

APPLICATION		REVISIONS			
NEXT ASSY.	USED ON	REV	DESCRIPTION	DATE	APPROVED
		K	ECN 97301	06-19-97	FRANKEL
		L	ECN 99069	02-24-99	FRANKEL
		M	ECN 00280	10-05-00	FRANKEL
		N	ECN 03143	06-23-03	RYAN
		P	ECN 05377	08-05-05	FRANKEL
		R	ECN 06285	07-06-06	SEEGAR
		T	ECN 06484	11-20-06	RYAN
		U	ECN 07035	01-19-07	SEEGAR
		V	ECN 07353	09-14-07	SANDOVAL
		W	ECN 08243	08-22-08	HOLLIDAY
		Y	ECN 100079	03-25-10	SEEGAR
		AA	ECN 100104	04-14-10	HOUSENGA
		AB	ECN 100345	10-14-10	HOUSENGA
		AC	ECN 110034	02-02-11	STEELMAN
		AD	ECO 2013-148	4-23-13	JENNINGS
		AE	ECO 2013-234	6-17-13	JENNINGS
		AF	ECO 2014-314	9-3-14	JENNINGS
		AG	ECO 2015-456	9/17/2015	JENNINGS

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REVISION STATUS OF SHEETS	REV.																					
	SHT.	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	
	REV.																					
	SHT	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	
	REV.	AG	AE	AF	AE	AG	AE	AB	AF	AF	AF	AG	AG	AG	AG	AG						
	SHT.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	

DRAWING NO. 91124-0008	PREPARED BY	DATE	Crane Electronics, Inc.																				
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	FRANKEL	06-22-89																					
MODEL NO.	CAGE CODE	DRAWING NO.	REV.	SHEET	33025 91124-0008 AG 1 of 15																		

1.0 SCOPE

1.1 Purpose

This document defines the Quality Control Codes required on all Purchase Orders and lists the required codes for each part category.

1.2 Applicability

This procedure is applicable to all purchase orders.

1.3 Supplier Notification

Upon any revision of this document, all suppliers will be notified of changes. Posting the current revision of this document to the Crane Aerospace and Electronics' website will be considered sufficient notification.

2.0 APPLICABLE DOCUMENTS

2.1 Crane Electronics, Inc. Documents

08A30520-0001	Package Specification – Etched Substrates Chip Components
07A35627	Statement of Work (Hazeltime)
63A26349-0000	Hybrid MIC Workmanship Standards

2.2 Government Documents

MIL-I-45208	Inspection System Requirements
MIL-STD-883	Test Method and Procedures for Microelectronics
MIL-PRF-55110	Printed Wiring Boards
MIL-HDBK-263	Electrostatic Discharge Handbook for Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices) METRIC
MIL-STD-1686	Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices) METRIC
MIL-P-50884	Printed Wiring, Flexible General Specification for
MIL-S-13949	Printed Wiring Board, General Specification for
MIL-PRF-38534	Hybrid Microcircuits, General Specification for
MIL-STD-1580	Destructive Physical Analysis for Space Quality Parts
MIL-DTL-5541	Chemical Conversion Coating on Aluminum Alloys
MIL-HDBK-1547	Electronic Parts, Materials, and Processes for Space and Launch Vehicles
FED-STD-209	Clean Room and Work Station Requirements Controlled Environment
FED-STD-595	Color (Requirements for Individual Color Chips (3 x 5 Supplements))

2.3 Industry Standards

ANSI/IPC A-610B	Acceptability of Printed Board Assemblies
ANSI/ASQC Q9000	Quality Systems
AS7108	NADCAP Audit Criteria for Chemical Processing
ISO 9002	Quality Management
ISO 9001	Quality Management System Requirements
AS9102	Aerospace First Article Inspection Requirements
AS9100	Quality Management System-Requirements for Aviation, Space, and Defense Organizations

3.0 QUALITY CONTROL CODES

CODE 17: Quality Management System

The Supplier shall have an established Quality Management System (QMS) that conforms to ISO9001 or AS9100. The Supplier's Quality Manual, procedures, and quality records shall be made available to Crane Electronics, Inc. for inspection, if requested.

CODE 18: Visual Inspection and Electrical Test

Supplier to certify that 100% electrical test in accordance with manufacturer's specifications, and 100% visual inspection in accordance with MIL-STD-883, Method 2010, 2017 or 2032, have been performed as applicable for Class "H" devices or approved manufacturer's workmanship standards.

CODE 19: Packaging Requirements

This order shall comply with the packaging requirements of Crane Electronics, Inc. specification 08A30520-0001.

CODE 20: First Article Inspection

The seller shall perform a First Article Inspection on Crane Electronics, Inc. controlled drawings and specifications unless otherwise specified by the Purchase Order or SOW.

First Article Inspection (FAI) shall conform to the requirements of Aerospace Standard AS9102, Aerospace First Article Inspection Requirement. The revision of this standard at the time of the purchase order applies.

In addition to the requirements of AS9102, the supplier is to be in compliance with the following paragraphs:

Specification Controlled Drawings, Off-The-Shelf, Commercial, Supplier or Supplier Item Drawings do not require a First Article Inspection, unless specifically stated on the Purchase Order.

First Article Clarifications: A documented First Article Verification is a requirement of this purchase order if:

- This order is the first to the supplier's facility or changes in manufacturing location for the part number identified on the purchase order; or if
- There is a change in drawing revisions, inspection methods, tooling, or materials with the potential of affecting form, fit, or function, a First Article Update is required for the area affected by the change only; or if
- There has been a 2-year or greater lapse in production (not applicable for Distributors); or if
- This is the first purchase order for this part number to call out First Article Verification, i.e., it is a new requirement.

Evidence of Supplier's First Article Verification documentation shall include:

- Recorded inspection and test variable data for all characteristics, requirements and parameters. The Supplier shall record all measurable characteristics (i.e., drawing dimension, tolerance, measured dimension, electrical tests, etc.), including a verification of drawing notes. If the report is not 100% complete, please explain omissions. The supplier shall forward a reproducible, signed copy of the report along with applicable material certifications (e.g., coating, paint, plating, composition, etc.) with the initial lot. Certifications are required for all items listed on the Crane Electronics, Inc. drawings or bills of material for the item or assembly purchased. Certifications for commercially available components used in the manufacture are not required to be submitted with the First Article but must be available upon request.
- Verification Quality Notes listed on the purchase order have been satisfied.
- First Article Verification Report shall include supplier name and be validated with an appropriate Quality Acceptance by stamp or signature and date of inspection. It must include purchase order number, part number, revision letter, drawing number, drawing and parts list revisions, and date code (if applicable).

The First Article sample shall have been fabricated using the same parts, materials and processes where production will be performed. A First Article shall not be performed on prototype parts unless specified by the Purchase Order.

NOTE: First Article Verification Report shall be shipped to Crane Electronics, Inc. with the deliverable lot.

NOTE: At the discretion of Crane Electronics, Inc., actual confirmation of the First Article Verification data at the supplier's plant may be required.

CODE 21: Printed Circuit Board Quality Requirements

Printed circuit board (PCB) suppliers shall have production and quality controls in place to produce PCBs that meet the requirements of IPC-A-600, IPC-A-6012 and as specified in the specific PCB drawing. Coupons, if required, for solderability testing shall be provided with each shipment. Coupons shall be from the same plating lot as the PCB's shipped.

CODE 22: Printed Circuit Board Assembly Quality Requirements

Printed circuit board assembly suppliers shall establish Electrostatic Discharge (ESD) controls in accordance with MIL-STD-1686 and MIL-HDBK-263. Workmanship Standards shall be in accordance with IPC-610 Class III, latest revision.

CODE 23: Microcircuit and Hybrid Quality Requirements

Microcircuit, hybrid module assembly workmanship, shall be controlled by the manufacturer and shall be in full compliance with Crane Electronics, Inc. Workmanship Standard 63A26349-0000. Electrostatic Discharge (ESD) controls, in accordance with MIL-STD-1686 and MIL-HDBK-263, are required.

CODE 24: Limited Life Materials

Items specified on this Purchase Order are shelf life limited and/or require temperature control. The supplier shall identify the product as applicable with the date of manufacture/temperature storage and shelf life requirements. Items shall have a minimum of 75% of the available shelf life remaining on the date of shipment to Crane Electronics, Inc.

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CODE 25: Semiconductor, GaAs and Transistor Quality Requirements

Field Effect Transistors (FET's), MMIC's, SRD's, Varactors, and Bipolar Junction Transistors (BJTs), etc. Lot Acceptance Required (LAR). Wafer lot samples for electrical and bondability evaluation (approval) are required prior to any shipments. Total sample size shall be 20, (10) for bondability evaluation testing and (10) for RF testing. Bondability samples may be visual or electrical rejects from the same wafer lot number provided the bond pads meet dimensional/mechanical requirements. If the bondability samples are rejects, they shall be separately packaged from the RF samples and shall be marked "Bondability Samples". Bonding profile and accept/reject criteria shall be per MIL-STD-883, Method 2011, and as listed below:

Bonding Profile

1. Bonds must meet the MIL-STD-883, Method 2017 Visual Criteria.
2. Westbond 7416A Thermocompression Wedgebonder

Heat Stage Temperature : 170°C ±5°C
Tip Temperature : 205°C to 215°C
Gram Force : 20 to 25 grams
Time Delay on 1st Bond : 150 to 250 msec

Tool, DeWyle Tungsten Carbide: A-1/16-L-45-F-2010T = .012

Wire: .0007" Au, .5% to 1.5% elongation

Pass/Fail Criteria

1. Pass – Wires that break at or above 2 grams that exhibit acceptable bonds.
2. Fail – Any bond wire breakage or bond lift below 2 grams.

NOTE: Failures shall require process investigation and re-sampling before acceptance.

Lot Integrity

After the initial LAT (Lot Acceptance Test), if the wafer lot integrity is maintained, LAT shall not be repeated for subsequent shipments.

CODE 26: Wafer Lot Evaluation and Approval

Wafer lot samples for evaluation (approval) are required prior to any shipments for any wafer lot not previously approved by Crane Electronics, Inc.

CODE 27: Government Source Inspection

Government Source Inspection is required prior to shipment from your plant. Upon receipt of this order, promptly furnish a copy to the government representative who normally services your plant, so appropriate planning for government inspection can be accomplished. In the event the representative or office cannot be located, notify Crane Electronics, Inc. buyer immediately. Inspection and tests by the Government at the supplier's facility does not absolve the supplier of providing acceptable product or any subsequent rejections.

CODE 28: Plating Test Coupons

Test coupons shall be processed with the plating lot and shall be submitted with the lot. All parts shall be individually wrapped.

CODE 29: Certificate-of-Conformance (C-of-C)

- The Supplier shall provide a Certificate-of-Conformance (C-of-C) for each shipment of parts or material to Crane Electronics, Inc. The C-of-C shall list the following information:
 - Crane Electronics, Inc. purchase order number
 - The Crane Electronics, Inc. part number
 - The manufacturer's unique job or lot number, date, or date code (if applicable)
 - The sub-tier supplier's unique job or lot number, if applicable.
- Crane Electronics, Inc. shall be notified of non-conforming product. Non-conforming product shall be dispositioned by Crane Electronics, Inc., Crane Electronics, Inc.'s customer and/or government, as applicable, prior to shipment.
- The supplier shall notify Crane Electronics, Inc. of changes in product and/or process definition and obtain approval prior to changes. Product or process changes include changes in manufacturing location or manufacturing changes that affect form, fit, function, or reliability.
- Records: The supplier is required to maintain manufacturing records for a minimum of five (5) years, unless otherwise specified by purchase order. These records shall be available for review by Crane Electronics, Inc., Crane Electronics, Inc. customer and/or government agencies, as applicable.

CODE 30: Source Inspection Required

Crane Electronics, Inc. Source Inspection is required. Notify buyer ten (10) days in advance of shipment date to arrange for Crane Electronics, Inc. Source Inspection. Inspection and tests by Crane Electronics, Inc. or its customer at the supplier's facility or at our facility does not absolve the supplier of providing acceptable product or any subsequent rejections.

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CODE 31: Wire Bonding Samples

Supplier shall supply ten (10) bonding samples. Visual/electrical rejects from the same wafer lot number may be used provided the bond pads meet dimensional/mechanical requirements. Bonding profile and accept/reject criteria shall be as listed below:

Bonding Profile

1. Bonds must meet the MIL-STD-883, Method 2017 Visual Criteria.
2. Westbond 7416A Thermocompression Wedgebonder

Heat Stage Temperature : 170°C ±5°C
Tip Temperature : 205°C to 215°C
Gram Force : 20 to 25 grams
Time Delay on 1st Bond : 150 to 250 msec

Tool, DeWyle Tungsten Carbide: A-1/16-L-45-F-2010T = .012

Wire: .0007" Au, .5% to 1.5% elongation

Pass/Fail Criteria

1. Pass – Wires that break at or above 2 grams that exhibit acceptable bonds.
2. Fail – Any bond wire breakage or bond lift below 2 grams.

CODE 32: Duroid Printed Circuit Board Quality Requirements

Duroid printed circuit board suppliers shall have production and quality controls that meet the requirements of MIL-P-13949 and the SCD.

CODE 33: Burrs on Machined Items

Burrs, sharp projections or excess material located on the edges or corners of parent material: Any burrs, protrusions, or excess material that is visible under 10X magnification must be removed.

CODE 34: Flex Circuit Board Quality Requirements

Flex circuit board suppliers shall have production and quality controls that meet the requirements of MIL-PRF-31023 and the SCD.

CODE 35: Substrate Testing Requirements

Substrate Testing – All substrates shall be evaluated to the requirements of MIL-PRF-38534, Table VII. With the following additional requirements:

- a. Conductor Thickness shall be performed on sides A and B.
- b. Wirebond Evaluation shall be accomplished using the following profile:

Bonding Profile

Westbond 7416A Thermocompression Wedgebonder

Heat Stage Temperature : 170°C ±5°C
Tip Temperature : 205° to 215°C
Gram Force : 20 to 25 grams
Time Delay on 1st Bond : 150 to 250 msec

Tool, DeWyle Tungsten Carbide: A-1/16-L-45-F-2010T = .012

Wire: .0007” Au, .5% to 1.5% elongation

- c. Die Shear: The die attachment material shall be either AuGe or AuSn. Objective evidence of evaluation shall accompany each shipment.

CODE 36: Circuit Card Assemblies (CCA) Quality Requirements

CCA Assemblies (Hazeltine) - Statement of Work (SOW), 35627-0000, must be provided with each order.

CODE 37: Substrates With Thin-Film Resistors

Substrates - All resistor values must be adjusted by heat treat only. Laser trim is not acceptable unless otherwise specified in the applicable SCD.

CODE 38: Plating Surface Finish and Conditioning Suppliers

If the primary Supplier utilized sub-tier suppliers for special processes, such as plating, annealing, heat treating, or painting, the primary Suppliers Certificate-of-Conformance (C-of-C) shall indicate the sub-tier supplier’s name and lot or run number. Contact the Crane Electronics, Inc. buyer for a list of approved processors.

The sub-tier suppliers performing plating, heat treating, painting or other processes shall provide a Certificate-of-Conformance (C-of-C) that list the Government, Military or Industry specification used to perform the special processing. These processes callout should exactly match the requirements of the Crane Electronics, Inc. drawing.

CODE 39: External Lead and Termination Requirements

Pure tin finish is not permitted for External Lead/Termination finish. If the final layer contains tin; it must have a minimum of 3% Lead (Pb) by weight. Hot solder dip or tin-lead (Sn/Pb) plate is acceptable.

CODE 40: Prohibited Materials

Supplier shall not furnish products containing cadmium, zinc, mercury, or pure tin, unless otherwise specified on the SCD.

CODE 41: NADCAP Plating Requirements

Plating, surface finish, or conditioning shall be performed by an approved NADCAP accredited processor in the applicable plating, surface finish, or conditioning process.

CODE 42: Calibration Quality Requirements

Certificate of Calibration shall be attached along with the equipment verifying the following:

This instrument shall be calibrated to manufacturer specifications using standards which are traceable to the National Institute of Standards and Technology (NIST) and a quality system registered to ISO9001 or AS9100.

Supporting documentation relative to traceability shall be kept on file.

CODE 43: Foreign Object Damage (FOD) Control

The supplier or sub-tier supplier shall maintain a Foreign Object (FO) Control program assuring work is accomplished in a manner preventing foreign objects, materials or debris from entering and remaining in finished housings, parts and PCB assemblies. Supplier shall provide FO Control program training to employees performing operations on Crane Electronics, Inc. products. Maintenance of the work area and control of raw materials, metal shavings, tools, clippings and parts shall mitigate the risk of FO incidents.

CODE 44: Supplier Qualification

The supplier shall maintain strict control to ensure that, after the item(s) successfully pass the supplier qualification, no changes will be made to any design, material, part, process, procedure, fixtures, machines or machine setups, tooling or test equipment, measuring or aligning; nor shall they be altered, redesigned, or replaced by any other design, material, part, process procedure, tooling or test equipment, or the items shall not be produced at a facility other than the supplier's original facility which produced the acceptable items, without prior written approval by the Buyer.

The definition of change does not include the following: editorial or administrative changes such as spelling or typographical errors, clarifications, personnel, maintenance, or equipment changes not affecting the qualified product.

CODE 45: Certificate-of-Analysis (C-of-A) Report

The supplier will include with each shipment the raw material manufacturer's Certificate-of-Analysis test report (e.g., mill test report) that states that the lot of material furnished has been tested, inspected, and found to be in compliance with the applicable material specifications. The test report will list the specifications, including revision numbers or letters, to which the material has been tested and/or inspected and the identification of the material lot to which it applies. When the material specification requires quantitative limits for chemical, mechanical, or physical properties, the test report will contain the actual test and/or inspection values obtained. For aluminum products, certifications for chemistry may indicate compliance within the allowed range. Certifications for physical properties will show actual values.

CODE 46: Supplier Access

Supplier shall provide accessibility to their facility for Crane Electronics, Inc.'s customers, as well as, their customers.

CODE 47: ESD Control

The supplier system shall have in place the requirements for an ESD control program in accordance with MIL-STD- 1686 or ANSI/ESD-S-20.20 to minimize the effects of ESD on parts, assemblies, and equipment.

CODE 48: ESD Class Zero

The supplier shall have in place the requirements and training for a "zero" ESD control plan in accordance with MIL-STD- 1686 or ANSI/ESD-S-20.20 to eliminate the effects of ESD on parts, assemblies & equipment.

CODE 49: Test/ Inspection Data

Supplier shall provide a complete set of Test/Inspection Data as recorded during acceptance test for purpose of quality analysis with each shipment.

CODE 50: Preference for Domestic Specialty Metals

This purchase order incorporates Crane Electronics, Inc. Group Purchase Order Terms and Conditions which impose requirements with which you must comply when filling this purchase order. In addition, this Purchase Order incorporates the following contract clauses (as applicable) which shall be flowed down to all of your suppliers that supply any articles delivered under this purchase order that include specialty metals.

DFARS 252.225-7008 Restriction on Acquisition of Specialty Metals

DFARS. 252.225-7009 Restriction on Acquisition of Certain Articles Containing Specialty Metals.

DFARS 252.225-7010 Commercial Derivative Military Article—Specialty Metals Compliance Certificate.

Exemptions to requirements of the above clauses may exist, as outlined in the clauses themselves or by operation of applicable Department of Defense Domestic Non-Availability Determinations (DNADs) posted on its public web site for that purpose (<http://www.dema.mil/dnad/>) if you believe an exemption(s) apply, please specify the specifics and provide Crane with documents and information sufficient to demonstrate your entitlement thereto.

CODE 51: Prevention of Fungus Growth

All components, equipment or materials used in the procurement of stated purchased items must not result in the evidence of fungus growth on any surface. This requirement must be verified by analysis and/or test. The analysis to include supplier certifications of potentially fungus nutrient materials, if supplier certifications are unavailable a representative sample of exposed coatings, cables, gaskets, and other potentially fungus nutrient materials shall be subjected to MIL-STD-810, Method 508.5.

CODE 52: Supplier Flow-Down

ALL Quality Codes listed on the Crane Electronics, Inc. Purchase Order are required to be flowed down to the Suppliers sub-tiers, when used.

CODE 53: Tooling and/or Process Controls

Supplier shall notify the Crane Electronics, Inc. buyer for any of the following occurrences:

- Use of tooling that has not been in production for 1 year or more.
- Rework, refurbishment or replacement of any portion of the tooling used to produce the Purchase Order item.
- Any manufacturing process changes that alters the configuration, composition or physical properties of the produced item.
- Post notification the buyer will advise the supplier of a need for: First piece sample, new mold, die or tooling analysis.
- Buyer acceptance does not constitute acceptance of subsequent items or relieve the supplier from any obligations in compliance with the purchase order requirements.

4.0 PURCHASE ORDER (REQUISITION) REQUIREMENTS. Unless otherwise directed by Design, Manufacturing, or Quality Engineering, the following codes are the minimum required on each Purchase Order for the type of material being purchased:

Section	Description	Codes
4.1	Electronic Components, Non-RF (Packaged, SMDs intended to be soldered): Integrated Circuits Transistors Diodes Resistors Capacitors Inductors	17, 29, 39, 40, 47
4.1.1	Electronic Components, RF (Packaged): RF Integrated Circuits (RFICs) MMICs Transistors RF Diodes Varactors PINs SRDs Mixers Detectors Etc.	17, 29, 39, 40, 47 26 (as required by Engineering)
4.2	Miscellaneous Electrical/Mechanical Items: Fasteners Washers Wire Connectors Etc.	17, 29, 40

Section	Description	Codes
4.3	Raw Material: Metal Plastic Liquids Pastes Etc.	17, 29
4.4	Plating	17, 28,29,38
4.5	Printed Circuit Boards: Subcontract Assembly Suppliers	17, 22, 39, 40, 46, 47, 52
4.6	Hybrid Modules: Subcontract Assembly Suppliers	17, 23, 29, 39, 40, 43, 46, 47, 52
4.7	Printed Circuit Boards/Printed Wiring Boards: Manufacturing of PCBs (for commodity Flex Circuits see 4.18) Rigid, Single, Double, Multi-Layer Flexible, Single, Double, Multi-Layer Rigid Flex, Single, Double, Multi-Layer	17, 21, 29, 40, 44, 46, 52, 53
4.8	Electronic Components, Non-RF (Die, Unpackaged, SMDs intended for use in hybrid assemblies): Integrated Circuits Transistors Diodes Capacitors (Mнос, MNS, MOS, etc. only)	17, 19, 29, 39, 40, 47 26 (as required by Engineering)
4.9	Electronic Components, (Die, Unpackaged, SMDs intended for use in hybrid assemblies): Resistors Capacitors (except Mнос, MNS, MOS, etc.) Inductors	17, 19, 29, 39, 40, 47 26 (as required by Engineering)
4.10	Age and/or Temperature Controlled Items: Epoxyes RTV Loctite Adhesives Etc.	17, 24, 29
4.11	Machined Parts: Housings Covers Base Plates Panels Brackets Etc.	17, 29, 33, 38, 40, 43, 44, 45, 46, 52, 53

Section	Description	Codes
4.11.1	Carriers: Kovar W-Cu Molybdenum Steel Etc.	17, 29, 33, 38, 44, 45, 46, 52, 53
4.12	Paint Shops	17, 29, 38
4.13	Substrates, Ceramic Patterned Unpatterned Alumina BeO Aluminum Nitride Quartz Sapphire Etc.	17, 19, 29, 35, 37, 46, 52, 53
4.14	Customer Source Inspection (CSI)	30
4.15	Destructive Bond Pull Samples	31
4.16	Substrates, PTFE Based Patterned Unpatterned Duroid Polyflon Rogers Arlon Etc.	17, 29, 32, 46, 52, 53
4.17	Electronic Components, RF (Die Unpackaged, SMDs intended for use in hybrid assemblies): RF Integrated Circuits (RFICs) MMICs Transistors	17, 29, 39, 40, 47 26 (as required by Engineering)
4.18	Flex circuits (Commodity)	17, 29, 39, 40
4.19	Calibration	17, 42
4.20	“R” Part (Identified by Crane for solder dipping) (Items with packaging prohibitive to solder dipping)	17, 29
4.21	Beverly/MET Reference	17, 29, 46, 47, 48, 49, 50, 51, 52, 53