



DATA REQUIREMENTS AND FORMAT

**DCA Manufacturing
January 2013**

Data Requirement and Format Manufacturing Procedure

APPROVED BY: James Beard

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REVISION HISTORY

REVISION	REASON	BY
10/6/2011	Initial Issue Data Requirements for DCA Manufacturing.	James Beard
1/21/2013	Revision of corporate logo, company name usage, table contents, formatting	Dan Vogtman

DCA Manufacturing

If you please...

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TABLE OF CONTENTS

REVISION HISTORY	2
1.0 SCOPE.....	5
2.0 PURPOSE.....	5
3.0 DCA MANUFACTURING CONTACTS.....	5
4.0 DATA TRANSFER OPTIONS.....	5
5.0 DATA REQUIREMENTS	6
5.1 Bill of Material / Approved Manufacturer’s List.....	6
5.1.1 BOM Data Field Order:.....	7
5.1.2 Suggested Bill of Material Reference Designator Description	8
5.2 Electronic Data Requirements.....	8
5.2.1 Printed Circuit Board Data	8
5.2.2 Assembly and Fabrication Drawings	9
5.2.3 Schematic Files	9
5.2.4 Programmable Part Data.....	9
5.2.5 Boundary Scan Parts.....	9
5.2.6 Custom Part Specifications (ASIC, etc)	9
5.2.7 Readme	9
5.2.8 Test Specifications.....	9
5.3 Printed Circuit Board Requirements.....	9
5.3.1 Loaded Board	9
5.3.2 Bare Board.....	9
5.4 Manufacturing and Test Programming CAD Files.....	9
5.4.1 ASCII NET LIST FILE Format.....	9
5.4.2 ASCII TEST POINTS FILE Format	9
5.4.3 INSERTION FILE Format	100
APPENDIX A: SUPPORTED NATIVE ASCII CAD OUTPUT FORMATS	111
APPENDIX B: BILL OF MATERIAL EXAMPLE:	122

1.0 Scope

This document applies to all process documents sent to DCA Manufacturing, via electronic or non-electronic means, used for manufacturing, test development, or business operations.

2.0 Purpose

To provide a standard method of manufacturing data transferred between DCA Manufacturing and their customers. Process data is defined as confidential information shared between the customer and DCA Manufacturing relating to business transactions, manufacturing, test processes, and quotations.

3.0 DCA Manufacturing Contacts

The Manufacturing Engineer and the rest of your respective DCA Manufacturing Business Team are your primary contacts. If you are unable to contact your Business Team, please use the following:

DCA Manufacturing	(715) 822-5550
DCA Manufacturing FAX #:	(715) 822-5552

Manufacturing Engineer	Tony Gruber	tgruber@DCAmfg.com
Manufacturing Engineer	Jayme Schnacky	jaysch@DCAmfg.com

4.0 Data Transfer Options

(Listed in order of preference)

- If less than 10 Megabytes of data, use E-mail. If greater than 10 Megabytes of data, use FTP or www.dcamfg.com/contact/rfq - See below.
- Other: Contact DCA Manufacturing Manufacturing Engineer
- DCA Manufacturing has a public ftp site. Please contact the respective facility for log-in name and password privileges. After transmitting the files, please indicate the filename to the proper DCA Manufacturing contact for retrieval. If privacy is desired, please contact your respective Program Manager or Manufacturing Engineer in order to support a private ftp account. Files in a private ftp account are considered more secure than in a public area.

NOTE: THIS DOCUMENT IS FOR USE BY DCA MANUFACTURING CUSTOMERS ONLY. IT IS NOT CONSIDERED CONTROLLED ONCE IT LEAVES DCA MANUFACTURING FACILITY. FOR ADDITIONAL INFORMATION OR UPDATES OF THIS DOCUMENT, PLEASE REFER TO THE CONTACTS ABOVE.

5.0 Data Requirements

EST = Estimating & Quotation

MFG = Manufacturing

TEST = Test Development

MATERIAL	SECTION	PREFERRED FORMATS	EST	MFG	TEST
Bill of Material / Approved Manufacturer's List	(5.1)	Excel (.xls), .CSV, ASCII Text	●	●	●
PCB Gerber Data	(5.2.1)	RS-274X, RS-274D	●	●	●
PCB Fabrication Drawings	(5.2.1)	Gerber, Adobe (.PDF), .DWG, DXF	●	●	●
NC Drill and Tooling Data	(5.2.1)	Excellon	●	●	●
Assembly Drawings	(5.2.2)	Adobe (.PDF), .DWG, HPGL, .TIF, DXF	●	●	●
Schematics	(5.2.3)	HPGL, EDIF, .DXF, .JPG, PDF	●	●	●
Programmable Part Data	(5.2.4)	BP Microsystems Format	○	●	●
Custom Part Specifications	(5.2.6)	Adobe (.PDF), .DWG, Word (.doc), DXF	●	●	●
Readme file	(5.2.7)	ASCII Text, Word (.doc)	◐	◐	◐
Test Specifications	(5.2.8)	Word (.doc), Adobe (.PDF), ASCII Text	●	●	●
1 - Assembled "ICT/Functional" Board	(5.3.1)		◐	◐	●
Consigned Components		Excel (.xls), Word (.doc), ASCII Text	●	●	○
Customer Component Contracts		Word (.doc), ASCII Text	●	●	○
Purchased Components from Customer		Excel (.xls), Word (.doc), ASCII Text	●	●	○
Packaging Requirements		Adobe (.PDF), Word (.doc), .DWG	●	●	○
CAD file for CircuitCam import		See Appendix A	○	●	○

● = Required

◐ = Supply if available

○ = Not Required

5.1 Bill of Material / Approved Manufacturer's List

A Bill of Materials (BOM) must include: Customer Assembly number, Customer Part number, Component Type, Description, Reference Designator, Revision, Quantity, Unit of Measure, and if possible, value with positive and negative tolerances. The Approved Manufacturer's List (AML) must correlate the Customer Part # to the Manufacturer Name and MFG Part # if this information is not already contained within the BOM.

NOTE: This BOM and AML must also correlate to the insertion file (Customer part #/package identifier). See Section 5.4.3

Requirements for BOM/AML Importing format:

Electronically formatted Bill of Material's (BOM) may be electronically imported into our database system. This import supports a MS-Excel (.xls) or Comma Separated Value (.csv) ASCII format. All major spreadsheet programs can open and save files in a CSV format. For example: within MS-Excel, by choosing, "Save AS..." under the "File" Menu, you may select a CSV format within the "Save as Type" pull down list.

Additionally, each assembly, sub-assembly and line item in a BOM that is to be imported must be defined correctly with columns in the appropriate order as shown in the BOM Data Field Order (Section 5.1.1). It is imperative to accurately define the values in the proper order to assure the preservation of the imported BOM structure.

In cases when a delimited format is utilized, symbol characters or alphanumeric fields may be enclosed with double quotes on either side, and must be enclosed in double quotes if a comma is located within the character field. If there is a double quote within a character field, it should be changed to two double quotes and it will then be treated as a single quote.

There is presently a directive by the European nations to move away from lead bearing solders and other hazardous materials by July 1 2006 in most electronic assemblies. The WEEE (EC Directive on Waste Electrical and Electronic Equipment) and ROHS (EC Directive on the Restriction of the use of certain Hazardous Substances on Electrical and Electronic Equipment) groups in Europe have identified the materials and products that will be affected. Because of this, manufacturers are changing their component's material plating and/or chemicals in order to become RoHS compliant. Approximately 20% of the manufacturers are doing so without changing their part numbers. Therefore, specifying a component now requires the analysis of an added attribute. DCA Manufacturing is referring to this additional attribute as an "Environmental Restriction". In most cases when a manufacturer

does not change their part number this additional attribute will be a date code where only parts manufactured after a specific date are RoHS compliant. However, additional attributes could be the revision of the part, the lot code or in some cases it may be on oddity such as the plant of manufacture. The Bill of Materials (BOM) and its associated Approved Manufacturer List (AML) are customer owned documents that dictate what parts the Contract Manufacturer (CM) is authorized to purchase and use. Until the advent of RoHS, the manufacturer and manufacturer's part number were all that was required. With RoHS in many cases there is now a third element, "a restriction attribute". To ensure that the CM purchases RoHS compliant components, if restrictions apply to a part those restrictions must be identified by the customer. It is not sufficient to simply supply the CM with the manufacturer, the manufacturer's part number and state the component must be RoHS compliant.

5.1.1 BOM Data Field Order:

The field order and definition for an imported BOM should be as follows: NOTE: See Appendix C for a sample bill of materials.

- | | | |
|----|----------------------------------|--|
| A. | Parent Assembly: | Required field: a 15-character field that is the parent assembly of the component defined on the current line item. |
| B. | Part Number: | Required field: a 15-character field that defines the Customer Part Number. |
| C. | Revision: | Required field: A 2-character field that defines the current revision of a Part Number; I.e. PCB = A. |
| D. | Description: | Required field: a 35-character field that defines the description for the current Part Number. |
| E. | Quantity Per: | Required field: defines the quantity per the current Part number for the current parent assembly. |
| F. | Ref. Designators: | Required field: an open character field which identifies a specific location of a Part Number. I.e. R1,R2,R3 C2,C6,C9,C23 U1,U3,U6 |
| G. | Manufacturer ID: | Required field: a 35-character alphanumeric field that identifies the manufacturer. |
| H. | Manufacturer PN: | Required field: a 35-character alphanumeric field that identifies the manufacturers Part Number. |
| I. | Units of Measure: | Required field: a 2-character field that defines the unit of measure for the current Part Number; I.e. EA = each, FT = feet. |
| J. | Target Price: | Optional field: a numeric field that identifies the ceiling price. |
| K. | Std. Cost: | Optional field: a numeric field that represents a standard price for the current Part Number. |
| L. | Sub-assembly Flag: | Optional field: a flag that will be set to 1 if the current item is a sub-assembly, otherwise it should be left blank or set to 0. |
| M. | Environmental Restriction | Required field: Restrictions may be defined as a Date Code, Lot Code, or Revision. These codes are a requirement when manufacturers retain the same manufacturer's part number, which there are no distinguishing differences between the old and new part number. If the part numbers are dissimilar, this restriction will not be required. |
| N. | Comments: | Optional field: a 254-character field that identifies a long comment for the manufacturer part being imported. |

5.1.2 Suggested Bill of Material Reference Designator* Description

COMP. DESC.	REF.DES. STARTING PREFIX	COMP. DESC.	REF. DES. STARTING PREFIX	COMP. DESC.	REF. DES. STARTING PREFIX
Resistor	R	Transformer	X, T	Display	DIS
Capacitor	C	Crystal	Y, XTL	Speaker	Spk
Integrated Circuit	U	Connector	J, P	Socket	XU(IC), XQ(Trans)
Diode	D, CR	Jumper Wire	W, JMP	Battery	Bat
Transistor	Q	Voltage Reg.	VR	Switch	S, SW
Relay	K	Resistor Network	RN, R	Hardware (additional desc. i.e. screw, nut,...etc.)	Part No. or Customer description
Fuse	F	Resistor Pack	RP, U	Fiducial	FID
Inductor	L	Light Emitting Diode	LED, DS		

*Ref. Designators: Required field: an open character field which identifies a specific location of a Part Number. I.e. R1,2,3 C2,6,9,23 U1,3,6

5.2 Electronic Data Requirements

The following is a list of hard and soft data that DCA Manufacturing requires for the manufacturing and testing of PCB assemblies. This list will change periodically due to the technologies involved. Please contact your Program Manager at DCA Manufacturing to ensure that you have the latest list and to answer any assembly specific questions. Refer to Appendix A for a list of our supported PCB CAD Systems and Formats.

5.2.1 Printed Circuit Board Data

Gerber Data: Gerber Format (RS-274-X is the preferred format): Gerber is the de facto standard for photo plot data, which is based on 5 additional Numeric Control (NC) machine tool languages.

RS-274-D – This Gerber format consists of a layer file that defines X, Y coordinates to a code, (D Code) and a separate file that defines aperture definitions for the D Codes, (all layers must include D code definitions, which contain the D Code, shape and associated dimensions).

RS-274-X - Aperture definitions are embedded into the layer files. Must include signal, pwr/gnd, masking, paste, silk and internal layers. If the assembly will be panelized, a Gerber package for the panel must also be included in addition to the single up Gerber package. This package should contain either all pads & drill hole data for the entire panel or pad & drill hole data for one of the boards and include offset information to other boards within the panel.

NOTE: Make sure tooling hole information for the frame of the panel is also included within these files. Ensure solder paste layers are 1:1 with SMT pads on copper layers. DCA MANUFACTURING may modify paste layers when creating stencil artwork to accommodate gasketing of stencil to pad.

PCB Fabrication Drawings: Includes a graphical representation of the PCB Drill Chart, Layer stack up, and a detailed NOTES section which defines specific requirements and specifications needed to build the bare board. This may be displayed within either the Gerber data or the Fabrication drawings. An Adobe (.pdf) or HPGL format is preferred. Correlate layer file names (Layer 1 = layer1.lyr) in the stack up list. Dielectric thickness of each layer should also be provided.

NC drill file (include all plated and non-plated holes). A reference report must be included that lists Tool Number, Tool sizes and whether they apply to the plated or non-plated holes. If there are blind and buried vias, please include a separate drill file for this information.

Circuit board outline files (typically a NC rout file).

NOTE: Ensure all data supplied is from the customer's native PCB CAD system, not from the bare board fabrication house.

5.2.2 Assembly and Fabrication Drawings

These files must include all reference designators and measurement information for the assembly. Any special assembly instructions should be clearly noted and point to the area it pertains. The format of the files is preferred to be in Adobe .PDF, DWG, or HPGL format (1:1).

5.2.3 Schematic Files

Plot to file (HPGL format preferred) at original creation size. All off page nets must include page to page annotations.

5.2.4 Programmable Part Data

For production: JEDEC (BIN or HEX formats). BP Microsystems Formats.

For test development: Equation (source) and BSDL files.

NOTE: Depending on the part type, file requirements can vary and must be communicated through the DCA Manufacturing Engineering Department.

5.2.5 Boundary Scan Parts

Must be IEEE 1149.1 compliant BSDL (Boundary Scan Description Language) Files.

5.2.6 Custom Part Specifications (ASIC, etc)

Component data sheets must be supplied to include both electrical and mechanical data.

5.2.7 Readme

This is a clarification file from the customer that will detail parameters, formats, explanations, etc. of the assembly data that are sent to DCA Manufacturing. Specific to Gerber data, the readme file is optional only if the layer names are contained within the artwork. A text-formatted document is preferred.

5.2.8 Test Specifications

This file should contain any specific testing requirements for the given assembly. If UUT firmware contains any testing or diagnostic routines, please detail within file. A text-formatted document is preferred.

5.3 Printed Circuit Board Requirements

5.3.1 Loaded Board

Referred to as a Golden Board, or a correctly built and functional board. Manufacturing uses it for component location and polarity reference. It is mandatory that a Golden Board is provided for ICT/Functional test development (Fixture build, program debug).

5.3.2 Bare Board

5 bare/blank PCB must be included and is essential as a reference for assembly build processes and test fixture development.

5.4 Manufacturing and Test Programming CAD Files

The items listed below are specific to developing manufacturing and test programs. These items are not required if the Native PCB CAD file is provided. (Appendix A)

5.4.1 ASCII NET LIST FILE Format

Example:

NET NAME	NET	REF DES.	PIN
NET02427	C47.1	CR6.1	R5.2
NET02416	L4.1	J4.9	
NET00003	U8.81	U8.82	R1.2

5.4.2 ASCII TEST POINTS FILE Format

Included in this file is a list of all inaccessible nets. DCA Manufacturing prefers all access point features are 35 mils or larger, spaced at 100 mil from other access points and not obstructed by components or masking. Each access point not meeting the above criteria must be denoted to include explanation of the non-compliance. This file can be left out of the package for a testability analysis if one does not exist.

Example:

NET NAME	XY COORDINATES	TOP/BOT OF BOARD	POINT TYPE
----------	----------------	------------------	------------

NET02427	2.454	6.572	B	VIA
NET02416	-0.159	6.072	T	TP27
NET00003	-1.235	1.050	B	TP35

5.4.3 INSERTION FILE Format

This must list both through-hole (TH) and surface mount devices (SMT).

SMT - Centroid (X, Y) must be at center of part

TH - Datum (X, Y) must be at pin 1 of device

Example:

Customer part #	Ref Des	Board Side	X POS.	Y POS.	Package	ROTATION
123456-ABCD	R1	Bottom	2.4575	3.4989	0805	270
GLOBAL_FID	FID1	Top	2.0000	1.5000	FID_050_RND	0

NOTE: Global fiducials must be included within the insertion file and Customer part # in file must correlate to BOM

Appendix A: Supported Native ASCII CAD Output Formats

CircuitCAM Data Requirements

In order to successfully process your assemblies with our new CircuitCAM software, we will require a bill of materials (refer to Section 5.1) and one of the following groups of board design data. However, more data is always beneficial in order to cope with unforeseen file difficulties. Summary Information of Data Sources

Native CAD Data:

Accel EDA, Accel Tango, & Accel PCAD
Cadence Allegro via Aegis Script
DIF (Design Interchange Format) PADS DFT Audit, and C-Link
EE Designer III ASCII File
GenCAD v. 1.4
INCASES TL CA File
Intergraph Veribest GenCAD
IPC-D-356
Mentor Graphics Neutral File
OrCAD
PADS Power PCB, PADS Perform, PADS 2000-2007 , PADS Work
Pantheon PDB File
P-CAD PDIF Design File
P-CAD for DOS
Protel 98/99 ASCII PCB File
SCI Cards Neutral File
Supermax CAD
Tango for DOS
Ultiboard
Valor ODB++ CAD Project
Zuken Visula and Cadstar

3rd Party CIM Software Applications:

Fabmaster FATF File
Panapro / PanaCIM PCB File
Unicam Project File

Appendix C: Bill of Material Example:

Parent Assembly	Customer Part Number	Sub-Assy Flag	Qty	Description	Unit	Revision	Reference Designator	Mfg. ID	Mfg. PN	Environmental Restrictions	Comments
12345678	135799000	0	1	PCB, Fab Board	EA	B		ADVANCE CIRCUITS INC	135799000		
12345678	134567000	0	2	CAP .1uF 25V 0805 20%	EA		C1,15	KEMET CORP	C0805C104M5U AC		
12345678	134567000	0	2	CAP .1uF 25V 0805 20%	EA		C1,15	AVX CORP	08053E104MAT MA		
12345678	134567000	0	2	CAP .1uF 25V 0805 20%	EA		C1,15	MURATA ELECTRO	GRM40Z5U104M 050BD	DateCode 3205	
12345678	234188000	0	9	RES 150 OHM 1/8W 1206.5%	EA		R1,2,3,4,5,10, 12,15,21	AVX CORP	CR32-151J		
12345678	234188000	0	9	RES 150 OHM 1/8W 1206.5%	EA		R1,2,3,4,5,10, 12,15,21	CAL-CHIP ELECTRO	RM12J151	DateCode 1603	
12345678	234188000	0	9	RES 150 OHM 1/8W 1206.5%	EA		R1,2,3,4,5,10, 12,15,21	DALE VISHAY	CRCW 1206 151J		
12345678	234188000	0	9	RES 150 OHM 1/8W 1206.5%	EA		R1,2,3,4,5,10, 12,15,21	ROHM	MCR18 J151		
12345678	781427000	0	1	IC 74ALS541 OCTAL	EA		U1	PHILIPS	N74ALS541N		
12345678	781427000	0	1	IC 74ALS541 OCTAL	EA		U1	TI	SN74ALS541N		
12345678	555135000	0	1	HRDWR FRONT PANEL	EA	C		INFAB	555135000		
12345678	789654000	1	1	IC PROG DPS100P4 24PIN	EA	F1	U2	PROG	444654000		
12345678	444654000	0	1	IC UNPROG DPS100P4 24PIN	EA			ADVANCE	PALCE22V10H-25PC/4		
12345678	444654000	0	1	IC UNPROG DPS100P4 24PIN	EA			LATTICE	GAL22V10-25LP		
12345678	787432000	1	1	CABLE WIRE ASSY	EA	D	W1	WFAB	787432000		
12345678	111432000	0	1	CONN MOLEX PLASTIC 8PIN	EA			MOLEX INC	3434 6775		
12345678	888565000	0	8	WIRE 24AWG COATED RED	EA			ALPHA	#291	Lot Code 32541	
12345678	393984000	0	8	HRDWR POKELUG 24AWG	EA			MOLEX INC	8777 3421		

Note: Some cells are word wrapped only to reduce the table area.