

National Radio Astronomy Observatory  
Electronics Division Technical Note

## EDTN 227

### Solders and Fluxes

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This memo gives details of the different types and uses of solders and fluxes currently used in electronics work at NRAO. It supercedes EDTN 197 (2004).

A Standard Operating Procedure covering the safety aspects of soldering<sup>1</sup> is in preparation and should be generally applicable to soldering work at NRAO.

#### Central Development Lab:

##### **1) Sn62 – used for most electronics soldering**

*Alloy:* 62% Sn, 36% Pb, 2% Ag.

*Melting point:* 179 C (eutectic).

*Manufacturer:* Kester. ([Kester 24-7150](#))

*Flux:* RMA (Rosin mildly activated).

*Cleaning:* After soldering, the joints are cleaned with acetone followed by isopropyl alcohol.

*Notes:* Used against gold plated surfaces, including ENEPIG (e.g., for space-qualified amplifiers on W-MAP spacecraft). The gold-plated surface is first tinned, then the solder is wicked off to remove scavenged gold, and then re-soldered. Also used in assembling heat straps – see note in appendix.

##### **2) Sn63Pb37**

*Alloy:* 63% Sn, 37% Pb

*Melting point:* 183 C (eutectic)

*Manufacturer:* Kester ([Kester 24-6337](#))

*Flux:* Rosin in the core.

*Cleaning:* Isopropyl alcohol.

*Note:* Because it leaches gold, this solder is not good for use against gold surfaces.

##### **3) Indalloy #2 – low-temperature solder with minimum leaching of gold**

*Alloy:* 80% In, 15% Pb, 5% Ag.

*Melting point:* 154 C liquidus, 149C solidus.

*Manufacturer:* Indium Corp. ([Indium Corp. data](#))

*Flux:* Supersafe 334 Flux ([Superior Flux and Mfg. Co.](#)).

*Cleaning:* After soldering, clean with 60 C water.

*Note:* Indalloy #2 is used for attaching Lakeshore DT-670-SD silicon diode temperature sensor chips to gold-plated connector blocks. (Previously B20E2 solder was used but this was found to create an offset in the temperature reading).

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<sup>1</sup> E Ford and T. Cotter, "Standard Operating Procedure for Soldering Procedures," NRAO Doc. 000.20.00.00.00  
0001-SOP 2021-04-16 (in preparation)..

#### **4) B20E2 – a lower-temperature solder than Indalloy #2**

*Alloy:* 52% Bi, 32% Pb, 16% Sn ("Roses Metal")

*Melting point:* 96 C (eutectic).

*Manufacturer:* Originally Alpha Metals, which is now Macdermid Emthone. Most recently BOW Electronic Solders – now Canfield Technologies, but it is not a current product.

*Flux:* Superior Supersafe #30 or Superior #334 Flux ([Superior Flux and Mfg. Co.](#)).

*Cleaning:* After soldering, clean with hot water.

*Notes:* For attaching gold wires to SIS mixer chips, B20E2 is used with Superior #334 flux which prevents damage to the circuit. Also used with Superior Supersafe #30 flux where two solders with different melting points are required on the same piece.

#### **5) Stay Brite 8 – used for lower temperature brazing**

*Alloy:* 94% Sn, 6% Ag.

*Melting point:* 279 C liquidus, 221 C solidus

*Manufacturer:* Harris Products ([Stay Brite 8](#))

*Flux:*

*Cleaning:*

#### **6) Eutectic 157 – for soldering stainless steel**

*Alloy:* 95% Sn, 5% Ag.

*Melting point:* 245 C (eutectic).

*Manufacturer:* Eutectic Corp. ([EutecRod 157](#))

*Flux:* #157 flux. Eutectic Corp. ([EutecTor 157](#))

*Cleaning:* After soldering, clean with hexane.

*Note:* Used for attaching heat straps to stainless steel waveguides and cables.

#### **7) Alternative for soldering stainless steel**

Plate the stainless steel with ~100 micro-inches of copper, then use SN62 with rosin flux as described above.

#### **8) Epotek H20E – silver-filled epoxy**

*Manufacturer:* Epoxy Technology, Inc. ([H20E](#))

*Mix ratio:* 1:1 by weight

*Curing schedule:* Recommended: 1 hour at 150 C, but alternative minimum cures are given in the data sheets: 3 hours at 80 C, or 15 min at 120 C, or 5 min at 150 C.

*Pot life:* 2.5 days.

*Shelf life:* One year at room temperature.

*Cleaning:* Isopropyl alcohol and in some applications plasma etching.

*Notes:* Used for attaching components to gold plated mixer and amplifier blocks for cryogenic operation. Extremely thorough mixing is essential, especially when used in very small amounts. A useful study of the effects of mix ratio, burn-in time, and pot age on H20E is given in Epotek technical paper #021 by Michael Dassele.

### **Green Bank Observatory:**

#### **1) Sn62 – for general purpose soldering**

*Alloy:* 62% Sn, 36% Pb, 2% Ag.

*Melting point:* 179 C (eutectic).

*Manufacturer:* Kester. ([Kester 24-7150-0027](#), [Kester 24-7150-9702](#)).

*Flux:* Rosin core.

*Cleaning:* Spray flux remover.

## **2) Sn63Pb37**

*Alloy:* 63% Sn, 37% Pb

*Melting point:* 183 C (eutectic)

*Manufacturer:* Kester (Kester 24-6337)

*Flux:* Rosin in the core.

*Cleaning:* Isopropyl alcohol, or any common flux remover

## **3) Eutectic 157 – for general brass and copper soldering** (mostly used in the GB machine shop)

*Alloy:* 95% Sn, 5% Ag.

*Melting point:* 245C (eutectic).

*Manufacturer:* Eutectic Corp. ([EutecRod 157](#))

*Flux:* Eutectic ME-157PA solder paste ([Eutectic 157-PA](#)).

*Cleaning:* Clean with soap and hot water

## **4) R276 – for surface mount work**

*Alloy:* R276 solder paste (63% Sn, 37% Pb) Mesh -325/+500

*Melting point:* 183C

*Manufacturer:* Kester ([R276 Solder Paste](#)).

*Flux:* Contained in R276 solder paste.

*Cleaning:* Spray flux remover such as Chemtronics Rosin Flux-Off ES1035 ([ES1035](#)).

## **5) Indalloy 204 – for attaching MMICs to gold plated conductors**

*Alloy:* 70% In, 30% Pb.

*Melting point:* liquidus 175 C, solidus 165 C

*Manufacturer:* Indium Corp. ([Indium Corp. data](#))

*Flux:* Contained in NC-SMQ80 solder paste.

*Cleaning:* Alcohol or spray flux remover.

## **6) Indalloy 290 – lower strength for attaching MMICs to gold plated conductors**

*Alloy:* 97% In, 3% Ag.

*Melting point:* 143 C (eutectic).

*Manufacturer:* Indium Corp. ([Indium Corp. data](#))

*Flux:* Contained in NC-SMQ80 solder paste.

*Cleaning:* Alcohol or spray flux remover.

## **7) ME1020XFC – for stainless-steel soldering**

*Alloy:* High silver brazing alloy.

*Melting point:* liquidus 651 C, solidus 618 C.

*Manufacturer:* Eutectic Corp., ([eutecrod-xuper-1020-xfc](#)).

*Flux:* Eutectic ME-157PA solder paste ([EutecTor 157](#))

*Cleaning:* Clean with soap and hot water

*Note:* Mostly used on stainless steel vacuum fittings in GB shop and cryogenics lab).

## **8) Epotek H20E – silver-filled epoxy**

*Manufacturer:* Epoxy Technology, Inc. ([H20E](#))

*Mix ratio:* 1:1 by weight

*Curing schedule:* Recommended: 1 hour at 150 C, but alternative minimum cures are given in the data sheets: 3 hours at 80 C, or 15 min at 120 C, or 5 min at 150 C.

*Pot life:* 2.5 days.

*Shelf life:* One year at room temperature.

*Cleaning:* Isopropyl alcohol and in some applications plasma etching.

*Notes:* Used for attaching components to gold plated mixer and amplifier blocks for cryogenic operation. Extremely thorough mixing is essential, especially when used in very small amounts. A useful study of the effects of mix ratio, burn-in time, and pot age on H20E is given in Epotek technical paper #021 by Michael Dassele.

### **VLA:**

#### **1) SN62 – used for most Front End electronics soldering**

Alloy: 62% Sn, 36% Pb, 2% Ag.

Melting point: 179 C (eutectic).

Manufacturer: Kester. ([Kester 24-7150](#))

Flux: RMA (Rosin mildly activated).

Cleaning: After soldering, the joints are cleaned with acetone followed by isopropyl alcohol.

Notes: Generally used by Front End group on assemblies.

#### **2) SN63PB37 – for larger and general purpose soldering**

Alloy: 63% Sn, 37% Pb.

Melting point: 183 C (eutectic).

Manufacturer: Kester. ([Kester 24-6337](#))

Flux: Rosin (in the core).

Cleaning: Isopropyl alcohol, acetone.

Note: Can be used for rework.

#### **3) SolderPlus 63RMA-A – solder paste for syringe & pneumatic dispenser**

Alloy: 63% Sn, 37% Pb.

Melting point: 183C, eutectic

Manufacturer: Nordson - EFD ([Nordson Guide](#))

Flux: RMA (in the paste)

Cleaning: isopropyl alcohol

Notes: Can be used for rework. Adequate only for large packages.

#### **4) EPO-TEK H20E – silver filled epoxy**

*Manufacturer:* Epoxy Technology, Inc. ([H20E](#)).

*Mix ratio:* 1:1 by weight

*Curing schedule:* Recommended: 1 hour at 150 C, but alternative minimum cures are given in the data sheets: 3 hours at 80 C, or 15 min at 120 C, or 5 min at 150 C.

*Pot life:* 2.5 days.

*Shelf life:* One year at room temperature.

*Cleaning:* Isopropyl alcohol and in some applications plasma etching.

*Notes:* Used for attaching components to gold plated mixer and amplifier blocks for cryogenic operation. Extremely thorough mixing is essential, especially when used in very small amounts. A useful study of the effects of mix ratio, burn-in time, and pot age on H20E is given in Epotek technical paper #021 by Michael Dassele.

### **Appendix: References and other notes:**

Wikipedia has a useful list of solder alloys: [https://en.wikipedia.org/wiki/Solder\\_alloys](https://en.wikipedia.org/wiki/Solder_alloys)

[Indium Corp.](#) has tables of solders, fluxes, and material compatibility. In particular:

<https://www.indium.com/technical-documents/product-data-sheets/download/3365/>

<https://www.indium.com/technical-documents/application-notes/download/10/>

***Sn62 at 4 K:*** There has been some concern over using a solder for a thermal connection at a temperature below its superconducting transition temperature. In a 2006 correspondence with Harvey Moseley (NASA-GSFC) concerning the use of the Sn62 eutectic alloy (62% Sn, 36% Pb, 2% Ag) for attaching heat straps in 4-K applications, he said that, with a superconducting transition temperature about 6.5 K, it will have lost only a few of its electrons at 4.2 K, so its thermal conductivity should be high. For much lower temperatures, there are silver alloys that remain normal down below 50 mK, but that should not be relevant at 4.2 K.