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Document Title **CAL Process Specification for Soldering and Staking of Dual PIN Photodiode and Wire Cable**		

GLAST LAT

Calorimeter Process Specification for

High Reliability Soldering and Staking

of

Dual PIN Photodiode and Wire Cable

DOCUMENT APPROVAL

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CHANGE HISTORY LOG

Revision	Effective Date	Description of Changes	DCN #
1		Initial Release	

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1. PURPOSE AND SCOPE

1.1 General

This document defines the soldering procedures and acceptance criteria to be used for high reliability of hand soldering of the Dual PIN Photodiode (DPD) to Wire cable conductors.

2. REFERENCE DOCUMENTS

2.1 Military

MIL-F-14256	Flux, Soldering, Liquid (Rosin Base)
QQ-S-571	Solder, Tin Alloy, Tin Lead Alloy and Lead Alloy
MIL-S-46844	Solder Bath Soldering

2.2 NASA

NASA-STD-8739.1	NASA Technical Standard, Staking and Conformal Coating
NASA-STD-8739.3	NASA Technical Standard, Soldered Electrical Connections
NASA-STD-8739.7	NASA Technical Standard, Electrostatic Discharge Control

2.3 Other

ESA/SCC-23800	Electrostatic Discharge Sensitivity Test Method
ECSS-Q-70-08A	The Manual Soldering of High Reliability Electrical Connections
ANSI/J-STD-002	Solderability Tests for Components Leads, Terminations, Lugs, Terminals, and Wires
ANSI/J-STD-006	Requirements for Electronic Grade Solder Alloys and Fluxed and Non-Fluxed Solid Solders for Electronic Soldering Applications

3. PROCEDURE

3.1 Prerequisites

3.1.1 Personnel Certification

All personnel engaging in fabrication, assembly and inspection of Dual PIN Photodiode (DPD) and wire cable conductor to which this procedure applies shall be qualified and certified for soldering, staking, and ESD functions. Certification will consist of training and actual performance of prescribed duties under the supervision of qualified instructors. Personnel will satisfactorily demonstrate individual abilities and job proficiency to qualify. The names of all certified personnel and their training records shall be recorded and kept on file.

All personnel shall be given an eye test by an accredited eye examiner to determine their ability to meet these vision requirements. Use of prescription lenses to meet the vision requirements is permissible. When such lenses are required, the certification record shall so state and such lenses shall be used whenever soldering or inspection is being performed. When a binocular microscope, with individually adjustable eyepieces, is used for the soldering or inspection operation, prescription lenses are not required. Records (reference Appendix C) shall be recorded and kept on file.

3.1.2 Electrostatic Discharge Requirements

Electrostatic discharge (ESD) training and handling requirements shall be in accordance with NASA-STD-8739.7 or equivalent (to be approved). All operations as per this procedure require ESD precautions and handling as per NASA-STD-8739.7 or equivalent.

3.1.3 Environment

Soldering and staking operations shall be performed in an enclosed facility maintained at a slightly positive air pressure.

3.1.4 Temperature and Humidity

The temperature shall be maintained at 75 ± 9°F (24 ± 5°C) and the relative humidity shall not exceed 70 percent. When humidity decreases to a level of 30 percent or lower, electrostatic discharge sensitive devices and assemblies shall be protected using extraordinary controls, such as air ionizers, for the protection of electrostatic sensitive Dual PIN Photodiodes (DPDs) and assemblies. Work must stop until the humidity level reaches the proper level of above 30%. Temperature and humidity levels shall be monitored and recorded using a recorder

3.1.5 Workstation Cleanliness

Work areas and tools shall be maintained in a clean and orderly condition. There shall be no visible dirt, grime, grease, flux, or solder splatter, nor other contaminating foreign materials at any workstation. Eating, smoking or drinking in the work area is prohibited. Hand creams, ointments, perfumes, cosmetics and other materials unessential to the assembly operation are also prohibited at the workstation or in the work area.

3.1.6 Lighting Requirements

Light intensity shall be a minimum of 100 foot-candles (1077 Lm/M^2) on the surface used for soldering or inspection. Supplemental lighting may be used to assist these operations.

3.1.7 Solder

Solder composition (Sn 63%, Pb 37%, eutectic solder), conforming to ANSI/J-STD-006, Requirements for Electronic Grade Solder Alloys and Fluxed and Non-Fluxed Solid Solders for Electronic Soldering Applications, shall be used.

3.1.8 Flux

Rosin based fluxes shall be only type RMA (mildly activated). Liquid flux used in conjunction with core flux shall be of the same manufacturers type. Liquid flux used shall be within the shelf life expiration date.

3.2 Tooling, Equipment, and Fixtures

3.2.1 Clinching Tools

Clinching tools or clinching devices shall be of such a design and manufacture so that they will not cause damage to assembly DPD leads.

3.2.2 Lead Cutting Tools

Tools used to cut leads of DPDs and other shock-sensitive components shall not damage the leads or impart any stress (shock) to the component body or seal. Shear-type cutters or holding fixtures to absorb the shock shall be used. Diagonal, side or end cutting tools shall only be used to cut leads of DPDs, which are not sensitive to mechanical shock. Snip the surplus pin leads length off first, to make the solder joint more accessible and avoid applying a mechanical shock to the solder joint.

3.2.3 Holding Devices and Fixtures

Devices and fixtures that hold, handle or come in contact with DPD and wire cable and the assembly shall not damage, deform or degrade them. Only approved fixtures and tools shall be used.

3.2.4 Brushes

Brushes used for cleaning or applying solvents shall have medium stiff natural bristles.

3.2.5 Tweezers

Tweezers used, if required for the holding of DPD, shall be of the smooth jawed type to prevent tool marks. Material type used shall be ESD Safe. Size will be optional based upon intended use.

3.2.6 Soldering Equipment

Soldering irons, soldering machines and systems and associated process equipment (including fluxers, preheaters, solder pots, cleaning system and cleanliness test equipment) shall be of a type that does not compromise functional integrity by injecting electrical energy to the item(s) being soldered.

3.2.7 Solder Pots and Degolding of Leads

Solder pots shall be grounded and shall be capable of maintaining the solder temperature at 500 ±10°F (260 ± 5.5°C). Solder pots shall be monitored and controlled. Gold shall be removed from DPD leads by dipping the leads into a solder bath (bath 1) held at 250ºC to 280ºC for 2-3 seconds. After gold dissolution the leads shall be pre-tinned (in bath 2). During this process regular analyses of baths 1 and 2 shall be made. Alternatively the solder within these baths may be regularly replaced, (the replacing frequency shall be justified). The gold shall not exceed 1 % by weight in bath 1. Bath 2 shall not be contaminated with copper in excess of 0,25 % by weight or gold in excess of 0,2 %, the total gold plus copper not exceeding 0,3 %. Contamination with zinc, aluminum or iron shall be carefully avoided. Moreover, the following special constraints shall apply:

a. On no account shall pre-tinning be carried out in the solder, which has been used for gold dissolution.
b. Suitable thermal shunts shall be used.

The solderability of the leads shall meet ANSI/J-STD-002 requirements. For additional details on the degolding process, refer to the NASA soldering specification, NASA-STD-8739.3, and ESA soldering standard, ECSS-Q-70-08A.

3.2.8 Soldering Irons

Soldering irons shall be of the temperature controlled type, controllable within ±10°F (+5.5°C) of the pre-selected idling temperature. The size and shape of the soldering iron and tip shall permit soldering with the maximum ease and control without causing damage to adjacent areas or connections. The soldering iron or resistance heating element shall heat the connection area rapidly and maintain proper soldering temperature at the connection throughout the soldering operation. Three-wire cords and tip grounding to prevent potential greater than 2 mV RMS at the tip shall be used when soldering. The soldering iron shall be of such design as to provide zero voltage switching. Transformer type soldering guns shall not be used. Soldering equipment shall be calibrated and verified for temperature stability, tip voltage and tip resistance semiannually in accordance with Appendix B using a solder system tester. Calibration records traceable to each solder iron by model and serial number shall be maintained. A calibration sticker shall be affixed to each solder iron.

3.2.9 Soldering Iron Tips

The soldering iron tips or resistance soldering element shall be sized to the operations involved. Soldering iron tips shall be made of commercially pure copper, tellurium copper or lead copper and shall be plated or coated with another metal that prevents degradation of the tip in molten solder. Soldering iron tips must be kept clean and tinned adequately to prevent oxidation while idling. Tips must be loosened, rotated and re-tightened daily to assure consistent heat transfer from iron to tip. Tips must be replaced when oxidized or pitted.

3.2.10 Magnification Aids

Magnification aids for inspection of solder connections shall be 4x to l0x. For inspection of solder connections, magnification aids of a type that permits simultaneous viewing with both eyes shall be used. Additional magnifications may be used as necessary to resolve suspected anomalies or defects.

3.2.11 Light Sources

Light sources shall provide illumination to the solder connection area such that no shadows fall on the connection except those caused by the connection itself or the leads entering the connection.

3.2.12 Handling

DPD leads and wire cable surfaces to be soldered shall not be handled with bare hands. If the DPDs cannot be handled without touching the surface to be soldered, protective devices such as ESD safe finger cots or special tooling shall be used. Wire cable shall be handled by the insulation or protective devices such as finger cots or special tooling.

3.2.13 Cleanliness

Any unit that has been subjected to a soldering operation and will subsequently be stored prior to further processing must be thoroughly cleaned as defined herein.

3.2.14 Pre-Tinning of Dual PhotoDiodes (DPDs)

DPDs to be soldered must be pre-tinned with a solder coating (Sn 63%, Pb 37% eutectic solder) that is shiny and free of oxidation and contaminants. tinning should be performed as per paragraph 3.2.7 described herein. Tinning shall be performed using a fixture as per drawing A.1 in Appendix A.

3.2.15 Wire Cable Stress Relief

Stress relief shall be incorporated during soldering to provide freedom of movement of DPD leads and wire cable. Freedom of movement shall be sufficient to prevent detrimental stresses to the solder connection due to expansion or contraction caused by thermal variations or mechanical excursions.

3.3 Soldering Iron Preparation

1) Select a soldering iron with the appropriate temperature for the connection or tinning to be performed.
2) Check tools daily for proper condition, operation, performance, and cleanliness.
3) Prior to and periodically during use, the tip shall be checked for:
    a. Proper insertion
    b. Tight attachment
    c. Cleanliness

d. No oxidation scale between the tip and heat element
e. Proper grounding
f. Proper tip size relative to the work involved.
g. Tip temperature

4) After selecting the proper iron, allow five (5) minutes for warm-up.
5) Apply RMA flux to soldering tip, apply sufficient solder to cover the tip and wipe on the damp sponge.
6) Repeat, as necessary, to obtain clean, shiny surface on the tip.

3.4 Soldering Procedure

The final key to a successful solder joint is to apply an appropriate amount of solder. Too much solder is an unnecessary waste and may cause damage. Too little and it may not support the DPD properly, or may not fully form a working joint. How much to apply, only really comes with practice.

Steps on how to make the solder joint while using fixtures for assembly of DPD and wire cable as shown in figures A.2, A.3, and A.4 in Appendix A.

3.4.1 Wire Stripping

1) Wire Preparation – Cut a 6” length of wire using side cutters.

2) Mechanical Wire Stripping – With jaws open, place the wire in the appropriate die corresponding to the wire size being stripped. Squeeze the handles to partially cut and separate the insulation only a short distance. Slightly release the pressure on the handles. Remove the wire, close the strippers, and set the stripper down.
   - Mechanical strippers must not be operator adjustable, must be in calibration, and must not damage the wire or unstripped insulation.

3) Remove the Insulation – Holding the wire in one hand, grasp the separated portion of the insulation with the thumb and forefinger of the other hand. Remove this portion with a smooth, even motion in the direction of the lay of the wire.
   - If disturbed, the lay of the wire strands shall be restored as nearly as possible to the original.

4) Inspection – Inspect under 4x to 10x magnification.
   - Conductors and parts rejections include nicks, cuts, and crushing or charring of the insulation (slight discoloration from thermal stripping is acceptable).
   - After insulation removal, the conductor shall not be cut, nicked, stretched, or scraped leads or wires exposing base metal (except smooth impression marks resulting from bending tool holding forces).

3.4.2 Tinning of Wires Using Solder Pot

1) Clean the lay of the wire strands.

2) Check solder pot temperature – Check the temperature of the solder pot by immersing a calibrated thermometer approximately 2.5cm (1 in.) into the solder at the center of the pot. The reading should be 260°C ± 5.5°C (500°F ± 10°F).

3) Add Flux – Place type R or RMA flux on the end of the stripped wire to be tinned.

4) Remove Dross – Remove the dross from the solder surface with an approved tool.

5) Tinning – Dip the prepared wire into the molten solder within 0.5mm (0.020 in.) of the insulation. Slowly rotate the wire for no more than 5 seconds, and then slowly remove the wire from the solder.

6) Clean the wire – Clean the flux from the tinned portion of the wire with an acid brush; use the approved solvent and shopwipe.

7) Inspection – Inspect the tinned wire under 4x to 10x magnification.
   - Conductors tinning personnel shall ensure that the tinned surfaces exhibit 100% coverage. Wire strands shall be distinguishable.

8) The appearance of the solder joint surface shall be smooth, nonporous, undisturbed, and shall have a finish that may vary from satin to bright depending on the type of solder used.

3.4.3 Photodiode and Wire Cable Soldering

1) Prepare the connections
   a. Clean the wire and DPD with an acid brush, using the approved solvent and a shopwipe.
   b. Position the DPD in the approved fixture as defined in figure A.2. To bend the wire around the DPD lead, grasp the end of the stripped and tinned wire with a pair of pliers. Place the wire on the lead of the DPD. Holding the wire in place with your fingers, move the pliers to wrap the wire tightly around the lead, being aware of the proper insulation clearance.
   c. Remove the wire from the DPD lead. Using wire cutters, flush cut the bent wire so that it will only make contact with the lead from 180° minimum (1/2 turn) to less than 360° maximum, as defined in figure A.2.
   d. Hold the cut wire against the terminal to check the wrap dimension. The wire shall contact the DPD lead for the full turn for which it is cut. Recut the end of the wire as necessary.
      a. The insulation shall not be imbedded in the solder joint, and shall be less than 2 wire diameters, including insulation.

2) Position the Wire – Hold the wire during soldering. The wire is mounted on the DPD pin and shall stay in contact with the diameter. Adjust the wire for the proper tension, centering, and position.

3) Clean the Connection – Clean the connection with a soft brush, using the approved solvent and shopwipe. Do not disturb the position of the wire.

4) Cut the Solder – Cut the end of the solder to expose the flux in the core of the solder. Wipe the solder with a shopwipe and solvent to remove any contaminants.

5) Clean the Soldering Iron – Prepare the iron by wiping the tip with a dry shopwipe. Lightly wipe the tip on a slightly moist sponge to remove the oxides.

6) Position the Iron – Place a clean soldering iron tip against the DPD lead so as to contact both the wire and the DPD lead at the same time.

7) Apply Solder – Apply a small amount of solder to the junction where the wire, DPD lead, and iron meet to form a thermal (solder) bridge. Now touch the solder to the end of the cut wire to cover the exposed copper. Add solder as needed to complete the soldered connection. Remove the solder; remove the iron.

8) Tin the Iron – Tin the iron tip, while the connection is cooling at room temperature. A small amount of solder should remain on the tip. Return the iron to the holder.

9) Clean the connection – Clean the flux from the soldered connection with an acid brush, using the ethyl alcohol and shopwipe.

10) Inspect the Connection – Inspect the solder joint under 4x to 10x magnification to the specified requirements:
    a. Wire conductor bend shall be wrapped more than ½ (180°) but less the 360°.
    b. All tinned wire shall be confined to DPD lead.
    c. Wires shall be maintained in contact with the DPD lead for full curvature of the wrap and the wire ends shall not extend beyond the base of the diode.
    d. Free flux residue and other contaminants.
    e. The surface shall be smooth and nonporous.
    f. It shall be undisturbed and have a finish that may vary from satin too bright.
    g. The solder shall wet all elements of the connection.
    h. The solder shall fillet between connection elements over the complete periphery of the connection.
    i. The lead contour shall be visible.
    j. Proper insulation clearance.

11) Using the above steps, solder all four leads of the DPD using wire with different color insulation as defined in figure TBD.

3.4.4 Preloading

During the soldering operation, DPD retainment must be consistent with the principle that no preloading of the leads/solder joint is allowed. There shall be no relative motion between DPD leads and wire cable termination areas during solder application and solidification. The soldering operation must not result in the holding of DPD leads against normal spring-back forces or deforming wire cable such that resulting solder joints contain residual stresses.

3.4.5 Heat Damage

Due to the small size of wire cable, proper heat dissipation is essential. Excessive heat can damage wire cable. For this reason, soldering iron tip temperature shall not exceed 650°F (343°C). Size of the tip (heat capacity) must be selected so that fairly rapid heating is accomplished and the solder connection is made in less than five (5) seconds.

3.4.6 Flux Application

The use of external flux should be avoided. However, if external flux is required it must be applied to the surfaces to be joined prior to the application of heat. The use of excess flux should be avoided. When an external liquid flux is used in conjunction with cored flux solders, the fluxes shall be chemically compatible.

3.4.7 Solder Application

A well-tinned tip shall be applied to the joint and the solder introduced at the junction of the tip and the connection for maximum heat transfer. After applying heat and achieving heat transfer, the solder should be applied to the joint and not the soldering iron tip.

The joint should be heated with the bit for just the right amount of time - during which a short length of solder is applied to the joint. Do not use the iron to carry molten solder over to the joint. Excessive time will damage the component and perhaps the wire cable. Heat the joint with the tip of the iron, then continue heating whilst applying solder, then remove the iron and allow the joint to cool. This should take only a few seconds (no more than 5 seconds), with experience.

The shunt can be attached, if required, to the leads near to the DPDs ceramic body. Any excess heat then diverts up the heat shunt instead of into the DPD junction, thereby saving the DPD from over-heating. Beginners find them reassuring until they've gained more experience. After experience, shunt is not needed,

NOTE: Timing – it is essential that the total time-temperature cycle is enough to assure a properly wet joint, and small enough to assure that the joint is not overheated, or that heat damage to the wire cable conductor has occurred.

3.4.8 Cooling

Forced cooling shall not be used to cool solder joints. Connections shall only be cooled at room temperature.

3.4.9 Cleanliness

Without exception, all DPD leads and wire cable, including the iron tip itself, must be clean and free from contamination. Solder will not "take" to dirty DPDs. Hence, it is an absolute necessity to ensure that the DPDs are free from grease, oxidation and other contamination. After preparing the surfaces, avoid touching the DPDs afterwards if at all possible.

Another side effect of having dirty surfaces is the tendency for operators to want to apply more heat in an attempt to "force the solder to take". This will often do more harm than good because it may not be possible to burn off any contaminants anyway, and the DPD may be overheated. In the case of DPDs, temperature is quite critical and they may be harmed by applying such excessive heat.

Before using the iron to make a joint, it should be "tinned" (coated with solder) by applying a few millimeters of solder, then wiped on a damp sponge preparing it for use: you should always do this immediately with a new bit, anyway. Always re-apply a very small amount of solder again, mainly to improve the thermal contact between the iron and the joint, so that the solder flows quickly and easily.

Normal electronics grade solder is usually 67% lead - 33% tin, and it contains flux, which helps the molten solder to flow more easily over the joint. Flux removes oxides, which arise during heating, and is seen as a brown fluid bubbling away on the joint.

3.4.9.1 Cleanliness and Reliability

a. Cleaning is required during and after processing DPD assemblies. DPD assemblies shall be cleaned within a time frame of 10 minutes for appropriate removal of flux contaminants after soldering.
b. Due to tight spacing, use the clean room lint free swabs to clean the solder joint and underneath the solder joints within 10 minutes of soldering.
c. After cleaning the assemblies, the solder joints must be verified to ensure that the assemblies are free of dirt, lint, solder splash, dross, flex residue, and other ionic contamination.
d. Ultrasonic cleaning is not permissible on DPDs, since the mechanical and electrical performance of the DPDs and wire cable conductors can be damaged.

3.5 Role of the Operator

The operator has a definite effect on the manual soldering process. The operator controls the factors during soldering that determine how much of the soldering iron's heat finally goes to the connection. Besides the soldering iron configuration and the shape of the iron's tip, the operator also affects the flow of heat from the tip to the connection. The operator can vary the iron's position and the time on the connection, and pressure of the tool against the pad and DPD lead and wire cable connection. When the tip of the iron contacts the solder connection, the tip temperature decreases as thermal energy transfers from the tip to the connection. The ability of the soldering iron to maintain a consistent soldering temperature from connection to connection depends on the iron's overall ability to transfer heat as well as the operator's ability to repeat proper technique.

Two easily measured indicators in the soldering process that can determine the reliability of the solder connection are the soldering iron's tip temperature and the solder's wetting characteristics. The tip's temperature during the soldering process is an indicator of the amount of heat being transferred from the tip to the connection. The optimum rate of heat transfer occurs if the soldering iron tip temperature remains constant during the soldering process. Another indicator for determining reliability is the solder's wetting action with the DPD lead and wire conductor preparation. As operators transfer heat to the connection, this wetting characteristic can be seen visually. If the molten solder quickly wicks up the sides of the component on contact, the wetting characteristic is considered good. If the operator sees the solder is flowing or spreading quickly through or along the surface of the wire cable conductor assembly, the wetting is also characterized as good.

3.6 Solder Rework

Rework of soldered connections shall be documented prior to any rework and NRL shall be informed. Rework of soldered photodiode assembly shall be performed in accordance with the soldering requirements of this procedure.

3.7 Wire Cable Staking

3.7.1 Preparation of Wire Cable Routing for Staking

1) Route the wire cables without stressing the solder joint in the staking fixture as defined in figure A.3 for Engineering Model (EM) and A.4 for Flight Model (FM).
2) During routing the wire cable, the insulation of the wire should not be damaged. No metallic tools shall be used to route the four wires in the fixtures.
3) Inspect the routing.

3.7.2 Staking Material and Facility Requirements

1) The staking area shall have a controlled environment that limits the entry of contamination. The temperature and humidity of this area shall be monitored at 75 °F ± 9°F (25 °C ± 5°C) and relative humidity no to exceed 70%.
2) Urethene (uralane 5753 LV A/B with CASOSIL premixed from Appli-Tech Inc., MA) shall be used for staking application and must meet the following outgassing criteria:
   a. The percentage of collectable volatile condensable material (CVCM) for the substance must be less than 0.1%.
   b. The total mass loss (TML) for the substance must be less than 1% and must be approved by NASA.

   These materials shall be stored in accordance with the manufacturers specification. This is to ensure that the stated shelf life and use of material is not compromised. Proper storage usually indicates a definite temperature for a suitably scaled container.
3) Staking material storage shall be controlled by shelf life stickers attached to each material container. Staking material shall not be used if the shelf life has expired. The material

shelf life shall be as stated by the manufacturer and in accordance with the manufacturer's specifications governing the usable life of the product.

4) Records of manufacturing date, lot number, receiving date, and manufacturer's certification of compliance of each material shipment shall be maintained.
5) Material containers shall be marked in accordance with the following:
   a. Manufacturer's identification.
   b. Manufacturer's product designation.
   c. Batch number (if applicable).
   d. Storage temperature range (if applicable).
   e. Expiration date of guaranteed product life or use.
   f. Caution notes (where applicable).
6) Contact with bare hands should be avoided. Gloves or finger cots shall not generate a static charge.
7) A record of each mix batch date and procedure shall be maintained.
8) In all mixing operations, nonabsorbent plastic, glass, or metal containers and stirrers shall be used. Containers with seams and crevices that trap unmixed materials are mixed in plastic containers.
9) A witness sample shall be maintained for each mixed bath. The witness sample shall be processed at the same time and under the same conditions as the staking of the DPD assembly.

3.7.3 Staking

The main purpose for staking is to protect and support the wire cables, after forming, that may be damaged during bonding, handling, or vibration.

1) The staking material shall be applied to the parts and areas specified in the figure TBD. This material shall adhere to all surfaces to be joined.
2) Before any staking application processing can begin, mixing utensils, tools, assemblies, and working surfaces must be properly cleaned. Alcohol must be used and correct cleaning procedures for substrates must be followed, or else reliable adhesion will be compromised. All surface must be free from solder flux and other ionic, oily, or particulate contaminants.. Any trapped contaminants will interfere with the performance on the staking application and will degrade the function of the DPD assembly. After cleaning, the DPD assembly shall be thoroughly dried to remove all residual solvents and moisture. The DPD assemblies to be processed shall be kept clean and dry until processing, with the staking material, is initiated. The effectiveness of cleaning will depend on the proper execution of the approved cleaning procedure and the consistent use of fresh and residue free ethyl alcohol.
3) Caution must be taken to assure that:

a. The staking compound does not negate stress relief of wire cable and solder joints, or mechanically compromise the reliability of the DPD assembly.

b. Staking material shall be free from contamination.

4) The staking material shall be allowed to cure in accordance with the cure schedule specified for the material by the manufacturer. A tack free cure can usually be expected in a minimum of 24 hours. A complete cure at elevated temperatures (50°C) is usually expected in two (2) hours or at 85°C in one (1) hour.

5) Acceptance Criteria for Staking

a. The staking material shall adhere to the substrates’ ceramic surface.

b. The staking material shall be free from contamination.

c. Wire and solder joints shall be staked as per figure TBD.

d. The staking material shall be tack free when cured.

e. Staking material meets the hardness requirements.

4. QUALITY ASSURANCE

4.1 Inspection And Acceptance Criteria For Solder Joints

4.1.1 General

The acceptance criteria shall be based on the requirements outlined in NASA/ESA Specification, which will be the governing document. Illustrations and photographs in NASA/ESA Soldering documents and in this document shall be used to the greatest extent possible in determining acceptance or rejection of soldered connections. Soldering shall be performed in such a manner as to be uniform in quality and free from defects. Inspection shall be performed at 10x magnification to verify workmanship requirements.

4.1.2 Acceptable Solder Connections

Solder connections wire cables and DPD leads will be acceptable when characterized by the following:

1) Clean, smooth, bright, undisturbed surface.
2) Solder fillets between the DPD lead and wire cable conductor are as described and illustrated in NASA-STD-8739.3 and ECSS-Q-70-08A soldering standards.
3) Complete wetting.
4) Proper amount and distribution of solder.

4.1.3 Rejectable Solder Connections

Solder connections on wire cable and DPD assemblies will be rejected when any of the following conditions exist:

1) Charred, burned or melted insulation on flex.
2) Burns on insulation of the wire cable.
3) Discoloration, which is continuous between DPD lead and wire cable conductors.
4) Excessive solder (including peaks, icicles and bridging).
5) Flux residue, solder splatter or other foreign matter on circuitry or adjacent areas.
6) Insufficient solder.
7) Pits, holes or voids, or exposed base metal in the soldered connection.
8) Disturbed solder connection.
9) Fractured or cracked solder connection or evidence of grain structure change.
10) Cut, nicked, gouged or scraped conductors.

4.1.4 Wetting

Wetting is solder that has adhered to both surfaces of a solder connection. Dewetting is defined as a connection where the solder first wets the surfaces and back because of improper wetting, leaves behind a thin coat of solder over the base metal, then “balls up” on the surface. This condition is usually the result of improper surface and will be rejected.

4.2 Qualification

Personnel, materials and equipment to be used in the process covered by this specification shall be approved and qualified by Quality Assurance prior to production use.

4.2.1 Personnel

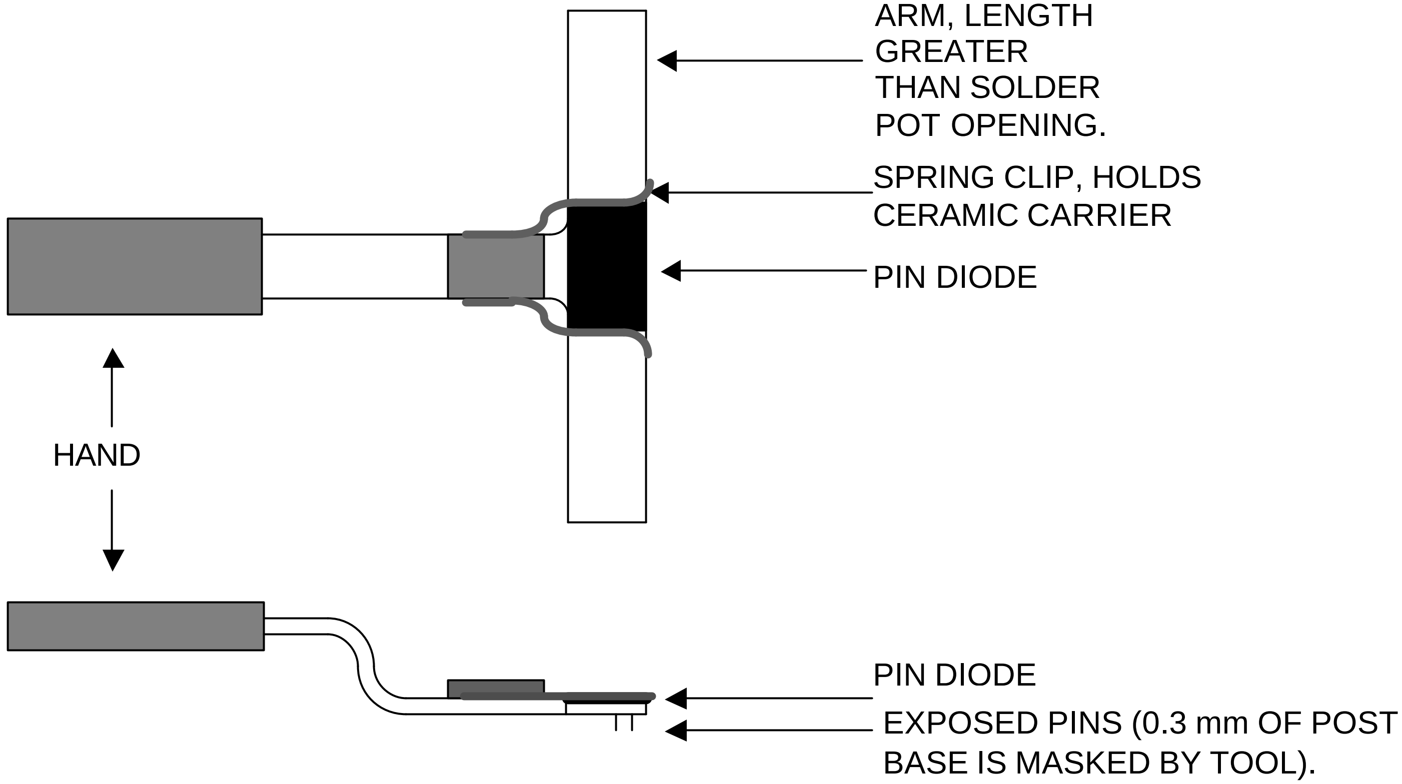
All personnel engaged in soldering, staking, and inspection shall be qualified and certified. Certification will consist of training and performing prescribed duties under supervision. Personnel well have satisfactorily demonstrated individual capabilities and job proficiency in order to be certified. Operators and inspectors will be subjected to a recertification/requalification program when efficiency deteriorates or new skills are required.

4.3 Process Controls

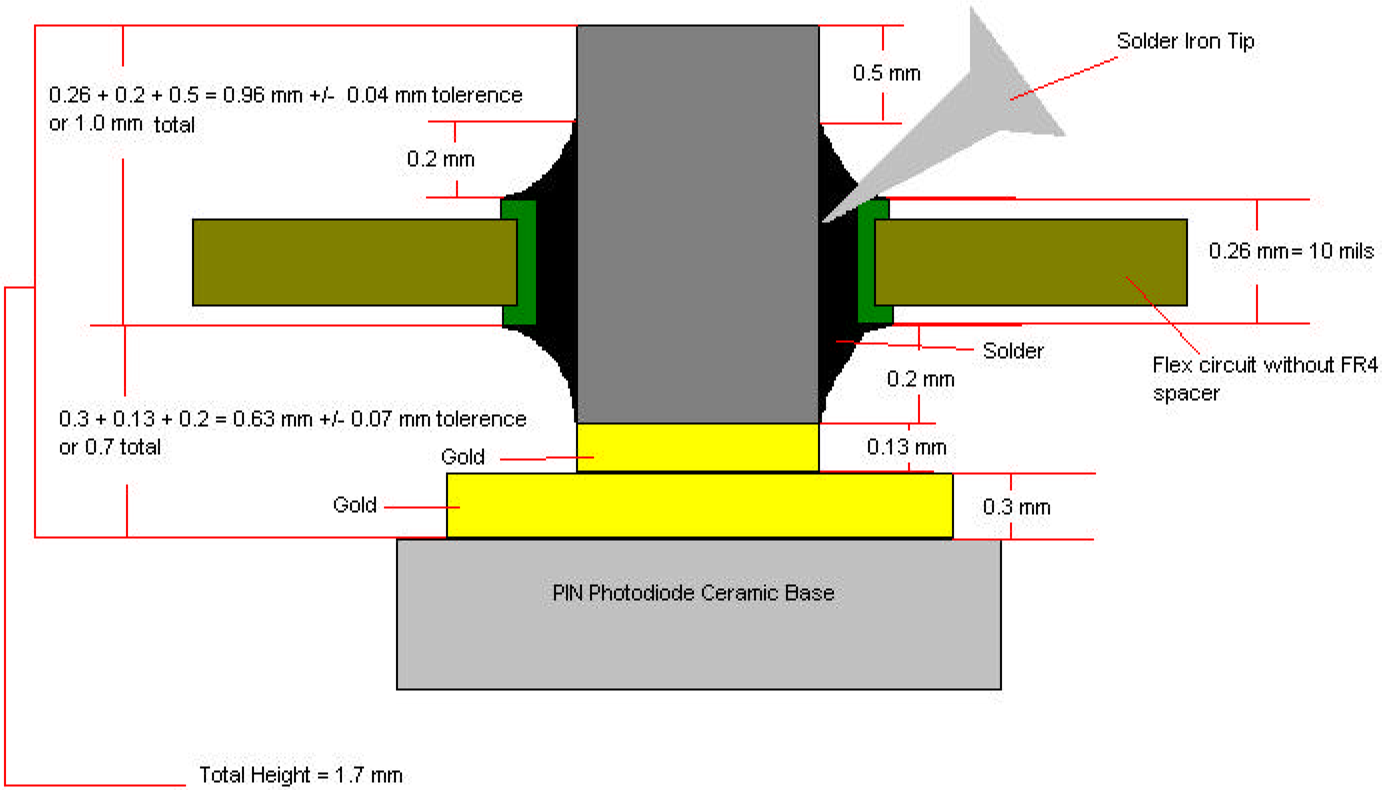
Quality improvement tools such as flow charts, cause and effect diagrams, Pareto charts, run/trend charts, histograms, control charts and scatter plots shall be used by Quality Assurance as part of a continuous process improvement program. Maintenance of adequate process controls shall be verified by monitoring quality performance and quality trends. Periodic Quality Assurance audits will assure compliance.

APPENDIX A

Solder Drawings



A.1 Dual PIN Photodiode (DPD) Gold Removal Tool for Dipping in Solder Pot



A.2. Assembly of DPD with Wire Cable Dimensions to be Maintained during Soldering Using Fixtures
(Picture needs to be modified)

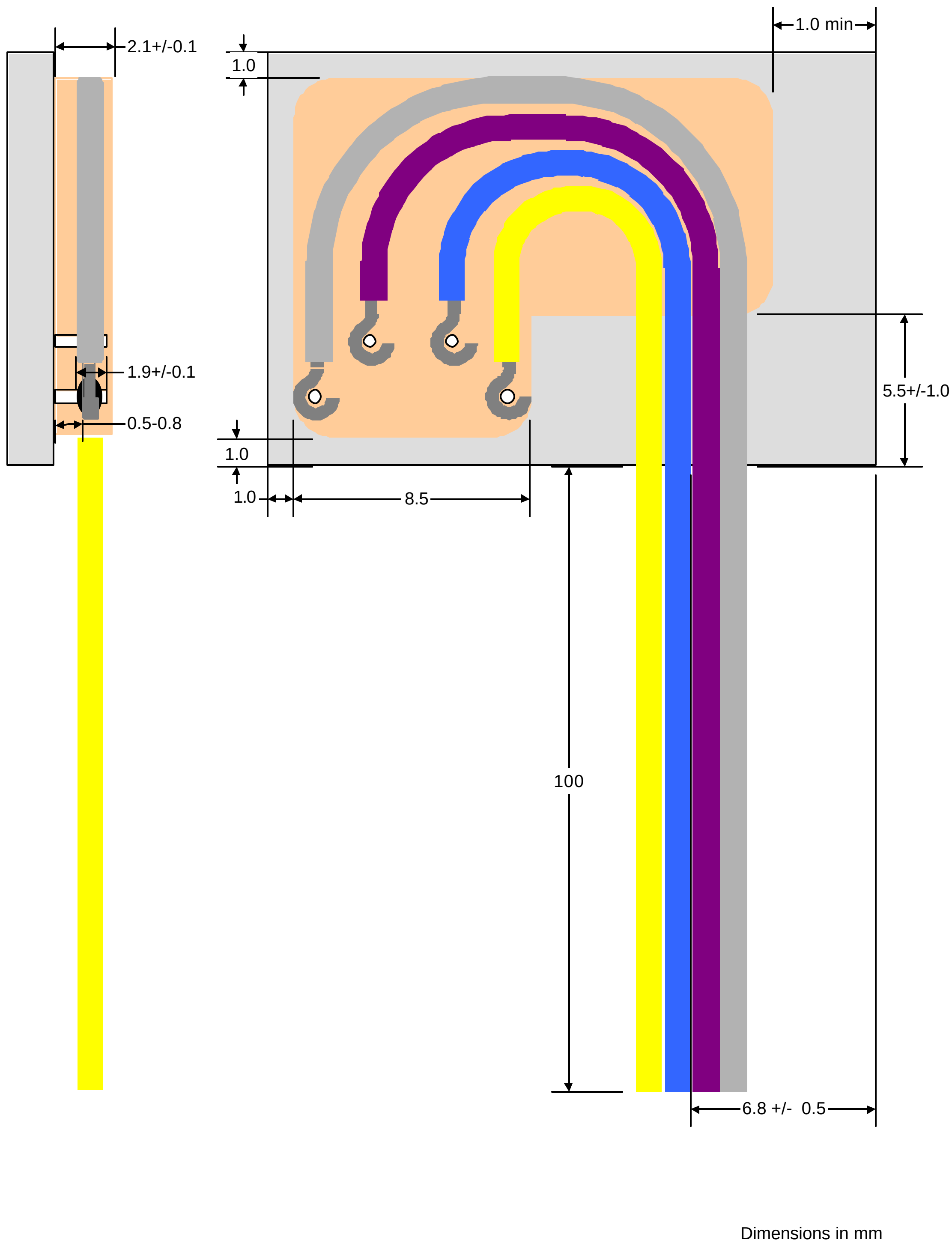


Figure A.3 EM PIN Diode Soldering/Staking Dimensions

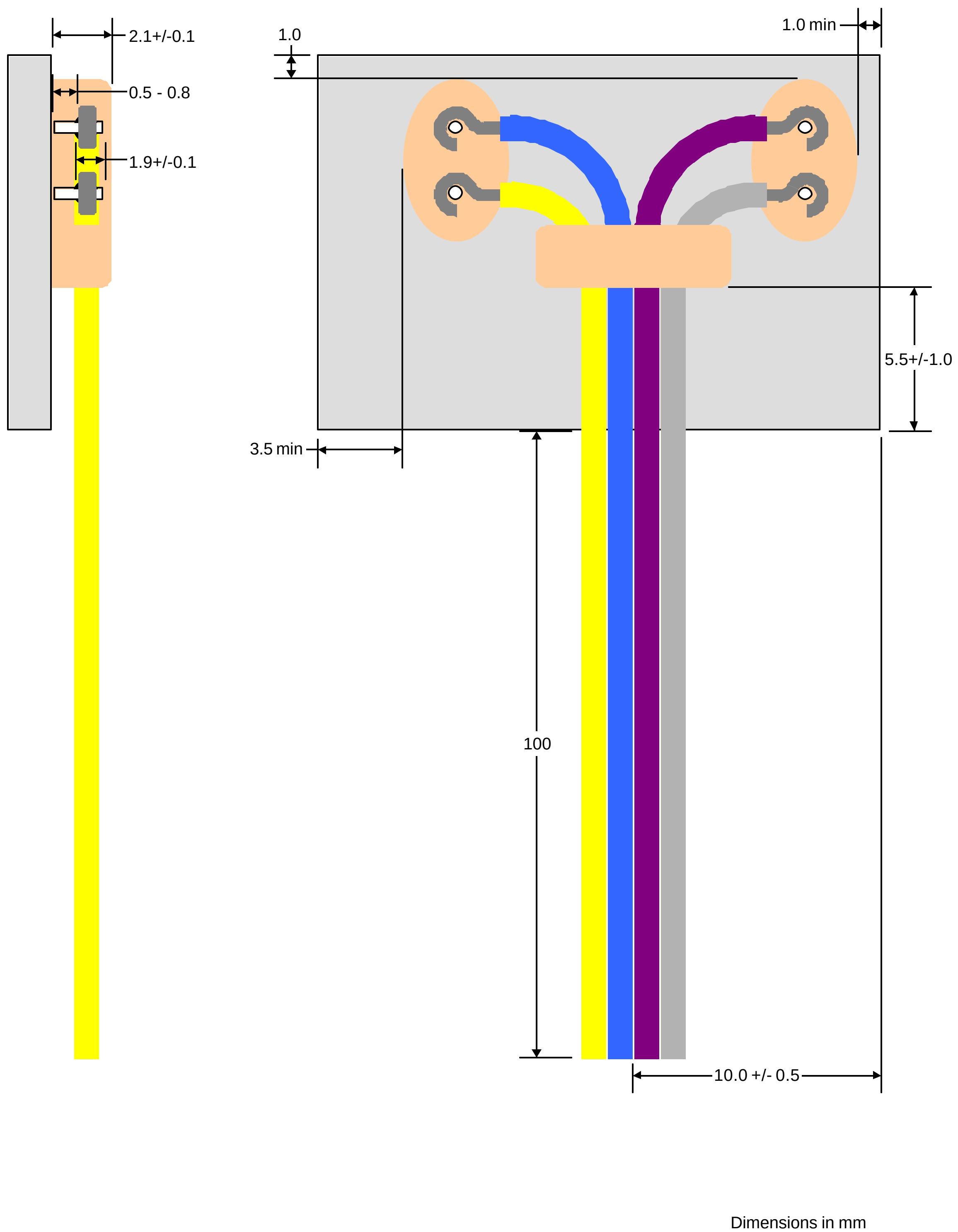


Figure A.4 Flight PIN Diode Soldering/Staking Dimensions

APPENDIX B

Solder Station Test and Calibration Record

Solder Station Test and Calibration Record

Model____________________________ S/N____________________________

Test Date	Operator	Tip Temperature 600°F ±10°F	Tip Voltage AC 2mV max (RMS)	Tip Resistance 2 Ohms max.	Results/Comments

Standard Specifications

Parameter	
Tip Temperature	Set Point ±10°F
Tip Voltage	2mV max. RMS
Tip Resistance	2 Ohms max.

Frequency of Test/Calibration: Semi-Annual

APPENDIX C

Eye Exam Record

VISUAL ACUITY EXAMINATION FOR: ______________________________

1. Far Vision: Snellen Chart 50/50, or better — RIGHT ______ LEFT ______

   _________ Pass _________ Fail

2. Near Vision: Jaeger 1 of .50 millimeter at 14 inches or better

   _________ Pass _________ Fail

3. Color Perception: Normal as determined by means of Color plates; (i.e., Dvorine, Pseduo-Isochromatic plates, Ishihara Plates or equivalent) _________ Normal _________ Fail

   Test Type: ______________________________

   Eyeglasses required for:

   _________ Far Vision

   _________ Near Vision

   _________ Not Required

This Employee is/is not visually qualified for certification for electrical soldering.

Examined By: ______________________ Date: __________