79.40
600	29.90	98.10
800	34.50	113.20

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VIDEO CABLE SPECIFICATION



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Safety Requirements

UL Listing: AWM Style 20276 60 °C (minimum) 30 Volts (minimum) VW-1

Polystyrene Migration Test Requirements

Polystyrene Migration testing is required for the outer jacket of all cables according to the following parameters.

Test Parameters

Temperature	50 ± 1 °C
Weight	500 ± 25 grams
Time	24 ± 1 hours
Material	ABS
Visual Inspection Criteria	No staining of the ABS material should be visible when viewed by the unaided eye.

Supplier Approval Requirements

New Supplier Qualification:

Prior to initial approval, the supplier must submit the following items to Molex Lisle:

1. Supplier Specifications
2. Sample Cable
3. Electrical Test Data
4. Polystyrene Migration Test Data

Approval of a new cable configuration from an approved supplier:

The following should be submitted to Molex for approval of a new cable.

1. Supplier Specifications - Of the new cable.
2. Sample Cable - Contact Molex to determine whether a sample of the new cable is required.

Supplier Requested Revisions:

Prior to a revision of these specifications, a supplier must submit the following to Molex Lisle before the changes are implemented:

1. Revised Supplier Specifications - Along with an attached cover sheet clearly identifying all proposed changes.
2. Sample Cable - This is to be provided if any changes in material or construction are requested.
3. Electrical Test Data - This is to be provided for all affected components
4. Polystyrene Migration Test Data - This is to be provided if any changes to the outer jacket are proposed.

Approval Responsibility:

This specification is created and maintained by Molex Lisle. As a result, only Molex Lisle can grant final approval for a new supplier, cable configuration, or change in cable construction.

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3.0 CABLE PINOUTS

Pin	Signal Assignment	Pin	Signal Assignment	Pin	Signal Assignment
1	T.M.D.S. Data2-	9	T.M.D.S. Data1-	17	T.M.D.S. Data 0-
2	T.M.D.S. Data2+	10	T.M.D.S. Data1+	18	T.M.D.S. Data 0+
3	T.M.D.S. Data2/4 Shield	11	T.M.D.S. Data 1/3 Shield	19	T.M.D.S. Data 0/5 Shield
4	T.M.D.S. Data 4-	12	T.M.D.S. Data 3-	20	T.M.D.S. Data 5-
5	T.M.D.S. Data 4+	13	T.M.D.S. 3+	21	T.M.D.S. Data 5+
6	DDC Clock	14	+5 V Power	22	T.M.D.S. Clock Shield
7	DDC Data	15	Ground (for +5V)	23	T.M.D.S. Clock+
8	No Connect	16	Hot Plug Detect	24	T.M.D.S. Clock-

Digital-Only Connector Pin Assignments

Pin	Signal Assignment	Pin	Signal Assignment	Pin	Signal Assignment
1	T.M.D.S. Data 2-	9	T.M.D.S. Data 1-	17	T.M.D.S. Data 0-
2	T.M.D.S. Data 2+	10	T.M.D.S. Data 1+	18	T.M.D.S. Data 0+
3	T.M.D.S. Data 2/4 Shield	11	T.M.D.S. Data 1/3 Shield	19	T.M.D.S. Data 0/5 Shield
4	T.M.D.S. Data 4-	12	T.M.D.S. Data 3-	20	T.M.D.S. Data 5-
5	T.M.D.S. Data 4+	13	T.M.D.S. Data 3+	21	T.M.D.S. Data 5+
6	DDC Clock	14	+5V Power	22	T.M.D.S. Clock Shield
7	DDC Data	15	Ground	23	T.M.D.S. Clock+
8	Analog Vertical Sync	16	Hot Plug Detect	24	T.M.D.S. Clock-
C1	Analog Red	C2	Analog Green	C3	Analog Blue
C4	Analog Horizontal Sync	C5	Analog Ground		

Combined Analog and Digital Connector Pin Assignments

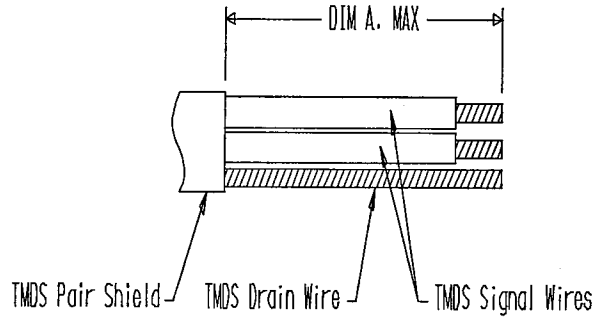
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4.0 TERMINATION PROCEDURES

4.1 Wire Strip Lengths

4.1.1 TMDS Shield Strip Length



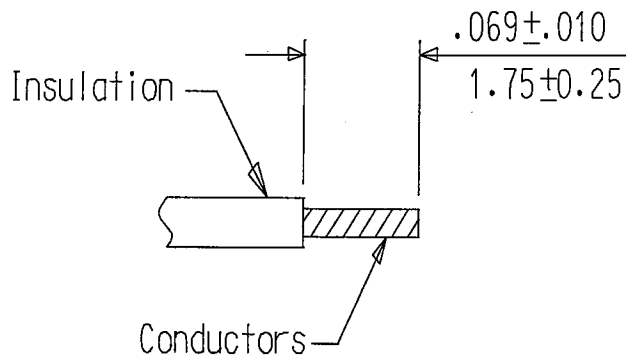
Dim A.

For DVI-D = .630 (16.0)

For DVI-I = .906 (23.0)

Foil shield must remain tightly wound after stripping.

4.1.2 Insulation Strip Length for All Wires



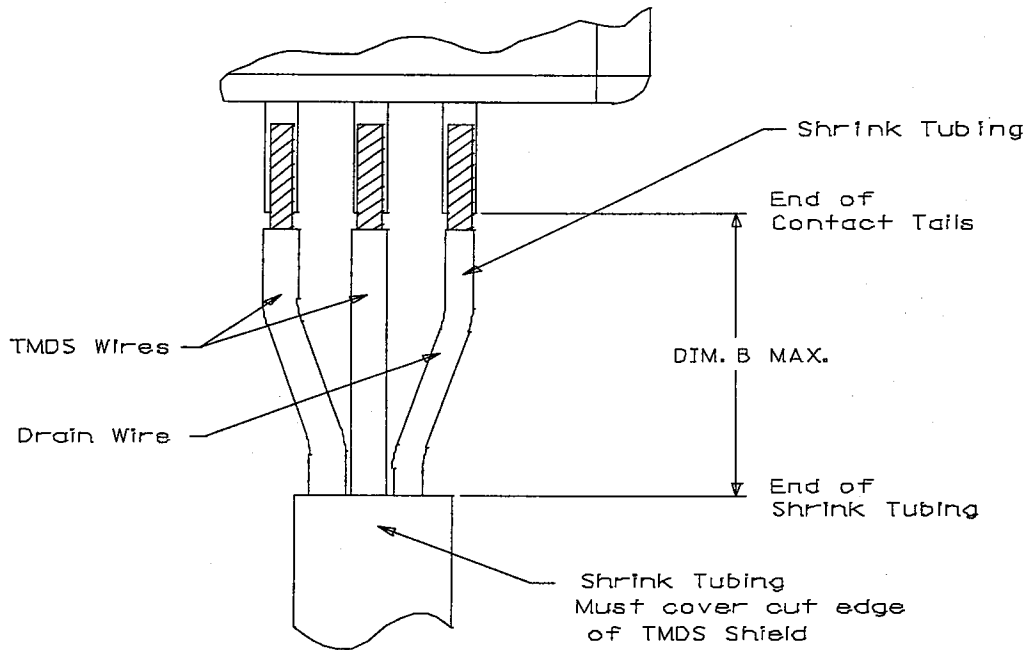
Conductors must remain tightly wound after wire stripping. Nicking of conductors is NOT acceptable.

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4.2 Shrink Tubing

A minimum of two pieces of shrink tubing is required per TMDS pair. One piece is used to cover the exposed drain wire. The other piece must cover the cut edge of the foil shield and extend to within Dim. B of the contact tails as shown below.



Dim. B

For DVI-D = .354 (9.0)

For DVI-I = .630 (16.0)

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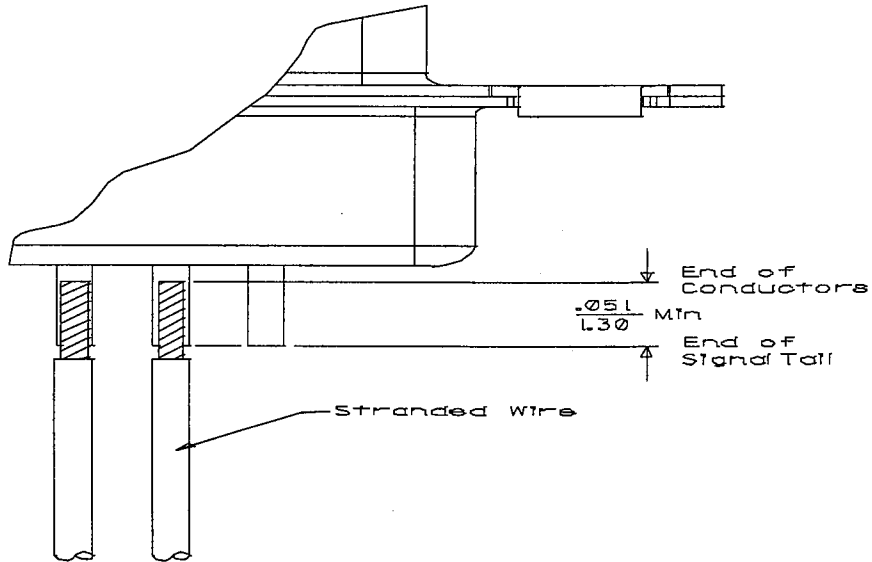


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4.3 Termination Detail

Individual wires can be either soldered or welded to the contact tails.



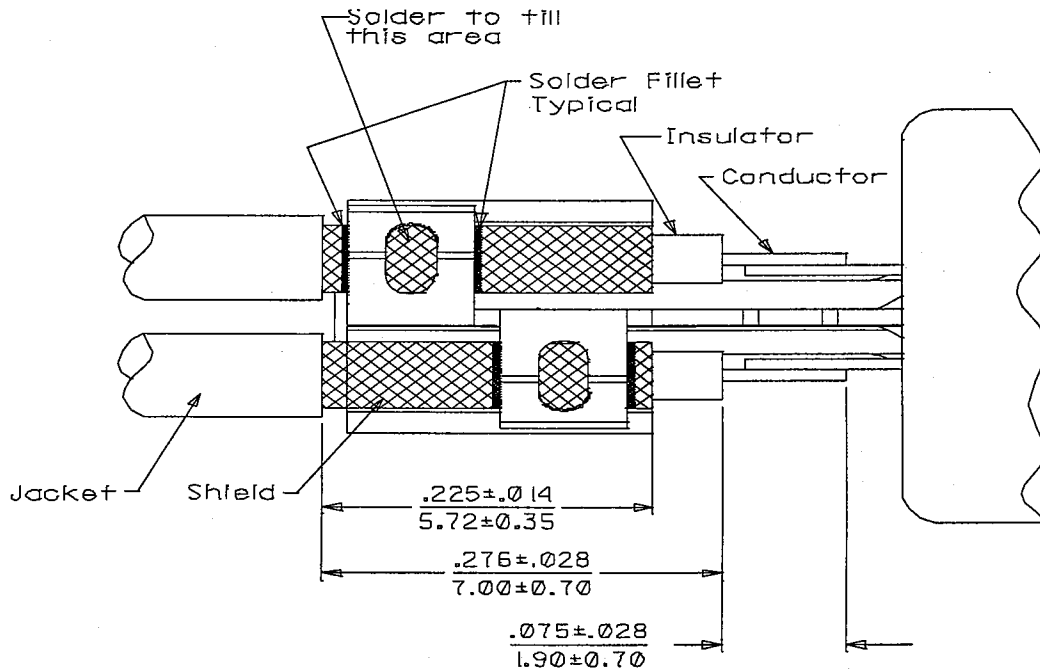
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4.4 Coaxial Termination Detail

Individual wires can be either soldered or welded to the contact tails.

Tin Jacket Shield prior to solder reflow process to ensure solder flows along the areas indicated.

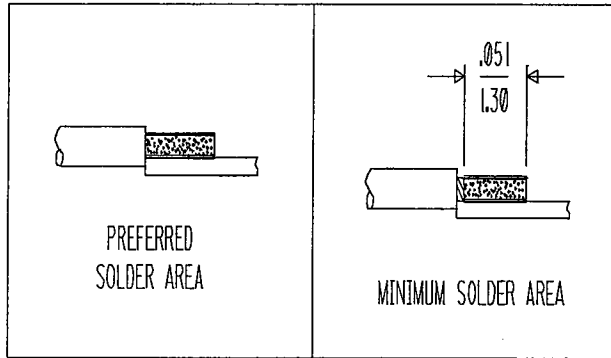


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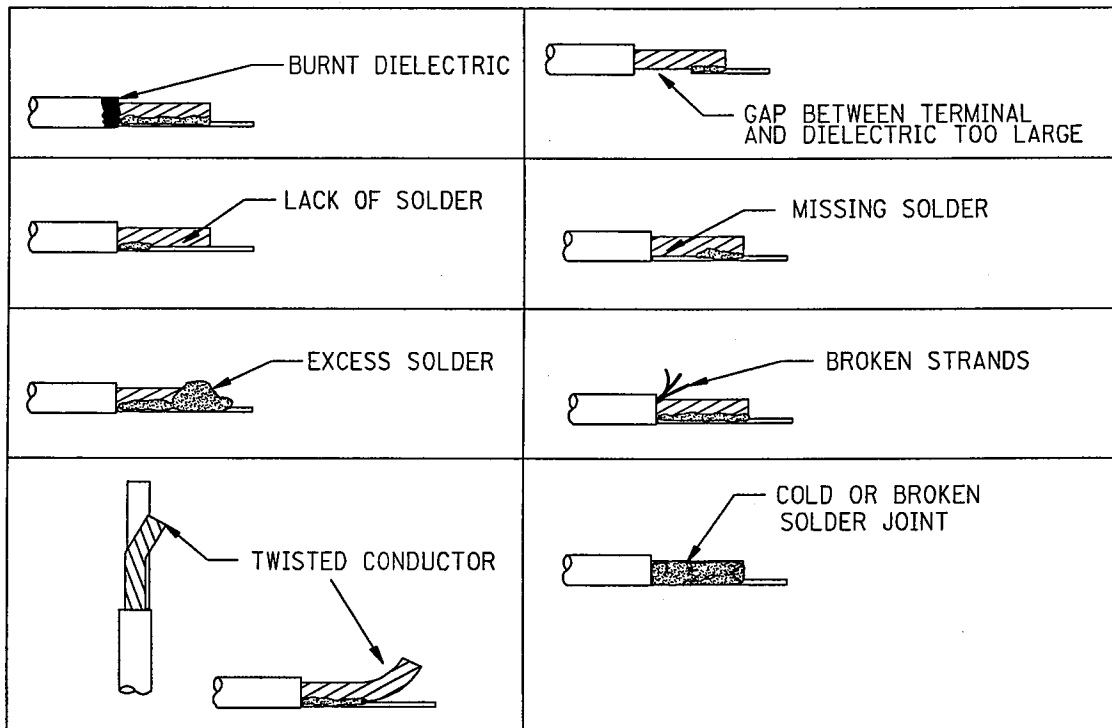


5.0 SOLDER INSPECTION CRITERIA

5.1 Acceptable Solder Joint Characteristics



5.2 Unacceptable Solder Joint Characteristics



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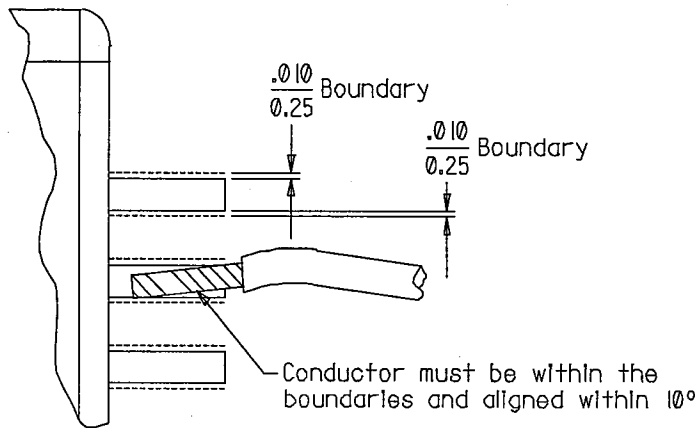


Note: The list of examples shown here is not all inconclusive.

6.0 WELD INSPECTION CRITERIA

6.1 Weld Inspection Details

- 1 There must be no visible separation between the conductors and the contacts.
- 2 The conductor must be centered on the contacts. Alignment between the conductor and the contact must be within 10°. Any portion of the conductors extending beyond



a .005" (0.13mm) boundary of each edge of the contact is cause for rejection.

- 3 The conductor must not be smashed onto the contact. The overall diameter of the conductor bundle after termination should be at least 60% of the original diameter.
- 4 The finished weld should be free of deep electrode indentations, electrode deposits, pits, cracks, strand separation or abnormal discoloration around the weld. Note: Surface appearance is not always a good indicator of weld quality. Insufficient

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heating or inadequate penetration, for example, usually leave no visible effects on the work piece.

- 5 Cracks, spitting (forcible ejection of material from the weld), and voids are not permitted.
- 6 Spikes on the top surface of the wire (evidence of "tip pickup" or welding of the electrode) are cause for rejection.
- 7 The peel strength of each conductor bundle must be greater than 65% of the tensile strength of the undisturbed bundle according to the following equation.

$$A_p - (3 \times S_d) \geq 0.65 \times T_w$$

where:

A_p = the average peel test value

S_d = the standard deviation of these values

T_w = the tensile strength of the wire

i.e. The mean tensile strength of the samples must be at least 3 standard deviations greater than 65% of the wire's original tensile strength.

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6.2 Acceptable Weld Characteristics

<p>A</p> <p>EMBEDMENT</p>	<p>B</p> <p>EXPULSION</p>	<p>C</p> <p>FILLETING</p>
<p>D</p> <p>SHALLOW INDENTATION</p>	<p>E</p> <p>UNDERCUT</p>	

6.3 Unacceptable Weld Characteristics

<p>A</p> <p>VOIDS</p>	<p>B</p> <p>LIGHT WELDS</p>	<p>C</p> <p>OPEN WELDS</p>
<p>D</p> <p>SPITTING</p>	<p>E</p> <p>BLOWN WELD</p>	<p>F</p> <p>TIP PICKUP</p>

Note: The list of examples shown here is not all inconclusive.

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APPENDIX B

TERMS AND CONDITIONS

LEASE NEW.	B-3
BUY NEW	B-5
LEASE REFURBISHED	B-6
BUY REFURBISHED	B-8

Molex distributes their Harness Assembly Tools and Machines through several different plans:

1. Lease New ----- The customer may lease a new machine or tool for a prearranged period of time:
2. Buy New ----- The customer may purchase a new machine or tool outright;
3. Lease Refurbished----- If available, a customer may lease a completely refurbished machine or tool for a prearranged period of time.
4. Buy Refurbished ----- Again if available, a customer may purchase a completely refurbished machine or tool outright.

The terms and conditions, including warranties, vary with each plan. The following pages list the generic parts of these four (4) plans.

NOTE: Not all tooling is available through all four (4) plans. i.e.: Some tooling is purchase only and some is lease only. Contact your local Molex Sales Engineer for additional information.

MOLEX EQUIPMENT LEASE TERMS AND CONDITIONS

ARTICLE I OWNERSHIP OF EQUIPMENT

- 1.01 ALL EQUIPMENT is owned by LESSOR. No right, title or interest in the EQUIPMENT shall pass to LESSEE other than, conditioned upon LESSEE'S performance hereunder, the right to maintain possession and use of the EQUIPMENT.

ARTICLE II SERVICE OF EQUIPMENT

- 2.01 LESSOR will provide LESSEE with instructions as to the set up, operation and maintenance of the equipment and, at LESSEE'S expense, an inventory of recommended perishable tooling.
- 2.02 LESSOR will service the EQUIPMENT (except for minor repairs and/or maintenance) to the extent provided for in the succeeding paragraphs.
- 2.03 If, during the first ninety (90) days after LESSEE received possession of the EQUIPMENT, the EQUIPMENT fails to perform in a satisfactory manner (except by reason of LESSEE'S misuse or negligence), LESSOR will repair the EQUIPMENT, at no cost for parts and labor, as soon as possible after notification.
- 2.04 After the first ninety (90) days of LESSEE'S possession, should the EQUIPMENT fail to operate satisfactorily (except by reason of LESSEE'S misuse or negligence), LESSOR will supply LESSEE with all the required perishable parts at the current standard selling price as soon as possible after notification. Spare parts will continue to be provided on a no-charge basis throughout the term of the lease. Should LESSEE be unable to repair the equipment, LESSOR will repair the inoperable equipment as soon as possible after notification.
- 2.05 By definition, perishable parts are those items that come in contact with the product media during the termination process. The media, normally, would be terminals, wire, connectors, cable, and the like. Examples of perishable parts are: punches, anvils, insertion blades, connector/terminal guides, etc. Where-in examples of spare parts are: motors, solenoids, valves, cylinders, et al.
- 2.06 If LESSOR cannot repair the EQUIPMENT as stated in paragraphs 2.03 and 2.04 hereof, LESSOR will replace the EQUIPMENT or any portion thereof, as soon as possible.
- 2.07 LESSOR cannot be responsible for the quality of connectors or terminals other than those of LESSOR. Accordingly, notwithstanding paragraphs 2.03 and 2.04 and/or 2.06 hereof, LESSOR reserves the right to charge LESSEE the cost of labor and/or parts for repairing EQUIPMENT which is applying connectors or terminals other than LESSOR'S.
- 2.08 LESSOR cannot be responsible for any modifications performed by LESSEE on the EQUIPMENT or the performance of the EQUIPMENT when used in association with machine components not supplied by LESSOR. Accordingly, notwithstanding paragraphs 2.03, 2.04 and/or 2.06 hereof, LESSOR reserves the right to charge LESSEE the cost of labor, and/or parts for the repairing the EQUIPMENT modified by LESSEE or used in association with machine components not supplied by LESSOR.

ARTICLE III WARRANTIES AND REMEDIES

- 3.0 In case of breach of warranty by LESSOR, LESSEE'S sole remedy shall be repair, or, at LESSOR'S option, replacement of the EQUIPMENT.
- 3.02 Under no circumstances shall LESSEE be entitled to any special or consequential damages for any action or non-action taken by LESSOR in connection with furnishing or servicing the EQUIPMENT.

ARTICLE IV LESSEE'S OBLIGATIONS

- 4.01 General - LESSEE shall use the EQUIPMENT in a careful manner, shall comply with all the laws relating to its possession, use, and maintenance and shall be responsible for keeping the EQUIPMENT in good repair, condition and working order and will not modify the EQUIPMENT without the prior written consent of LESSOR.

*ARTICLE IV
LESSEE'S OBLIGATIONS (Continued)*

- 4.02 Inspection - LESSEE shall permit LESSOR to inspect the EQUIPMENT and any pertinent records concerning the EQUIPMENT during LESSEE'S business hours.
- 4.03 Insurance - LESSEE shall provide, maintain, and pay for insurance against loss, theft, damage, and destruction of the EQUIPMENT. LESSEE shall also provide, maintain, and pay for public liability insurance, both personal injury and property damage, covering the EQUIPMENT in form and amount satisfactory to LESSOR.
- 4.04 Liens - LESSEE shall keep the EQUIPMENT free and clear of all levies, liens and encumbrances caused by LESSEE and shall not permit the EQUIPMENT to become a fixture on any premises.
- 4.05 Taxes - LESSEE shall pay all charges and taxes, which may now or hereafter be imposed upon the leasing, rental, possession or use of the EQUIPMENT. LESSOR shall have the right to invoice LESSEE any such taxes that it has paid.
- 4.06 Risk of loss - LESSEE assumes and shall bear the entire risk of loss, theft, destruction, and damage to the EQUIPMENT from any and every cause whatsoever from the date of delivery until return of the EQUIPMENT to LESSOR's plant excepting only that damage directly attributable to LESSOR's negligence. In the event of damage, LESSEE shall, as soon as possible, replace or repair the EQUIPMENT.
- 4.07 Indemnification - LESSEE shall indemnify, hold harmless, and (at LESSOR's option but at LESSEE'S expense) defend LESSOR against any and all claims, actions, liabilities, losses, damages, and expenses including attorney's fees, arising out of LESSEE'S breach of its obligations under this Agreement.

*ARTICLE V
TERMINATION*

- 5.01 Either party hereto may terminate this Agreement for nonperformance under any provision hereof within 10 days after the complaining party has made written demand therefore.
- 5.02 Lessor, at its sole discretion, may terminate this Agreement in the event of LESSEE'S bankruptcy, receivership, insolvency, assignment for the benefit of creditors or similar action or condition relating to LESSEE or LESSOR's property.
- 5.03 Upon termination of this Agreement for any reason except LESSOR's breach, LESSEE, at its expense, will return the EQUIPMENT in as good condition as received less normal wear, tear and depreciation to one of LESSOR's facilities situated in Illinois that shall be designated by LESSOR.

*ARTICLE VI
MISCELLANEOUS*

- 6.01 All notices hereunder shall be in writing and mailed to the respective parties, by registered or certified mail, at the address set forth in the preamble on the face of this Agreement.
- 6.02 This Agreement cannot be varied except by a writing signed by authorized agents of the parties. The definition of EQUIPMENT may be enlarged with the written consent of the parties. Any additional items which become EQUIPMENT shall be fully governed by this Lease Agreement.
- 6.03 This Agreement shall be governed by the Laws of the State of Illinois.
- 6.04 Any provision herein held unenforceable by a court of competent jurisdiction shall not affect any other provision herein and may be modified by such court so that it becomes reasonable and enforceable and, as modified, will be enforced as any other provision.

MOLEX EQUIPMENT SALES TERMS & CONDITIONS

ARTICLE I SERVICE OF EQUIPMENT

- 1.01 SELLER will provide BUYER instructions as to the setup, operation and maintenance of the EQUIPMENT and an inventory of suggested perishable tooling, if ordered, at BUYER'S expense.
- 1.02 SELLER will service the EQUIPMENT (except for minor repairs and/or maintenance) to the extent provided for in the succeeding paragraphs.
- 1.03 If, during the first thirty (30) days after BUYER received possession of the EQUIPMENT, the EQUIPMENT fails to perform in a satisfactory manner (except by reason of BUYER'S misuse or negligence), SELLER will repair the EQUIPMENT, at no cost for parts and labor, as soon as possible after notification.
- 1.04 If, during the first year after BUYER received possession of the EQUIPMENT, the EQUIPMENT fails to perform in a satisfactory manner (except by reason of the BUYER'S misuse or negligence), SELLER will repair the EQUIPMENT, at no cost for spare parts and labor, as soon as possible after notification. The replacement of perishable parts during the remaining eleven (11) months of the warranty is the responsibility of the BUYER.
- 1.05 By definition, perishable parts are those that come into contact with the product media during the termination process. The media, normally, would be terminals, wire, connectors, cable and the like. Examples of perishable parts are: punches, anvils, insertion blades, connector/terminal guides, etc. Wherein examples of spare parts are: motors, solenoids, valves, cylinders, et. al.
- 1.06 If SELLER cannot repair the EQUIPMENT as stated in Paragraphs 1.03 and 1.04 hereof, SELLER will replace the EQUIPMENT, or any portion thereof, still under warranty.
- 1.07 After the first year of BUYER'S possession, should EQUIPMENT fail to operate satisfactorily, SELLER will supply BUYER with all the required parts at the current standard selling price, as soon as possible after notification. Should BUYER be unable to repair the EQUIPMENT, SELLER will repair the inoperable EQUIPMENT, as soon as possible after notification. at then current service charges.
- 1.08 SELLER cannot be responsible for the quality of the connectors or terminals other than those of the SELLER. Accordingly, notwithstanding Paragraphs 1.03, 1.04, 1.06, and/ or 1.07 herein, SELLER reserves the right to charge BUYER the cost of labor and/or parts for repairing EQUIPMENT which is applying connectors or terminals other than SELLER'S.
- 1.09 SELLER cannot be responsible for any modifications performed by the BUYER on the EQUIPMENT or the performance of the EQUIPMENT when used in association with machine components not supplied by the SELLER, Accordingly, notwithstanding Paragraphs 1.03, 1.04, 1.06 and/or 1.07 hereof, SELLER reserves the right to charge BUYER the cost of labor and/or parts for repairing the EQUIPMENT modified by the BUYER or used in association with machine components not supplied by SELLER.

ARTICLE II WARRANTIES AND REMEDIES

- 2.01 In case of breach of warranty by SELLER, BUYER'S sole remedy shall be repair, or at SELLER'S option, replacement of the EQUIPMENT.
- 2.02 Under no circumstances shall BUYER be entitled to any special or consequential damages for any action or non-action taken by SELLER in connection with furnishing or servicing the EQUIPMENT.

**MOLEX EQUIPMENT LEASE TERMS
AND CONDITIONS FOR REFURBISHED EQUIPMENT**

*ARTICLE I
OWNERSHIP OF EQUIPMENT*

- 1.01 ALL EQUIPMENT is owned by LESSOR. No right, title or interest in the EQUIPMENT shall pass to LESSEE other than, conditioned upon LESSEE'S due to performance hereunder, the right to maintain possession and use of the EQUIPMENT.

*ARTICLE II
SERVICE OF EQUIPMENT*

- 2.01 LESSOR will provide LESSEE with instructions as to the set up, operation and maintenance of the equipment and, at LESSEE'S expense, an inventory of recommended perishable tooling.
- 2.02 LESSOR will service the EQUIPMENT (except for minor repairs and/or maintenance) to the extent provided for in the succeeding paragraphs.
- 2.03 If, during the first thirty (30) days after LESSEE received possession of the EQUIPMENT, the EQUIPMENT fails to perform in a satisfactory manner (except by reason of LESSEE'S misuse or negligence), LESSOR will repair the EQUIPMENT, at no cost for parts and labor, as soon as possible after notification.
- 2.04 After the first thirty (30) days of LESSEE'S possession, should the EQUIPMENT fail to operate satisfactorily (except by reason of LESSEE'S misuse or negligence), LESSOR will supply LESSEE with all the required perishable parts at the current standard selling price as soon as possible after notification. Spare parts will continue to be provided on a no-charge basis throughout the term of the lease. Should LESSEE be unable to repair the equipment, LESSOR will repair the inoperable equipment as soon as possible after notification.
- 2.05 By definition, perishable parts are those items that come in contact with the product media during the termination process. The media, normally, would be terminals, wire, connectors, cable, and the like. Examples of perishable parts are: punches, anvils, insertion blades, connector/terminal guides, etc. Where-in examples of spare parts are: motors, solenoids, valves, cylinders, et al.
- 2.06 If LESSOR cannot repair the EQUIPMENT as stated in paragraphs 2.03 and 2.04 hereof, LESSOR will replace the EQUIPMENT or any portion thereof, as soon as possible.
- 2.07 LESSOR cannot be responsible for the quality of connectors or terminals other than those of LESSOR. Accordingly, notwithstanding paragraphs 2.03 and 2.04 and/or 2.06 hereof, LESSOR reserves the right to charge LESSEE the cost of labor and/or parts for repairing EQUIPMENT which is applying connectors or terminals other than LESSOR'S.
- 2.08 LESSOR cannot be responsible for any modifications performed by LESSEE on the EQUIPMENT or the performance of the EQUIPMENT when used in association with machine components not supplied by LESSOR. Accordingly, notwithstanding paragraphs 2.03, 2.04 and/or 2.06 hereof, LESSOR reserves the right to charge LESSEE the cost of labor, and/or parts for the repairing the EQUIPMENT modified by LESSEE or used in association with machine components not supplied by LESSOR.

*ARTICLE III
WARRANTIES AND REMEDIES*

- 3.01 In case of breach of warranty by LESSOR, LESSEE'S sole remedy shall be repair, or, at LESSOR'S option, replacement of the EQUIPMENT.
- 3.02 Under no circumstances shall LESSEE be entitled to any special or consequential damages for any action or non-action taken by LESSOR in connection with furnishing or servicing the EQUIPMENT.

*ARTICLE IV
LESSEE'S OBLIGATIONS*

- 4.01 General - LESSEE shall use the EQUIPMENT in a careful manner, shall comply with all the laws relating to its possession, use or maintenance and shall be responsible for keeping the EQUIPMENT in good repair, condition and working order and will not modify the EQUIPMENT without the prior written consent of LESSOR.
- 4.02 Inspection - LESSEE shall permit LESSOR to inspect the EQUIPMENT and any pertinent records concerning the EQUIPMENT during LESSEE'S business hours.
- 4.03 Insurance - LESSEE shall provide, maintain, and pay for insurance against loss, theft, damage, or destruction of the EQUIPMENT. LESSEE shall also provide, maintain, and pay for public liability insurance, both personal injury and property damage, covering the EQUIPMENT in form and amount satisfactory to LESSOR.
- 4.04 Liens - LESSEE shall keep the EQUIPMENT free and clear of all levies, liens and encumbrances caused by LESSEE and shall not permit the EQUIPMENT to become a fixture on any premises.
- 4.05 Taxes - LESSEE shall pay all charges and taxes, which may now or hereafter be imposed upon the leasing, rental, possession or use of the EQUIPMENT. LESSOR shall have the right to invoice LESSEE any such taxes that it has paid.
- 4.06 Risk of loss - LESSEE assumes and shall bear the entire risk of loss, theft, destruction, or damages to the EQUIPMENT from any and every cause whatsoever from the date of delivery until return of the EQUIPMENT to LESSOR'S plant excepting only that damage directly attributable to LESSOR'S negligence. In the event of damage, LESSEE shall, as soon as possible, replace or repair the EQUIPMENT.
- 4.07 Indemnification - LESSEE shall indemnify, hold harmless, and (at LESSOR'S option but at LESSEE'S expense) defend LESSOR against any and all claims, actions, liabilities, losses, damages, and expenses including attorney's fees, arising out of LESSEE'S breach of its obligations under this Agreement.

*ARTICLE V
TERMINATION*

- 5.01 Either party hereto may terminate this Agreement for nonperformance under any provision hereof within 10 days after the complaining party has made written demand therefore.
- 5.02 Lessor, at its sole discretion, may terminate this Agreement in the event of LESSEE'S bankruptcy, receivership, insolvency, assignment for the benefit of creditors or similar action or condition relating to LESSEE or LESSOR'S property.
- 5.03 Upon termination of this Agreement for any reason except LESSOR'S breach, LESSEE, at its expense, will return the EQUIPMENT in as good condition as received less normal wear, tear and depreciation to one of LESSOR'S plants situated in Illinois that shall be designated by LESSOR.

*ARTICLE VI
MISCELLANEOUS*

- 6.01 All notices hereunder shall be in writing and mailed to the respective parties, by registered or certified mail, at the address set forth in the preamble on the face of this Agreement.
- 6.02 This Agreement cannot be varied except by a writing signed by authorized agents of the parties. The definition of EQUIPMENT may be enlarged with the written consent of the parties. Any additional items which become EQUIPMENT shall be fully governed by this Lease Agreement.
- 6.03 This Agreement shall be governed by the Laws of the State of Illinois.
- 6.04 Any provision herein held unenforceable by a court of competent jurisdiction shall not affect any other provision herein and may be modified by such court so that it becomes reasonable and enforceable and, as modified, will be enforced as any other provision.

MOLEX SALES TERMS & CONDITIONS FOR REFURBISHED EQUIPMENT

ARTICLE I SERVICE OF EQUIPMENT

- 1.01 SELLER will provide BUYER instructions as to the setup, operation and maintenance of the EQUIPMENT and an inventory of suggested perishable tooling, if ordered, at BUYER'S expense.
- 1.02 SELLER will service the EQUIPMENT (except for minor repairs and/or maintenance) to the extent provided for in the succeeding paragraphs.
- 1.03 If, during the first thirty (30) days after BUYER received possession of the EQUIPMENT, the EQUIPMENT fails to perform in a satisfactory manner (except by reason of BUYER'S misuse or negligence), SELLER will repair the EQUIPMENT, at no cost for parts and labor, as soon as possible after notification.
- 1.04 If, during the first six (6) months after BUYER received possession of the EQUIPMENT, the EQUIPMENT fails to perform in a satisfactory manner (except by reason of the BUYER'S misuse or negligence), SELLER will repair the EQUIPMENT, at no cost for spare parts and labor, as soon as possible after notification. The replacement of perishable parts during the remaining five (5) months of the warranty is the responsibility of the BUYER.
- 1.05 By definition, perishable parts are those that come into contact with the product media during the termination process. The media, normally, would be terminals, wire, connectors, cable and the like. Examples of perishable parts are: punches, anvils, insertion blades, connector/terminal guides, etc. Wherein examples of spare parts are: motors, solenoids, valves, cylinders, et. al.
- 1.06 If SELLER cannot repair the EQUIPMENT as stated in Paragraphs 1.03 and 1.04 hereof, SELLER will replace the EQUIPMENT, or any portion thereof, still under warranty.
- 1.07 After the first year of BUYER'S possession, should EQUIPMENT fail to operate satisfactorily, SELLER will supply BUYER with all the required parts at the current standard selling price, as soon as possible after notification. Should BUYER be unable to repair the EQUIPMENT, SELLER will repair the inoperable EQUIPMENT, as soon as possible after notification. at then current service charges.
- 1.08 SELLER cannot be responsible for the quality of the connectors or terminals other than those of the SELLER. Accordingly, notwithstanding Paragraphs 1.03, 1.04, 1.06, and/ or 1.07 herein, SELLER reserves the right to charge BUYER the cost of labor and/or parts for repairing EQUIPMENT which is applying connectors or terminals other than SELLER'S.
- 1.09 SELLER cannot be responsible for any modifications performed by the BUYER on the EQUIPMENT or the performance of the EQUIPMENT when used in association with machine components not supplied by the SELLER, Accordingly, notwithstanding Paragraphs 1.03, 1.04, 1.06 and/or 1.07 hereof, SELLER reserves the right to charge BUYER the cost of labor and/or parts for repairing the EQUIPMENT modified by the BUYER or used in association with machine components not supplied by SELLER.

ARTICLE II WARRANTIES AND REMEDIES

- 2.01 In case of breach of warranty by SELLER, BUYER'S sole remedy shall be repair, or at SELLER'S option, replacement of the EQUIPMENT.
- 2.02 Under no circumstances shall BUYER be entitled to any special or consequential damages for any action or non-action taken by SELLER in connection with furnishing or servicing the EQUIPMENT.