

QUALIFICATIONS VALIDATED  
ANNUALLY

QML-31032-9  
1 March 2001  
SUPERSEDING  
QML-31032-8  
31 October 2000

QUALIFIED MANUFACTURERS LIST

OF

PERFORMANCE SPECIFICATION

MIL-PRF-31032

PRINTED CIRCUIT BOARDS / PRINTED WIRING BOARDS

GENERAL SPECIFICATION FOR



This list has been prepared for use by or for the Government in the acquisition of printed circuit boards / printed wiring boards (hereafter referred to as printed boards) covered by Department of Defense Performance Specification MIL-PRF-31032. Listing of a manufacturer is not intended to and does not connote endorsement of the manufacturer by the Department of Defense. All listings herein have been qualified under the requirements as specified in the latest effective issue of MIL-PRF-31032. This list is subject to change without notice; revision or amendment of this list will be issued as necessary. The listing of a manufacturer does not in any way release the manufacturer from compliance with the individual item specification requirements.

THE ACTIVITY RESPONSIBLE FOR THIS QML IS THE DEFENSE SUPPLY CENTER COLUMBUS (DSCC-VQ), COLUMBUS, OH 43216-5000.

If a manufacturer desires to have test data considered for qualification, it must be certified and meet all qualification test requirements of MIL-PRF-31032 and the applicable associated specification.

The listing of printed board manufacturing lines in the QML applies only to printed boards produced in the plant(s) specified herein. Therefore, only those printed boards that have been manufactured and tested within the United States and its territories and as provided by international agreement(s) establishing reciprocal and equivalent quality systems and procedures, can be supplied as QML printed boards.

QML-31032 is available from the DSCC-VQ World Wide Web pages at the following addresses:

Web pages: [http://www.dscccols.com/offices/sourcing\\_and\\_qualification/](http://www.dscccols.com/offices/sourcing_and_qualification/)

QML: <http://www.dscccols.com/programs/qmlqpl/QPLdetail.asp?QPL=31032>

QML is a definition of a manufacturer's verified capabilities. Manufacturers may use the add-on qualification process to qualify capabilities that are not currently listed on the QML. The user is encouraged to contact the manufacturer or DSCC to make arrangements for QML availability.

**SECTION I**

**LIST OF MANUFACTURERS BY ASSOCIATED SPECIFICATION**

**MIL-PRF-31032/1 - Printed Wiring Board, Rigid, Multilayered, Woven E-Glass Reinforced Thermosetting Resin Base Material, With Plated Through Holes, For Soldered Part Mounting.**

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Accudyne, Inc.  
5800 McHines Place  
Raleigh, NC 27616-1839

Dynamic & Proto Circuits, Inc.  
869 Barton Street  
Stoney Creek, Ontario L8E 566  
Canada

Lockheed Martin Corp.  
Missiles and Fire Control Orlando  
5600 West Sandlake Road  
Orlando, FL 32819-8907

Lockheed Martin Federal Systems, Inc.  
1801 State Route 17C  
Owego, NY 13827

Philway Products, inc.  
701 Virginia Avenue  
Ashland, OH 44806

Printed Circuits, Inc.  
1200 W. 96<sup>th</sup> Street  
Bloomington, MN 55431-2699

Proto Circuit, Inc.  
7 Ascot Parkway  
Cuyahoga Falls, OH 44223

Teradyne Circuits Operation  
4 Pittsburgh Avenue  
Nashua, New Hampshire 03060

Tyco Printed Circuits Group  
Austin Division  
12501 Research Boulevard, Module 1  
Austin, TX 78759

**MIL-PRF-31032/2 - Printed Wiring Board, Rigid, Single and Double Layer, Woven E-Glass Reinforced Thermosetting Resin Base Material, With or Without Plated Through Holes, For Soldered Part Mounting.**

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Accudyne, Inc.  
5800 McHines Place  
Raleigh, NC 27616-1839

Dynamic & Proto Circuits, Inc.  
869 Barton Street  
Stoney Creek, Ontario L8E 566  
Canada

Lockheed Martin Corp.  
Missiles and Fire Control Orlando  
5600 West Sandlake Road  
Orlando, FL 32819-8907

Lockheed Martin Federal Systems, Inc.  
1801 State Route 17C  
Owego, NY 13827

Printed Circuits, Inc.  
1200 W. 96<sup>th</sup> Street  
Bloomington, MN 55431-2699

Teradyne Circuits Operation  
4 Pittsburgh Avenue  
Nashua, New Hampshire 03060

Tyco Printed Circuits Group  
Austin Division  
12501 Research Boulevard, Module 1  
Austin, TX 78759

**SECTION I**

**LIST OF MANUFACTURERS BY ASSOCIATED SPECIFICATION**

**MIL-PRF-31032/3** - Printed Wiring Board, Flexible, Single and Double Layer, With or Without Plated Through Holes, With or Without Stiffeners, For Soldered Part Mounting.

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Lockheed Martin Federal Systems, Inc.  
1801 State Route 17C  
Owego, NY 13827

Printed Circuits, Inc.  
1200 W. 96<sup>th</sup> Street  
Bloomington, MN 55431-2699

Tyco Printed Circuits Group  
Austin Division  
12501 Research Boulevard, Module 1  
Austin, TX 78759

**MIL-PRF-31032/4** – Printed Wiring Board, Rigid-Flex or Flexible, Multilayer with Plated Holes, With or Without Stiffeners, for Soldered Part Mounting

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Lockheed Martin Federal Systems, Inc.  
1801 State Route 17C  
Owego, NY 13827

Printed Circuits, Inc.  
1200 W. 96<sup>th</sup> Street  
Bloomington, MN 55431-2699

Tyco Printed Circuits Group  
Austin Division  
12501 Research Boulevard, Module 1  
Austin, TX 78759

**SECTION II**

**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

|   |                                   |   |
|---|-----------------------------------|---|
| <p>MANUFACTURER<br/>NAME &amp; ADDRESS</p> <p>Accudyne, Inc.<br/>5800 McHines Place<br/>Raleigh, NC 27616-1839</p>  | <p>PLANT LOCATION</p> <p>Same</p> | <p>CAGE CODE: 1JQF6</p> <p>CONTACT: Patrick J. Gardner<br/>PHONE #: 919-713-4872<br/>FAX #: 919-876-6385<br/>EMAIL: Accuengr@mindspring.com</p> |
| <p>CAPABILITIES BY TECHNOLOGY / ASSOCIATED SPECIFICATION:</p>   |                                   | <p>QUALIFICATION LETTER:</p>  |
| <p>MIL-PRF-31032/1<br/>MIL-PRF-31032/2</p> <p>Panel Size                    18" X 24"<br/>Max. Board Thickness        0.090"<br/>Max/Min Hole Size           /0.010"<br/>Aspect Ratio                   7:1<br/>Max. Number of Layers       8<br/>Min. Conductor Width       0.005"<br/>Min. Conductor Spacing     0.005"<br/>Part Mounting                SM, THM, COB<br/>Base Material                 GF                    (Epoxy resin)<br/>Finish System                 Fused SnPB<br/>   Hot Air Solder Leveling<br/>Hole Preparation              Permanganate Desmear<br/>Copper Plating                Acid Copper<br/>Solder Resist                 Liquid Photo Imagable, Dry Film<br/>   BGA Platform<br/>   250 volt testing max.</p> |                                   | <p>VQE-99-0871</p>  |

**SECTION II**

**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

|   |                                   |  |
|---|-----------------------------------|--|
| <b>MANUFACTURER<br/>NAME &amp; ADDRESS</b><br><br>Dynamic & Proto Circuits, Inc.<br>869 Barton Street<br>Stoney Creek, Ontario L8E 566<br>Canada  | <b>PLANT LOCATION</b><br><br>Same | <b>CAGE CODE: 38898</b><br><br>CONTACT: Mr. David Foster<br>PHONE #: 905-643-9900<br>FAX #: 905-643-9911<br>EMAIL: dfoster@dapc.com  |
| <b>CAPABILITIES BY TECHNOLOGY / ASSOCIATED SPECIFICATION:</b>   |                                   | <b>QUALIFICATION LETTER:</b>   |
| MIL-PRF-31032/1<br>MIL-PRF-31032/2<br>Panel Size                      16"X18"<br>Max. Board Thickness        0.125"<br>Max/Min Hole Size            0.039"/0.018" (0.0135" drilled)<br>Aspect Ratio                    9:3:1<br>Max. Number of Layers        10<br>Min. Conductor Width        0.005"<br>Min. Conductor Spacing      0.005"<br>Part Mounting                  SM, THM, MIX<br>Base Material                  GF    (Woven E-Glass, Epoxy resin)<br>GI    (Woven E-Glass, Polyimide resin)<br>Finish System                  Hot Air Solder Leveling<br>Hole Preparation               Plasma Etch<br>Copper Plating                  Acid Copper<br>Solder Resist                    Liquid Photoimagable<br>Dry film solder resist plugs |                                   | VQE-98-1143, VQE-00-0007<br>VQE-01-0311<br>VQE-01-0311<br>VQE-01-0311<br>VQE-98-1143, VQE-01-0311<br>VQE-01-0311<br>VQE-98-1143<br>VQE-98-1143<br>VQE-98-1143, VQE-00-0007<br>VQE-98-1143, VQE-00-0007<br>VQE-00-0007<br>VQE-98-1143<br>VQE-98-1143, VQE-00-0007<br>VQE-98-1143, VQE-00-0007<br>VQE-98-1143, VQE-00-0007<br>VQE-98-1143<br>VQE-00-0007 |

**SECTION II**

**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

|   |  |   |           |                      |                  |                   |               |              |     |                      |    |                      |        |                        |        |               |          |               |                                |               |               |                  |                |                |                               |                                    |
|---|--|---|-----------|----------------------|------------------|-------------------|---------------|--------------|-----|----------------------|----|----------------------|--------|------------------------|--------|---------------|----------|---------------|--------------------------------|---------------|---------------|------------------|----------------|----------------|-------------------------------|------------------------------------|
| <p><b>MANUFACTURER<br/>NAME &amp; ADDRESS</b></p> <p>Lockheed Martin Corp.<br/>Missiles &amp; Fire Control Orlando<br/>5600 West Sandlake Road<br/>Orlando, FL 32819-8907</p>   | <p><b>PLANT LOCATION</b></p> <p>Same</p> | <p><b>CAGE CODE:</b> 04939</p> <p><b>CONTACT:</b> Vijay Kumar<br/><b>PHONE #:</b> 407-356-0282<br/><b>FAX #:</b> 407-356-8291<br/><b>EMAIL:</b> <a href="mailto:vijay.kumar@lmco.com">vijay.kumar@lmco.com</a></p> <p><b>CONTACT:</b> Paul Rose<br/><b>PHONE #:</b> 407-356-5537<br/><b>EMAIL:</b> <a href="mailto:paul.b.rose@lmco.com">paul.b.rose@lmco.com</a></p> |           |                      |                  |                   |               |              |     |                      |    |                      |        |                        |        |               |          |               |                                |               |               |                  |                |                |                               |                                    |
| <p><b>CAPABILITIES BY TECHNOLOGY / ASSOCIATED SPECIFICATION:</b></p>  |  | <p><b>QUALIFICATION LETTER:</b></p>   |           |                      |                  |                   |               |              |     |                      |    |                      |        |                        |        |               |          |               |                                |               |               |                  |                |                |                               |                                    |
| <p>MIL-PRF-31032/1<br/>MIL-PRF-31032/2</p> <table border="0"> <tr> <td>Panel Size</td> <td>12" X 18"</td> </tr> <tr> <td>Max. Board Thickness</td> <td>0.088" (nominal)</td> </tr> <tr> <td>Max/Min Hole Size</td> <td>0.052"/0.031"</td> </tr> <tr> <td>Aspect Ratio</td> <td>3:1</td> </tr> <tr> <td>Max. Nuber of Layers</td> <td>10</td> </tr> <tr> <td>Min. Conductor Width</td> <td>0.010"</td> </tr> <tr> <td>Min. Conductor Spacing</td> <td>0.006"</td> </tr> <tr> <td>Part Mounting</td> <td>SMT, THM</td> </tr> <tr> <td>Base Material</td> <td>GI (Woven E-glass Epoxy Resin)</td> </tr> <tr> <td>Finish System</td> <td>Reflow Solder</td> </tr> <tr> <td>Hole Preparation</td> <td>Plasma Desmear</td> </tr> <tr> <td>Copper Plating</td> <td>Electro-deposited Acid Copper</td> </tr> </table> |  | Panel Size  | 12" X 18" | Max. Board Thickness | 0.088" (nominal) | Max/Min Hole Size | 0.052"/0.031" | Aspect Ratio | 3:1 | Max. Nuber of Layers | 10 | Min. Conductor Width | 0.010" | Min. Conductor Spacing | 0.006" | Part Mounting | SMT, THM | Base Material | GI (Woven E-glass Epoxy Resin) | Finish System | Reflow Solder | Hole Preparation | Plasma Desmear | Copper Plating | Electro-deposited Acid Copper | <p>VQE-00-0193<br/>VQE-00-0734</p> |
| Panel Size  | 12" X 18"                                |   |           |                      |                  |                   |               |              |     |                      |    |                      |        |                        |        |               |          |               |                                |               |               |                  |                |                |                               |                                    |
| Max. Board Thickness  | 0.088" (nominal)                         |   |           |                      |                  |                   |               |              |     |                      |    |                      |        |                        |        |               |          |               |                                |               |               |                  |                |                |                               |                                    |
| Max/Min Hole Size   | 0.052"/0.031"                            |   |           |                      |                  |                   |               |              |     |                      |    |                      |        |                        |        |               |          |               |                                |               |               |                  |                |                |                               |                                    |
| Aspect Ratio  | 3:1                                      |   |           |                      |                  |                   |               |              |     |                      |    |                      |        |                        |        |               |          |               |                                |               |               |                  |                |                |                               |                                    |
| Max. Nuber of Layers  | 10                                       |   |           |                      |                  |                   |               |              |     |                      |    |                      |        |                        |        |               |          |               |                                |               |               |                  |                |                |                               |                                    |
| Min. Conductor Width  | 0.010"                                   |   |           |                      |                  |                   |               |              |     |                      |    |                      |        |                        |        |               |          |               |                                |               |               |                  |                |                |                               |                                    |
| Min. Conductor Spacing  | 0.006"                                   |   |           |                      |                  |                   |               |              |     |                      |    |                      |        |                        |        |               |          |               |                                |               |               |                  |                |                |                               |                                    |
| Part Mounting   | SMT, THM                                 |   |           |                      |                  |                   |               |              |     |                      |    |                      |        |                        |        |               |          |               |                                |               |               |                  |                |                |                               |                                    |
| Base Material   | GI (Woven E-glass Epoxy Resin)           |   |           |                      |                  |                   |               |              |     |                      |    |                      |        |                        |        |               |          |               |                                |               |               |                  |                |                |                               |                                    |
| Finish System   | Reflow Solder                            |   |           |                      |                  |                   |               |              |     |                      |    |                      |        |                        |        |               |          |               |                                |               |               |                  |                |                |                               |                                    |
| Hole Preparation  | Plasma Desmear                           |   |           |                      |                  |                   |               |              |     |                      |    |                      |        |                        |        |               |          |               |                                |               |               |                  |                |                |                               |                                    |
| Copper Plating  | Electro-deposited Acid Copper            |   |           |                      |                  |                   |               |              |     |                      |    |                      |        |                        |        |               |          |               |                                |               |               |                  |                |                |                               |                                    |

**SECTION II**

**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

| MANUFACTURER<br>NAME & ADDRESS   | PLANT LOCATION  | CAGE CODE: 03640  |
|--|---|---|
| Lockheed Martin Federal Systems, Inc.<br>1801 State Route 17C<br>Owego, NY 13827 | Same  | CONTACT: Chris Conklin<br>PHONE #: 607-751-4251<br>FAX #: 607-751-7714<br>EMAIL: c.j.conklin@lmco.com |
| CAPABILITIES BY TECHNOLOGY/PRINTEDBOARD TYPE:                                    |   | QUALIFICATION LETTER:   |
| MIL-PRF-31032/1, /2  |   | VQE-99-0130<br>VQE-00-0961  |
| Panel Size   | 18" X 24"   |   |
| Max. Board Thickness   | 0.200"  |   |
| Max/Min Hole Size  | /0.020"   |   |
| Aspect Ratio   | 8:1   |   |
| Max. Number of Layers  | 16  |   |
| Min. Conductor Width   | 0.004"  |   |
| Min. Conductor Spacing   | 0.004"  |   |
| Part Mounting  | SMT, THM  |   |
| Base Material  | GF (Woven E-glass Epoxy Resin)<br>GI (Woven E-glass, Polyimide Resin)<br>AF (Woven Aramid, Epoxy Resin) |   |
| Finish System  | Fused SnPb<br>HASL  |   |
| Hole Preparation   | Permanganate Desmear/Plasma<br>Etchback   |   |
| Copper Plating   | Electro-deposited Copper  |   |
| Solder Resist  | Liquid Photoimagable  |   |
| CAPABILITIES BY TECHNOLOGY / ASSOCIATED SPECIFICATION:                           |   | QUALIFICATION LETTER:   |
| MIL-PRF-31032/3, /4  |   | VQE-00-0684   |
| Panel Size   | 18" X 24"   |   |
| Max. Board Thickness   | 0.110"  |   |
| Max/Min Hole Size  | /0.040"   |   |
| Aspect Ratio   | 2.75:1  |   |
| Max. Number of Layers  | 10  |   |
| Min. Conductor Width   | 0.004"  |   |
| Min. Conductor Spacing   | 0.004"  |   |
| Part Mounting  | SMT, THM  |   |
| Rigid Base Material  | GF (Woven E-glass Epoxy Resin)<br>GI ( Woven E-glass, Polyimide Resin)                                  |   |
| Flex Base Material   | IPC-FC-241/1 through /4<br>IPC-FC-241/11  |   |
| Finish System  | Fused SnPb,<br>HASL   |   |
| Hole Preparation   | Permanganate Desmear/Plasma<br>Etchback   |   |
| Copper Plating   | Electro-deposited Acid Copper   |   |
| Solder Resist  | UV-Cured Wet Screen   |   |

**SECTION II**

**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

|  |  |  |           |                      |        |                        |        |                          |              |              |     |                       |    |                      |        |                        |        |               |              |               |  |               |  |                  |                               |                |             |               |                      |             |
|--|--|--|-----------|----------------------|--------|------------------------|--------|--------------------------|--------------|--------------|-----|-----------------------|----|----------------------|--------|------------------------|--------|---------------|--------------|---------------|--|---------------|--|------------------|-------------------------------|----------------|-------------|---------------|----------------------|-------------|
| <b>MANUFACTURER<br/>NAME &amp; ADDRESS</b><br><br>Philway Products, Inc.<br>701 Virginia Avenue<br>Ashland, OH 44806   | <b>PLANT LOCATION</b><br><br>Same  | <b>CAGE CODE: 21971</b><br><br><b>CONTACT: Ted Norris</b><br>PHONE #: 419-281-7777<br>FAX #: 419-289-3447<br>EMAIL:chris@philway.com |           |                      |        |                        |        |                          |              |              |     |                       |    |                      |        |                        |        |               |              |               |  |               |  |                  |                               |                |             |               |                      |             |
| <b>CAPABILITIES BY TECHNOLOGY / ASSOCIATED SPECIFICATION:</b>  |  | <b>QUALIFICATION LETTER:</b>   |           |                      |        |                        |        |                          |              |              |     |                       |    |                      |        |                        |        |               |              |               |  |               |  |                  |                               |                |             |               |                      |             |
| <b>MIL-PRF-31032/1</b><br><br><table border="0"> <tr><td>Panel Size</td><td>18" X 21"</td></tr> <tr><td>Max. Board Thickness</td><td>0.090"</td></tr> <tr><td>Max. Base Cu Thickness</td><td>0.002"</td></tr> <tr><td>Max/Min Plated Hole Size</td><td>0.044"/0.012</td></tr> <tr><td>Aspect Ratio</td><td>4:1</td></tr> <tr><td>Max. Number of Layers</td><td>12</td></tr> <tr><td>Min. Conductor Width</td><td>0.005"</td></tr> <tr><td>Min. Conductor Spacing</td><td>0.005"</td></tr> <tr><td>Part Mounting</td><td>SM, THM, MIX</td></tr> <tr><td>Base Material</td><td>GF (Woven E-Glass, Epoxy resin)<br/>GI (Woven E-Glass, Polyimide resin)<br/>GM (Woven E-Glass, Triazine and/or<br/>Bismaleimide Modified Epoxy resin)</td></tr> <tr><td>Finish System</td><td>Hot Air Solder Leveling:<br/>IR Reflow following SnPb plate</td></tr> <tr><td>Hole Preparation</td><td>Permanganate Desmear/Etchback</td></tr> <tr><td>Copper Plating</td><td>Acid Copper</td></tr> <tr><td>Solder Resist</td><td>Liquid Photoimagable</td></tr> </table> |  | Panel Size   | 18" X 21" | Max. Board Thickness | 0.090" | Max. Base Cu Thickness | 0.002" | Max/Min Plated Hole Size | 0.044"/0.012 | Aspect Ratio | 4:1 | Max. Number of Layers | 12 | Min. Conductor Width | 0.005" | Min. Conductor Spacing | 0.005" | Part Mounting | SM, THM, MIX | Base Material | GF (Woven E-Glass, Epoxy resin)<br>GI (Woven E-Glass, Polyimide resin)<br>GM (Woven E-Glass, Triazine and/or<br>Bismaleimide Modified Epoxy resin) | Finish System | Hot Air Solder Leveling:<br>IR Reflow following SnPb plate | Hole Preparation | Permanganate Desmear/Etchback | Copper Plating | Acid Copper | Solder Resist | Liquid Photoimagable | VQE-99-1107 |
| Panel Size   | 18" X 21"  |  |           |                      |        |                        |        |                          |              |              |     |                       |    |                      |        |                        |        |               |              |               |  |               |  |                  |                               |                |             |               |                      |             |
| Max. Board Thickness   | 0.090"   |  |           |                      |        |                        |        |                          |              |              |     |                       |    |                      |        |                        |        |               |              |               |  |               |  |                  |                               |                |             |               |                      |             |
| Max. Base Cu Thickness   | 0.002"   |  |           |                      |        |                        |        |                          |              |              |     |                       |    |                      |        |                        |        |               |              |               |  |               |  |                  |                               |                |             |               |                      |             |
| Max/Min Plated Hole Size   | 0.044"/0.012   |  |           |                      |        |                        |        |                          |              |              |     |                       |    |                      |        |                        |        |               |              |               |  |               |  |                  |                               |                |             |               |                      |             |
| Aspect Ratio   | 4:1  |  |           |                      |        |                        |        |                          |              |              |     |                       |    |                      |        |                        |        |               |              |               |  |               |  |                  |                               |                |             |               |                      |             |
| Max. Number of Layers  | 12   |  |           |                      |        |                        |        |                          |              |              |     |                       |    |                      |        |                        |        |               |              |               |  |               |  |                  |                               |                |             |               |                      |             |
| Min. Conductor Width   | 0.005"   |  |           |                      |        |                        |        |                          |              |              |     |                       |    |                      |        |                        |        |               |              |               |  |               |  |                  |                               |                |             |               |                      |             |
| Min. Conductor Spacing   | 0.005"   |  |           |                      |        |                        |        |                          |              |              |     |                       |    |                      |        |                        |        |               |              |               |  |               |  |                  |                               |                |             |               |                      |             |
| Part Mounting  | SM, THM, MIX   |  |           |                      |        |                        |        |                          |              |              |     |                       |    |                      |        |                        |        |               |              |               |  |               |  |                  |                               |                |             |               |                      |             |
| Base Material  | GF (Woven E-Glass, Epoxy resin)<br>GI (Woven E-Glass, Polyimide resin)<br>GM (Woven E-Glass, Triazine and/or<br>Bismaleimide Modified Epoxy resin) |  |           |                      |        |                        |        |                          |              |              |     |                       |    |                      |        |                        |        |               |              |               |  |               |  |                  |                               |                |             |               |                      |             |
| Finish System  | Hot Air Solder Leveling:<br>IR Reflow following SnPb plate   |  |           |                      |        |                        |        |                          |              |              |     |                       |    |                      |        |                        |        |               |              |               |  |               |  |                  |                               |                |             |               |                      |             |
| Hole Preparation   | Permanganate Desmear/Etchback  |  |           |                      |        |                        |        |                          |              |              |     |                       |    |                      |        |                        |        |               |              |               |  |               |  |                  |                               |                |             |               |                      |             |
| Copper Plating   | Acid Copper  |  |           |                      |        |                        |        |                          |              |              |     |                       |    |                      |        |                        |        |               |              |               |  |               |  |                  |                               |                |             |               |                      |             |
| Solder Resist  | Liquid Photoimagable   |  |           |                      |        |                        |        |                          |              |              |     |                       |    |                      |        |                        |        |               |              |               |  |               |  |                  |                               |                |             |               |                      |             |



**SECTION II**

**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

|  |  |   |                      |                      |        |                   |         |              |      |                       |    |                      |        |                        |        |               |             |               |   |  |  |               |  |                  |                         |                |             |               |  |             |
|--|--|---|----------------------|----------------------|--------|-------------------|---------|--------------|------|-----------------------|----|----------------------|--------|------------------------|--------|---------------|-------------|---------------|---|--|--|---------------|--|------------------|-------------------------|----------------|-------------|---------------|--|-------------|
| <b>MANUFACTURER<br/>NAME &amp; ADDRESS</b><br><br>Printed Circuits, Inc.<br>1200 W. 96 <sup>th</sup> Street<br>Bloomington, MN 55431-2699  | <b>PLANT LOCATION</b><br><br>Same  | <b>CAGE CODE: 65114</b><br><br><b>CONTACT: Dennis Cantwell</b><br>PHONE #: 612-888-7900<br>FAX #: 612-888-2719<br>EMAIL: <a href="mailto:dcant@printedcircuits.com">dcant@printedcircuits.com</a> |                      |                      |        |                   |         |              |      |                       |    |                      |        |                        |        |               |             |               |   |  |  |               |  |                  |                         |                |             |               |  |             |
| <b>CAPABILITIES BY TECHNOLOGY / ASSOCIATED SPECIFICATION:</b>  |  | <b>QUALIFICATION LETTER:</b>  |                      |                      |        |                   |         |              |      |                       |    |                      |        |                        |        |               |             |               |   |  |  |               |  |                  |                         |                |             |               |  |             |
| <b>MIL-PRF-31032/1, /2, /3, /4</b><br><br><table border="0"> <tr> <td>Panel Size</td> <td>12" X 18", 18" X 24"</td> </tr> <tr> <td>Max. Board Thickness</td> <td>0.120"</td> </tr> <tr> <td>Max/Min Hole Size</td> <td>/0.010"</td> </tr> <tr> <td>Aspect Ratio</td> <td>10:1</td> </tr> <tr> <td>Max. Number of Layers</td> <td>16</td> </tr> <tr> <td>Min. Conductor Width</td> <td>0.004"</td> </tr> <tr> <td>Min. Conductor Spacing</td> <td>0.005"</td> </tr> <tr> <td>Part Mounting</td> <td>SM/THM, MIX</td> </tr> <tr> <td>Base Material</td> <td>GF (Woven E-glass Epoxy Resin)<br/>GI (Woven, E-glass Polyimide Resin)</td> </tr> <tr> <td></td> <td>IPC-FC-241/1 through /4<br/>IPC-FC-241/11</td> </tr> <tr> <td>Finish System</td> <td>Fused SnPb<br/>HASL<br/>Electroplated Nickel/Gold<br/>Electroless Nickel/Gold</td> </tr> <tr> <td>Hole Preparation</td> <td>Plasma Desmear/Etchback</td> </tr> <tr> <td>Copper Plating</td> <td>Acid Copper</td> </tr> <tr> <td>Solder Resist</td> <td>Liquid/Dry Film Photo Imageable<br/>SMOBC</td> </tr> </table> |  | Panel Size  | 12" X 18", 18" X 24" | Max. Board Thickness | 0.120" | Max/Min Hole Size | /0.010" | Aspect Ratio | 10:1 | Max. Number of Layers | 16 | Min. Conductor Width | 0.004" | Min. Conductor Spacing | 0.005" | Part Mounting | SM/THM, MIX | Base Material | GF (Woven E-glass Epoxy Resin)<br>GI (Woven, E-glass Polyimide Resin) |  | IPC-FC-241/1 through /4<br>IPC-FC-241/11 | Finish System | Fused SnPb<br>HASL<br>Electroplated Nickel/Gold<br>Electroless Nickel/Gold | Hole Preparation | Plasma Desmear/Etchback | Copper Plating | Acid Copper | Solder Resist | Liquid/Dry Film Photo Imageable<br>SMOBC | VQE-01-0024 |
| Panel Size   | 12" X 18", 18" X 24"   |   |                      |                      |        |                   |         |              |      |                       |    |                      |        |                        |        |               |             |               |   |  |  |               |  |                  |                         |                |             |               |  |             |
| Max. Board Thickness   | 0.120"   |   |                      |                      |        |                   |         |              |      |                       |    |                      |        |                        |        |               |             |               |   |  |  |               |  |                  |                         |                |             |               |  |             |
| Max/Min Hole Size  | /0.010"  |   |                      |                      |        |                   |         |              |      |                       |    |                      |        |                        |        |               |             |               |   |  |  |               |  |                  |                         |                |             |               |  |             |
| Aspect Ratio   | 10:1   |   |                      |                      |        |                   |         |              |      |                       |    |                      |        |                        |        |               |             |               |   |  |  |               |  |                  |                         |                |             |               |  |             |
| Max. Number of Layers  | 16   |   |                      |                      |        |                   |         |              |      |                       |    |                      |        |                        |        |               |             |               |   |  |  |               |  |                  |                         |                |             |               |  |             |
| Min. Conductor Width   | 0.004"   |   |                      |                      |        |                   |         |              |      |                       |    |                      |        |                        |        |               |             |               |   |  |  |               |  |                  |                         |                |             |               |  |             |
| Min. Conductor Spacing   | 0.005"   |   |                      |                      |        |                   |         |              |      |                       |    |                      |        |                        |        |               |             |               |   |  |  |               |  |                  |                         |                |             |               |  |             |
| Part Mounting  | SM/THM, MIX  |   |                      |                      |        |                   |         |              |      |                       |    |                      |        |                        |        |               |             |               |   |  |  |               |  |                  |                         |                |             |               |  |             |
| Base Material  | GF (Woven E-glass Epoxy Resin)<br>GI (Woven, E-glass Polyimide Resin)      |   |                      |                      |        |                   |         |              |      |                       |    |                      |        |                        |        |               |             |               |   |  |  |               |  |                  |                         |                |             |               |  |             |
|  | IPC-FC-241/1 through /4<br>IPC-FC-241/11                                   |   |                      |                      |        |                   |         |              |      |                       |    |                      |        |                        |        |               |             |               |   |  |  |               |  |                  |                         |                |             |               |  |             |
| Finish System  | Fused SnPb<br>HASL<br>Electroplated Nickel/Gold<br>Electroless Nickel/Gold |   |                      |                      |        |                   |         |              |      |                       |    |                      |        |                        |        |               |             |               |   |  |  |               |  |                  |                         |                |             |               |  |             |
| Hole Preparation   | Plasma Desmear/Etchback  |   |                      |                      |        |                   |         |              |      |                       |    |                      |        |                        |        |               |             |               |   |  |  |               |  |                  |                         |                |             |               |  |             |
| Copper Plating   | Acid Copper  |   |                      |                      |        |                   |         |              |      |                       |    |                      |        |                        |        |               |             |               |   |  |  |               |  |                  |                         |                |             |               |  |             |
| Solder Resist  | Liquid/Dry Film Photo Imageable<br>SMOBC                                   |   |                      |                      |        |                   |         |              |      |                       |    |                      |        |                        |        |               |             |               |   |  |  |               |  |                  |                         |                |             |               |  |             |

**SECTION II**

**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

|  |                                   |   |
|--|-----------------------------------|---|
| <b>MANUFACTURER<br/>NAME &amp; ADDRESS</b><br><br>Proto Circuit, Inc.<br>7 Ascot Parkway<br>Cuyahoga Falls, OH 44223   | <b>PLANT LOCATION</b><br><br>Same | <b>CAGE CODE: 7Z463</b><br><br><b>CONTACT: Peter Menez</b><br>PHONE #: 330-572-3400<br>FAX #: 330-572-3434<br>EMAIL: menez@protocircuit.com |
| <b>CAPABILITIES BY TECHNOLOGY / ASSOCIATED SPECIFICATION:</b>  |                                   | <b>QUALIFICATION LETTER:</b>  |
| <b>MIL-PRF-31032/1</b><br><br>Panel Size                      18" X 24"<br>Max. Board Thickness          0.126"<br>Max/Min Hole Size              /0.017"<br>Aspect Ratio                      5:1<br>Max. Number of Layers        16<br>Min. Conductor Width         0.004"<br>Min. Conductor Spacing       0.004"<br>Part Mounting                    SM/THM<br>Base Material                    GF (Woven E-glass Epoxy resin)<br>Finish System                    HASL<br>Hole Preparation                Plasma Etchback<br>Copper Plating                  Acid Copper |                                   | VQE-00-0289   |

**SECTION II**

**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

|   |                                    |   |           |                      |        |                   |         |              |     |                       |    |                      |        |                        |        |               |                         |               |  |  |                  |  |                      |               |            |  |        |  |      |                  |                               |                |             |               |                                    |                            |
|---|------------------------------------|---|-----------|----------------------|--------|-------------------|---------|--------------|-----|-----------------------|----|----------------------|--------|------------------------|--------|---------------|-------------------------|---------------|--|--|------------------|--|----------------------|---------------|------------|--|--------|--|------|------------------|-------------------------------|----------------|-------------|---------------|------------------------------------|----------------------------|
| <b>MANUFACTURER<br/>NAME &amp; ADDRESS</b><br><br>Teradyne, Inc.<br>Connection Systems Division<br>MS-124<br>4 Pittsburgh Avenue<br>Nashua, New Hampshire 03062   | <b>PLANT LOCATION</b><br><br>Same  | <b>CAGE CODE: 3T000</b><br><br>CONTACT: Mark Buechner<br>PHONE #: 603-791-3832<br>FAX #: 603-791-3080<br>EMAIL:buechner.mark<br>@tcs.teradyne.com |           |                      |        |                   |         |              |     |                       |    |                      |        |                        |        |               |                         |               |  |  |                  |  |                      |               |            |  |        |  |      |                  |                               |                |             |               |                                    |                            |
| <b>CAPABILITIES BY TECHNOLOGY / ASSOCIATED SPECIFICATION:</b>   |                                    | <b>QUALIFICATION LETTER:</b>  |           |                      |        |                   |         |              |     |                       |    |                      |        |                        |        |               |                         |               |  |  |                  |  |                      |               |            |  |        |  |      |                  |                               |                |             |               |                                    |                            |
| MIL-PRF-31032/1<br>MIL-PRF-31032/2<br><br><table border="0"> <tr><td>Panel Size</td><td>24" X 36"</td></tr> <tr><td>Max. Board Thickness</td><td>0.322"</td></tr> <tr><td>Max/Min Hole Size</td><td>/0.016"</td></tr> <tr><td>Aspect Ratio</td><td>8:1</td></tr> <tr><td>Max. Number of Layers</td><td>27</td></tr> <tr><td>Min. Conductor Width</td><td>0.004"</td></tr> <tr><td>Min. Conductor Spacing</td><td>0.004"</td></tr> <tr><td>Part Mounting</td><td>THM, Compliant Pin, SMT</td></tr> <tr><td>Base Material</td><td></td></tr> <tr><td></td><td>GF (Epoxy resin)</td></tr> <tr><td></td><td>GI (Polyimide resin)</td></tr> <tr><td>Finish System</td><td>Fused SnPB</td></tr> <tr><td></td><td>Nickel</td></tr> <tr><td></td><td>Gold</td></tr> <tr><td>Hole Preparation</td><td>Permanganate Desmear/Etchback</td></tr> <tr><td>Copper Plating</td><td>Acid Copper</td></tr> <tr><td>Solder Resist</td><td>Thermal cured soldermask and SMOBC</td></tr> </table> |                                    | Panel Size  | 24" X 36" | Max. Board Thickness | 0.322" | Max/Min Hole Size | /0.016" | Aspect Ratio | 8:1 | Max. Number of Layers | 27 | Min. Conductor Width | 0.004" | Min. Conductor Spacing | 0.004" | Part Mounting | THM, Compliant Pin, SMT | Base Material |  |  | GF (Epoxy resin) |  | GI (Polyimide resin) | Finish System | Fused SnPB |  | Nickel |  | Gold | Hole Preparation | Permanganate Desmear/Etchback | Copper Plating | Acid Copper | Solder Resist | Thermal cured soldermask and SMOBC | VQE-97-0649<br>VQE-97-0721 |
| Panel Size  | 24" X 36"                          |   |           |                      |        |                   |         |              |     |                       |    |                      |        |                        |        |               |                         |               |  |  |                  |  |                      |               |            |  |        |  |      |                  |                               |                |             |               |                                    |                            |
| Max. Board Thickness  | 0.322"                             |   |           |                      |        |                   |         |              |     |                       |    |                      |        |                        |        |               |                         |               |  |  |                  |  |                      |               |            |  |        |  |      |                  |                               |                |             |               |                                    |                            |
| Max/Min Hole Size   | /0.016"                            |   |           |                      |        |                   |         |              |     |                       |    |                      |        |                        |        |               |                         |               |  |  |                  |  |                      |               |            |  |        |  |      |                  |                               |                |             |               |                                    |                            |
| Aspect Ratio  | 8:1                                |   |           |                      |        |                   |         |              |     |                       |    |                      |        |                        |        |               |                         |               |  |  |                  |  |                      |               |            |  |        |  |      |                  |                               |                |             |               |                                    |                            |
| Max. Number of Layers   | 27                                 |   |           |                      |        |                   |         |              |     |                       |    |                      |        |                        |        |               |                         |               |  |  |                  |  |                      |               |            |  |        |  |      |                  |                               |                |             |               |                                    |                            |
| Min. Conductor Width  | 0.004"                             |   |           |                      |        |                   |         |              |     |                       |    |                      |        |                        |        |               |                         |               |  |  |                  |  |                      |               |            |  |        |  |      |                  |                               |                |             |               |                                    |                            |
| Min. Conductor Spacing  | 0.004"                             |   |           |                      |        |                   |         |              |     |                       |    |                      |        |                        |        |               |                         |               |  |  |                  |  |                      |               |            |  |        |  |      |                  |                               |                |             |               |                                    |                            |
| Part Mounting   | THM, Compliant Pin, SMT            |   |           |                      |        |                   |         |              |     |                       |    |                      |        |                        |        |               |                         |               |  |  |                  |  |                      |               |            |  |        |  |      |                  |                               |                |             |               |                                    |                            |
| Base Material   |                                    |   |           |                      |        |                   |         |              |     |                       |    |                      |        |                        |        |               |                         |               |  |  |                  |  |                      |               |            |  |        |  |      |                  |                               |                |             |               |                                    |                            |
|   | GF (Epoxy resin)                   |   |           |                      |        |                   |         |              |     |                       |    |                      |        |                        |        |               |                         |               |  |  |                  |  |                      |               |            |  |        |  |      |                  |                               |                |             |               |                                    |                            |
|   | GI (Polyimide resin)               |   |           |                      |        |                   |         |              |     |                       |    |                      |        |                        |        |               |                         |               |  |  |                  |  |                      |               |            |  |        |  |      |                  |                               |                |             |               |                                    |                            |
| Finish System   | Fused SnPB                         |   |           |                      |        |                   |         |              |     |                       |    |                      |        |                        |        |               |                         |               |  |  |                  |  |                      |               |            |  |        |  |      |                  |                               |                |             |               |                                    |                            |
|   | Nickel                             |   |           |                      |        |                   |         |              |     |                       |    |                      |        |                        |        |               |                         |               |  |  |                  |  |                      |               |            |  |        |  |      |                  |                               |                |             |               |                                    |                            |
|   | Gold                               |   |           |                      |        |                   |         |              |     |                       |    |                      |        |                        |        |               |                         |               |  |  |                  |  |                      |               |            |  |        |  |      |                  |                               |                |             |               |                                    |                            |
| Hole Preparation  | Permanganate Desmear/Etchback      |   |           |                      |        |                   |         |              |     |                       |    |                      |        |                        |        |               |                         |               |  |  |                  |  |                      |               |            |  |        |  |      |                  |                               |                |             |               |                                    |                            |
| Copper Plating  | Acid Copper                        |   |           |                      |        |                   |         |              |     |                       |    |                      |        |                        |        |               |                         |               |  |  |                  |  |                      |               |            |  |        |  |      |                  |                               |                |             |               |                                    |                            |
| Solder Resist   | Thermal cured soldermask and SMOBC |   |           |                      |        |                   |         |              |     |                       |    |                      |        |                        |        |               |                         |               |  |  |                  |  |                      |               |            |  |        |  |      |                  |                               |                |             |               |                                    |                            |

**SECTION II**

**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

|   |                                   |  |
|---|-----------------------------------|--|
| <b>MANUFACTURER<br/>NAME &amp; ADDRESS</b><br><br>Tyco Printed Circuits Group<br>Austin Division<br>12501 Research Blvd., Module 1<br>Austin, TX 78759  | <b>PLANT LOCATION</b><br><br>Same | <b>CAGE CODE: 96214</b><br><br>CONTACT: Roddy Scherff<br>PHONE #: (512) 250-7538<br>FAX #: (512) 250-7010<br>EMAIL: r-scherff@raytheon.com |
| <b>CAPABILITIES BY TECHNOLOGY / ASSOCIATED SPECIFICATION:</b>   |                                   | <b>QUALIFICATION LETTER:</b>   |
| MIL-PRF-31032/1<br>MIL-PRF-31032/2<br><br>Panel Size                      18" X 24"<br>Max. Board Thickness        0.150"<br>Max/Min Hole Size            /0.010"<br>Aspect Ratio                    9:1<br>Max. Number of Layers       20<br>Min. Conductor Width        0.004"<br>Min. Conductor Spacing      0.004"<br>Part Mounting                 THM, SM<br>Base Material                 BI (Nonwoven aramid reinforced<br>polyimide resin)<br>GF (Epoxy resin)<br>GI (Polyimide resin)<br>Finish System                 Fused SnPB<br>Hot Air Solder Leveling<br>OSP<br>Nickel<br>Gold<br>Hole Preparation              Plasma Desmear/Etchback<br>Copper Plating                 Acid Copper<br>Solder Resist                 Liquid Photo Imageable (spray coated and<br>screen printed), Dry Film Photo Imageable,<br>SMOBC |                                   | VQE-97-0509<br>VQE-97-0718   |
| MIL-PRF-31032/3<br><br>Panel Size                      18" X 24"<br>Max/Min Hole Size            /0.010"<br>Aspect Ratio                    9:1<br>Min. Conductor Width        0.004"<br>Min. Conductor Spacing      0.004"<br>Part Mounting                 THM<br>Flex Base Material             IPC-FC-241/1<br>IPC-FC-241/11<br>Finish System                 Fused SnPB, HAL, OSP, Nickel, Gold<br>Immersion Silver<br>Copper Plating                 Electro-deposited Acid Copper<br>Usage                              Class A  |                                   | VQE-99-0935  |

**SECTION II**

**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

|   |  |   |           |                      |        |                   |         |              |     |                       |    |                      |            |                      |        |                        |        |               |         |                     |  |                    |                               |               |  |                |                               |               |                     |       |                                    |             |
|---|--|---|-----------|----------------------|--------|-------------------|---------|--------------|-----|-----------------------|----|----------------------|------------|----------------------|--------|------------------------|--------|---------------|---------|---------------------|--|--------------------|-------------------------------|---------------|--|----------------|-------------------------------|---------------|---------------------|-------|------------------------------------|-------------|
| <b>MANUFACTURER<br/>NAME &amp; ADDRESS</b><br><br>Tyco Printed Circuits Group<br>Austin Division<br>12501 Research Blvd., Module 1<br>Austin, TX 78759  | <b>PLANT LOCATION</b><br><br>Same                      | CAGE CODE: 96214<br><br>CONTACT: Roddy Scherff<br>PHONE #: (512) 250-7538<br>FAX #: (512) 250-7010<br>EMAIL: r-scherff@ti.com |           |                      |        |                   |         |              |     |                       |    |                      |            |                      |        |                        |        |               |         |                     |  |                    |                               |               |  |                |                               |               |                     |       |                                    |             |
| <b>CAPABILITIES BY TECHNOLOGY / ASSOCIATED SPECIFICATION:</b>   |  | <b>QUALIFICATION LETTER:</b>  |           |                      |        |                   |         |              |     |                       |    |                      |            |                      |        |                        |        |               |         |                     |  |                    |                               |               |  |                |                               |               |                     |       |                                    |             |
| MIL-PRF-31032/4<br><br><table border="0"> <tr><td>Panel Size</td><td>18" X 26"</td></tr> <tr><td>Max. Board Thickness</td><td>0.150"</td></tr> <tr><td>Max/Min Hole Size</td><td>/0.010"</td></tr> <tr><td>Aspect Ratio</td><td>9:1</td></tr> <tr><td>Max. Number of Layers</td><td>20</td></tr> <tr><td>Internal Connections</td><td>Blind Vias</td></tr> <tr><td>Min. Conductor Width</td><td>0.004"</td></tr> <tr><td>Min. Conductor Spacing</td><td>0.004"</td></tr> <tr><td>Part Mounting</td><td>THM, SM</td></tr> <tr><td>Rigid Base Material</td><td>GF (Epoxy resin)<br/>GI (Polyimide resin)</td></tr> <tr><td>Flex Base Material</td><td>IPC-FC-241/1<br/>IPC-FC-241/11</td></tr> <tr><td>Finish System</td><td>Fused SnPb, HAL, OSP, Nickel<br/>Gold, Immersion Silver</td></tr> <tr><td>Copper Plating</td><td>Electro-deposited Acid Copper</td></tr> <tr><td>Solder Resist</td><td>UV-Cured Wet Screen</td></tr> <tr><td>Usage</td><td>Class A (Flex during installation)</td></tr> </table> |  | Panel Size  | 18" X 26" | Max. Board Thickness | 0.150" | Max/Min Hole Size | /0.010" | Aspect Ratio | 9:1 | Max. Number of Layers | 20 | Internal Connections | Blind Vias | Min. Conductor Width | 0.004" | Min. Conductor Spacing | 0.004" | Part Mounting | THM, SM | Rigid Base Material | GF (Epoxy resin)<br>GI (Polyimide resin) | Flex Base Material | IPC-FC-241/1<br>IPC-FC-241/11 | Finish System | Fused SnPb, HAL, OSP, Nickel<br>Gold, Immersion Silver | Copper Plating | Electro-deposited Acid Copper | Solder Resist | UV-Cured Wet Screen | Usage | Class A (Flex during installation) | VQE-99-0933 |
| Panel Size  | 18" X 26"  |   |           |                      |        |                   |         |              |     |                       |    |                      |            |                      |        |                        |        |               |         |                     |  |                    |                               |               |  |                |                               |               |                     |       |                                    |             |
| Max. Board Thickness  | 0.150"   |   |           |                      |        |                   |         |              |     |                       |    |                      |            |                      |        |                        |        |               |         |                     |  |                    |                               |               |  |                |                               |               |                     |       |                                    |             |
| Max/Min Hole Size   | /0.010"  |   |           |                      |        |                   |         |              |     |                       |    |                      |            |                      |        |                        |        |               |         |                     |  |                    |                               |               |  |                |                               |               |                     |       |                                    |             |
| Aspect Ratio  | 9:1  |   |           |                      |        |                   |         |              |     |                       |    |                      |            |                      |        |                        |        |               |         |                     |  |                    |                               |               |  |                |                               |               |                     |       |                                    |             |
| Max. Number of Layers   | 20   |   |           |                      |        |                   |         |              |     |                       |    |                      |            |                      |        |                        |        |               |         |                     |  |                    |                               |               |  |                |                               |               |                     |       |                                    |             |
| Internal Connections  | Blind Vias   |   |           |                      |        |                   |         |              |     |                       |    |                      |            |                      |        |                        |        |               |         |                     |  |                    |                               |               |  |                |                               |               |                     |       |                                    |             |
| Min. Conductor Width  | 0.004"   |   |           |                      |        |                   |         |              |     |                       |    |                      |            |                      |        |                        |        |               |         |                     |  |                    |                               |               |  |                |                               |               |                     |       |                                    |             |
| Min. Conductor Spacing  | 0.004"   |   |           |                      |        |                   |         |              |     |                       |    |                      |            |                      |        |                        |        |               |         |                     |  |                    |                               |               |  |                |                               |               |                     |       |                                    |             |
| Part Mounting   | THM, SM  |   |           |                      |        |                   |         |              |     |                       |    |                      |            |                      |        |                        |        |               |         |                     |  |                    |                               |               |  |                |                               |               |                     |       |                                    |             |
| Rigid Base Material   | GF (Epoxy resin)<br>GI (Polyimide resin)               |   |           |                      |        |                   |         |              |     |                       |    |                      |            |                      |        |                        |        |               |         |                     |  |                    |                               |               |  |                |                               |               |                     |       |                                    |             |
| Flex Base Material  | IPC-FC-241/1<br>IPC-FC-241/11                          |   |           |                      |        |                   |         |              |     |                       |    |                      |            |                      |        |                        |        |               |         |                     |  |                    |                               |               |  |                |                               |               |                     |       |                                    |             |
| Finish System   | Fused SnPb, HAL, OSP, Nickel<br>Gold, Immersion Silver |   |           |                      |        |                   |         |              |     |                       |    |                      |            |                      |        |                        |        |               |         |                     |  |                    |                               |               |  |                |                               |               |                     |       |                                    |             |
| Copper Plating  | Electro-deposited Acid Copper                          |   |           |                      |        |                   |         |              |     |                       |    |                      |            |                      |        |                        |        |               |         |                     |  |                    |                               |               |  |                |                               |               |                     |       |                                    |             |
| Solder Resist   | UV-Cured Wet Screen                                    |   |           |                      |        |                   |         |              |     |                       |    |                      |            |                      |        |                        |        |               |         |                     |  |                    |                               |               |  |                |                               |               |                     |       |                                    |             |
| Usage   | Class A (Flex during installation)                     |   |           |                      |        |                   |         |              |     |                       |    |                      |            |                      |        |                        |        |               |         |                     |  |                    |                               |               |  |                |                               |               |                     |       |                                    |             |

**SECTION III**  
**ALPHABETICAL LIST OF QUALIFIED MANUFACTURERS**

| MANUFACTURER'S NAME & ADDRESS   | PLANT LOCATION | OTHER INFORMATION   |
|---|----------------|---|
| Accudyne, Inc.<br>5800 McHines Place<br>Raleigh, NC 27616-1839  | Same           | CAGE CODE: 1JQF6<br>CONTACT: Patrick Gardner<br>PHONE #: 919-713-4872<br>FAX #: 919-876-6385<br>EMAIL: <a href="mailto:Accuengr@mindspring.com">Accuengr@mindspring.com</a>   |
| Dynamic & Proto Circuits, Inc.<br>869 Barton Street<br>Stoney Creek, Ontario L8E 566<br>Canada                | Same           | CAGE CODE: 38898<br>CONTACT: Mr. David Foster<br>PHONE #: 905-643-9900<br>FAX #: 905-643-9911<br>EMAIL: <a href="mailto:dfoster@dapc.com">dfoster@dapc.com</a>  |
| Lockheed Martin Corp.<br>Missiles & Fire Control Orlando<br>5600 Sandlake Road<br>Orlando, FL 32819-8907      | Same           | CAGE CODE: 09205<br>CONTACT: Vijay Kumar<br>PHONE #: 407-356-0282<br>FAX #: 407-356-8291<br>EMAIL: <a href="mailto:vijay.kumar@lmco.com">vijay.kumar@lmco.com</a><br><br>CONTACT: Paul Rose<br>PHONE #: 407-356-5537<br>EMAIL: <a href="mailto:paul.b.rose@lmco.com">paul.b.rose@lmco.com</a><br>CAGE CODE: 03640 |
| Lockheed Martin Federal Systems, Inc.<br>1801 State Route 17C<br>Owego, NY 13827                              | Same           | CONTACT: Chris Conklin<br>PHONE #: 607-751-4251<br>FAX #: 607-751-7714<br>EMAIL: <a href="mailto:c.j.conklin@lmco.com">c.j.conklin@lmco.com</a>   |
| Philway Products, Inc.<br>701 Virginia Avenue<br>Ashland, OH 44806  | Same           | CAGE CODE: 21971<br>CONTACT: Ted Norris<br>PHONE #: 419-281-7777<br>FAX #: 419-289-3447<br>EMAIL: <a href="mailto:chris@philway.com">chris@philway.com</a>  |
| Printed Circuits, Inc.<br>1200 W. 96 <sup>th</sup> Street<br>Bloomington, MN 55431-2699                       | Same           | CAGE CODE: 65114<br>CONTACT: Dennis Cantwell<br>PHONE #: 612-888-7900<br>FAX #: 612-888-2719<br>EMAIL: <a href="mailto:dcant@printedcircuits.com">dcant@printedcircuits.com</a>   |
| Proto Circuit, Inc.<br>7 Ascot Parkway<br>Cuyahoga Falls, OH 44223  | Same           | CAGE CODE: 7Z463<br>CONTACT: Peter Menuez<br>PHONE #: 330-572-3400<br>FAX #: 330-572-3434<br>EMAIL: <a href="mailto:menuez@protocircuit.com">menuez@protocircuit.com</a>  |
| Teradyne, Inc.<br>Connection Systems Division<br>MS-124<br>4 Pittsburgh Avenue<br>Nashua, New Hampshire 03062 | Same           | CAGE CODE: 3T000<br>CONTACT: Mark Buechner<br>PHONE #: 603-791-3832<br>FAX #: 603-791-3080<br>EMAIL: <a href="mailto:buechner.mark@tcs.teradyne.com">buechner.mark@tcs.teradyne.com</a>   |
| Tyco Printed Circuits Group<br>Austin Division<br>12501 Research Blvd., Module 1<br>Austin, TX 78759          | Same           | CAGE CODE: 96214<br>CONTACT: Roddy Scherff<br>PHONE #: (512) 250-7538<br>FAX #: (512) 250-7010<br>EMAIL: <a href="mailto:r.scherff@tyco.com">r.scherff@tyco.com</a>   |