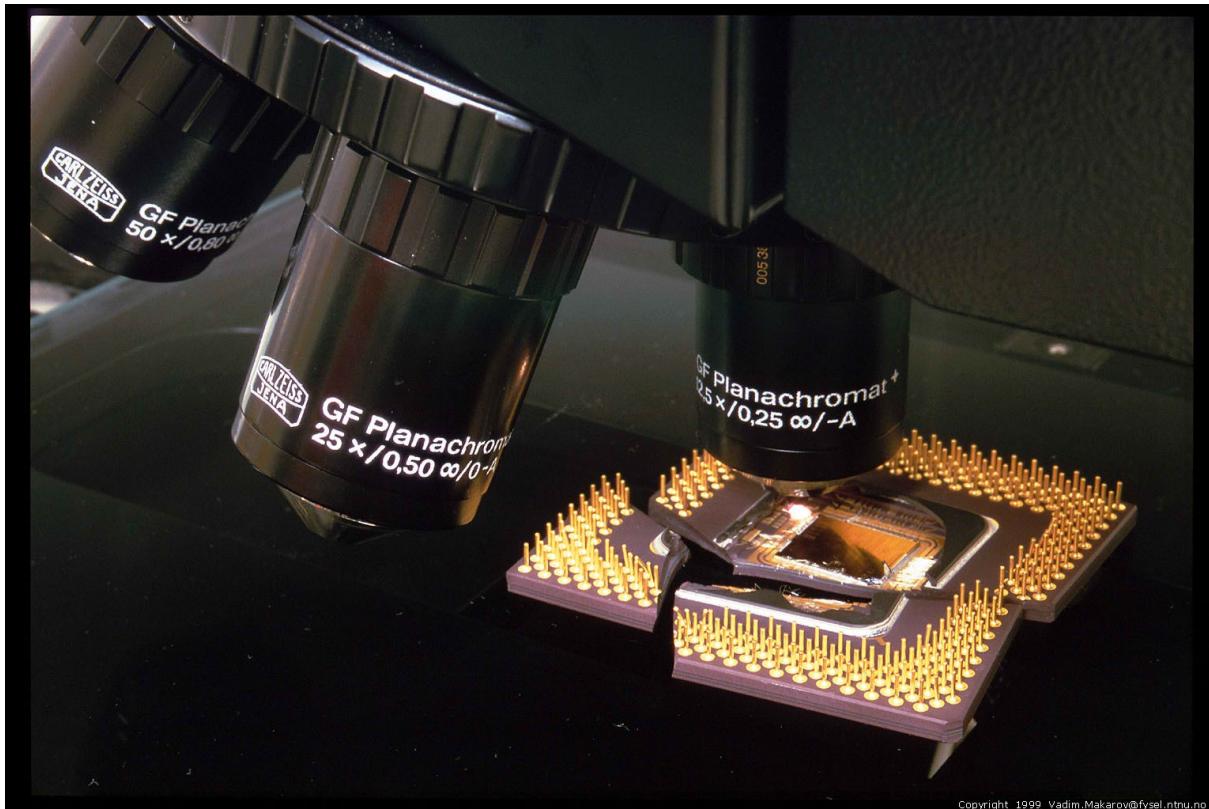
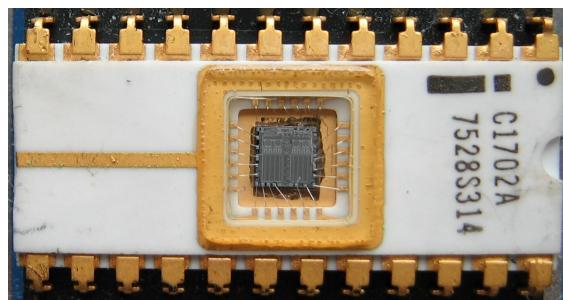


eScrap Refiner's Gold Mining Guide



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Drafted by REWR, Aug. 7, 2012 (Rev. 0.7). © 2012, REWR.
Credits: eScrap Recycling Community @ <http://goldrefiningforum.com>

THIS DOCUMENT WILL ALWAYS STAY FREE.

Feedback: info@rewr.org

AUTHOR'S WARNING:

The yield data of precious metals (PM) present in this document is provided for reference purposes only. The author's pledge is to keep the data as precise as possible, but each individual's results may vary, depending on skills, techniques of PM recovery and condition of raw material used. Please report any data discrepancy you may find here-within, and your individual yields to complement this document.

When making a decision for fail-safe purchase of eScrap material, good rule of thumb is to divide presumed amount of expected PM yield in half and time it by average gold price (per gram) for last 30 days. This will assure you do not lose invested money (in worst case scenario) and still make profit in the end of your day.

Gold Rich CPU's Yield Values & Other Components' Gold

VERY HIGH* YEILD CPU's – Have 0.25 gram or more per piece.

HIGH* YEILD CPU's – Have from 0.05 gram up to 0.25 gram per piece.

LOW* YEILD CPU's – Have under 0.05 gram per piece.

VERY HIGH YEILD CPU's (CERAMIC)

NEC (server chip - R10000) - 0.27 g per CPU

Toshiba (server chip) - 0.27 g per CPU

AMD K5 - 0.4 g per CPU (0.5 g is pretty much speculated)

Pentium Pro (the holy grail of scammers) – 0.3 up to

0.5 g per CPU (1 g per CPU figure is speculated by "eBay scrap gold advocates"). Yield values differ depending on manufacturing plant & CPU's cache size.

Cyrix 586 - 0.25 g per CPU

Cyrix 6x86-P166+GP 133MHz - 0.22 g per CPU

IBM 686 PR200 - 0.25 g per CPU

Original **Intel Pentium** 60Mhz - 90Mhz 0.48 g per CPU

Alpha DEC (large square, not smaller round heatsink) - 0.38 g Ag / 0.34 g Au per CPU



HIGH YEILD CPU's (CERAMIC)

Cyrix 486 - 0.11 g per CPU

IBM 586 - 0.1 g per CPU

IBM Blue Lightning DX2 486-V580 gA – 0.11 g per CPU

Texas Instruments 486 - 0.1 g per CPU

Intel 486SX - 0.1 g - per CPU

i486 TX 486DLC - 0.12 g per CPU

Cyrix 686 - 0.21 g per CPU

Cyrix MII - 0.18 g per CPU

Winchip - 0.17 g per CPU

Intel 486 DX4 - 0.19 g per CPU

Intel 486 + DX2 - 0.20 g per CPU

Intel I960 - 0.16 g per CPU

AMD 486 - 0.12 g per CPU

AMD K6 - 0.11 g per CPU

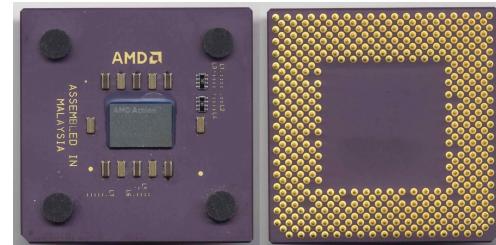
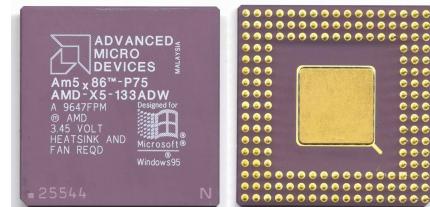
AMD Athlon-B 900MHz - 0.11 g per CPU

Intel Pentium & MMX - 0.12 g per CPU

Intel Pentium MMX - 0.12 g per CPU

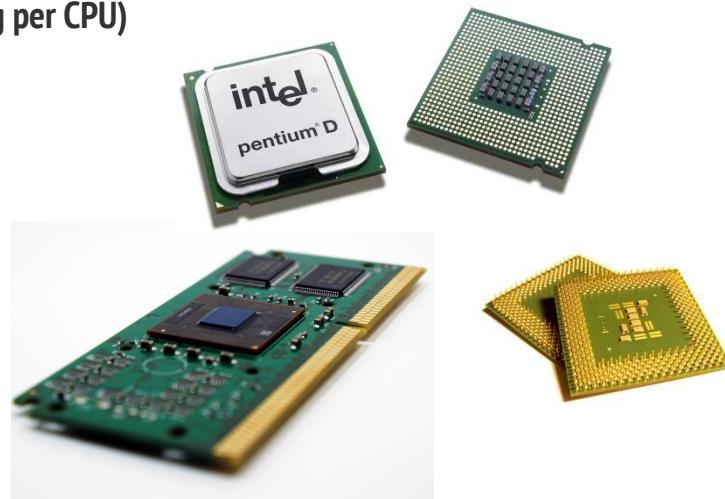
AMD (brown fiber) - 0.06 g per CPU (speculated)

AMD (early green fiber) - 0.08 g per CPU (speculated)



LOW YEILD CPU'S (FIBRE – less than 0.05 g per CPU)

Intel Pentium 1 MMX - black fibre
Celeron - black fibre
Celeron - green fibre
Celeron - slot one
Pentium 2 - slot one
Pentium 3 - slot one
Pentium 3 – all types
Pentium 4 - all types
Intel Core – all types
Intel Core 2 Duo – all types
Intel i3, i5, i7 – all types



* – Gold extraction values deeply depend on recovery techniques used, etc. One of the most neglected processes are crashing (milling) of ceramics in ball or hammer mill (stone crusher), and fine grinding of fibre CPUs (can be easily ground in Blendtec Blender) to get hold of hardly accessible gold in CPU's housing. **Fibre CPU's contain so little of precious metals that these are worthless to refine.**

NOTE: CPUs contain not just gold, but silver in the solder / tin, platinum (mostly fibre CPUs), and palladium. These should be tested for and precipitated if detected in AR solution. MLCCs (chip capacitors & capacitor arrays) on fibre CPUs and some ceramics contain palladium and silver.

NET WEIGHTS OF CPU's

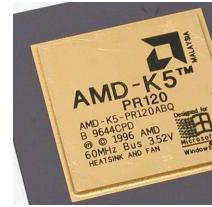
4 g - 24-pin socket IC (ceramic)	30 g - Intel Pentium (ceramic)
7 g - 24-pin socket Eprom (ceramic)	20 g - Intel Pentium (plastic)
7 g - 40-pin socket IC (ceramic)	89 g - Intel Pentium Pro (gold top)
24 g - AMD 486	42 g - Intel Celeron SEPP slot package (bare card - NO cache)
23 g - AMD K6 & K6-2	43 g - Intel Celeron SEPP slot package (bare card - with cache)
18 g - AMD Duron / Athlon (ceramic socket A)	153 g - Intel Pentium II SECC1 slot package (bare cartridge - NO heatsink)
11 g - AMD Duron / Athlon / (plastic socket A)	53 g - Intel Pentium III SECC2 slot package (bare cartridge - NO heatsink)
149 g - AMD Athlon (slot A cartridge only)	9 g - Intel Pentium III / Celeron (PPGA 370)
330 g - AMD Athlon (slot A passive heatsink)	23 g - Intel Pentium III / Celeron (PPGA 370 Taulatin)
41 g - AMD Athlon XP / Sempron /..... (AM / AM2 socket)	24 g - Intel Pentium IV (423 socket)
42 g - Cyrix MII (gold top)	19 g - Intel Pentium IV / Celeron (478 socket)
35 g - HP PA-Risc 7100/7150	22 g - Intel Pentium IV / Pentium D /(775 socket)
43 g - IBM 6x86L (gold top)	29 g - Intel Xeon (Prestonia)
25 g - IBM 6x86MX (brown top)	59 g - Intel Xeon (Gallatin MP)
29 g - IDT WinChip C6	23 g - Intel Xeon (Nocona, Irwindale)
24 g - Intel i960 (ceramic)	14 g - Motorola 68020 (ceramic)
16 g - Intel 386 (ceramic)	7 g - Motorola 68881 (ceramic)
10 g - Intel 387 (ceramic)	137 g - NEC mainframe CPU (rectangular ceramic, square gold top)
24 g - Intel 486 (ceramic)	35 g - VIA / Cyrix C3 (ceramic, gold top)
44 g - Intel 486 Overdrive	
36 g - Intel Pentium 60/66 (ceramic - Socket 4)	
61 g - Intel Pentium 60/66 (gold top - Socket 4)	
73 g - Intel Pentium Overdrive (including HS & fan)	
48 g - Intel Pentium 75, 90... (gold top - socket 5/7)	

Note: ALL masses rounded up to next nearest gram , without any heat sinks.

Ceramic CPU Lids (Gold plated, assorted):

Up to 1ozt / lb of gold plated old make lids.

- Example calculation: 81 various lids = 133.83 g of lids = 124 square inches. These yield 3.03 g of Au. That is 0.0374 g of Au per lid, or 22.64 g of Au / Kg



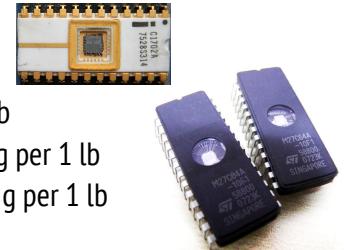
Gold inside Ceramic EPROM chips (Vintage Ceramic EPROM chips)

Gold plated legs (gold inside the windows, no gold plated caps) - 2-3 g per 1 lb

Gold plated legs (gold inside the windows, with gold plated caps) - 2-4 g per 1 lb

Tin (or Silver) plated legs (gold inside the windows, no gold plated caps) - 0.5-2 g per 1 lb

Tin (or Silver) plated legs (gold inside the windows, with gold plated caps) - 2-3 g per 1 lb



Gold inside chips (plastic black, flatpacks - not CPU)

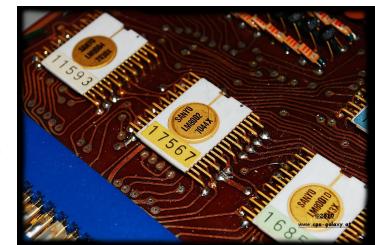
low yield - rectangular chips with legs/pins on two sides, EPROM like plastic/resin type (less than 1 g per kg)



middle yield - all square and rectangular with pins on all 4 sides and 2 sides pin chips from RAM (1-4 g per kg)



high yield - flatpacks (black top parts mostly) from south and north bridge BGA type chips from motherboards and video cards (over 5 g per kg)



highest yield - all square and rectangular (metal & white/blue ceramics mostly) with gold plated pins and top/bottom Au lids on all 4 sides and 2 sides pin chips, i.e. vintage military grade, USSR military/telecommunications IC's (over 6g per kg).

Hybrid IC's (Hybrid Integrated Circuits, SMD & TH packaging)

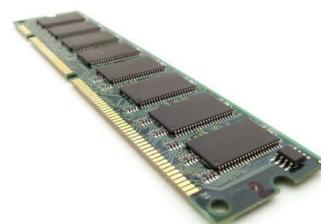
Hybrid IC's come in many shapes and sizes – in plastic, ceramic, metal (gold plated) and epoxy packages. These may contain gold, platinum, palladium and silver. Any combination of these IC's will yield different results.



RAM Modules (DIMM, SDRAM, etc.)

Raw weight of gold plated fingers, fully assembled RAM sticks – 0.6-0.9 g / 100 sticks. IC's on the RAM modules contain precious metals as well and should be processed with other plastic IC's such as flatpacks.

RAM Sticks with tin plated fingers will yield precious metals from IC's only.



Fingers (from RAM Sticks, AGP, ISA, PCI Cards)

11-15 lbs of close cut fingers that are plated on both sides should return at least 1 ozt gold.

- 28.35 gms of gold = 4.5359237 kg of RAM fingers.
- 1 g of fingers = 0.006 g of gold.
- So if you have 100 g of fingers, then it should yield 0.6 g of 24K gold.

All other fingers types average between 1.5-2 g / lb.

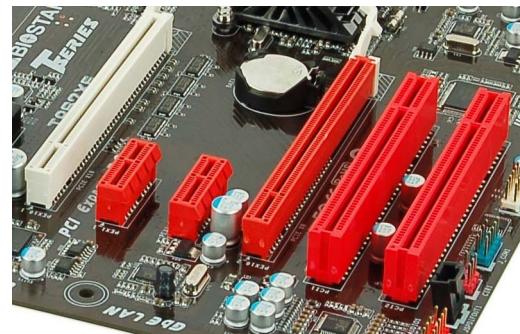
- 40 lbs of PCI boards roughly yield 2.5 lbs of fingers (average .06188 per 1 lb of boards). A 600 lbs gay-lord (huge cardboard skid box on 4'x4' pallet) should yield 37.13 lbs of fingers. That being converted into gold - $74.26 \text{ g} / 31.1 = 2.395 \text{ ozt}$.



Gold Plated Pins (CPU Socket Pins, Test Pins, Jumper Pins, Jumpers, Connector Pins, etc.)

There are many types of gold plated pins.

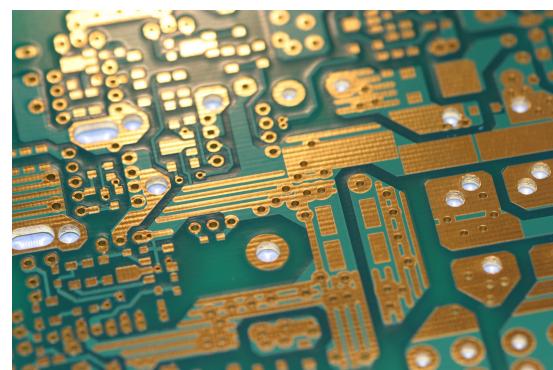
Mostly used are DB connectors, high frequency antenna connectors, test pins, jumper pins, thru hole IDE interface connectors, extension card slots (ISA, PCI, AGP, PCI-X, PCI-E, RAM module sockets, etc.). These average between 2-6 g per lb of pins. Yield values highly depend on plating processes used, full or partial plating such as flashing (lowest yield) of ISA and PCI slots, etc.



Gold Plated PCB's (Military Grade PCB's, Vintage PCB's, Communication Equipment PCB's, Cell Phone PCB's)

Depending on plating coverage, quantity of conductive layers, application and recovery method may yield between 0.5-4 g of gold per lb.

Military and Communication equipment PCB's will yield the highest amount of gold.



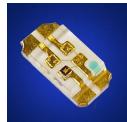
Chip Cards (GSM Cards, Payphone Cards, Sat-TV Cards, Banking Cards, etc.)

Today's ID-on-Chip Technology features broad range of Chip Cards, such as Payphone Cards, GSM Cell Phone Cards, Satellite TV Subscription Cards, Banking Debit and Credit Cards, Security ID Cards, etc. These Plastic cards implement nano-tech Security IC's mounted on a flexi-PCB that is gold plated on both sides with thick layer high Karat gold (in most cases). The chip parts of the plastic cards are easily peeled off and processed, and should yield very high amount of gold – somewhere between 6 and 12 g per lb of clean peeled off flexi-PCB's. *No real yield results are known yet.*



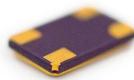
SMD LEDs

SMD LED's yield up to 2,4% Gold by its raw weight (no solder included in the weight). Yield rates vary depending on LED Manufacturer.



Ceramic Crystals aka Resonators (SMD)

Ceramic SMD Resonators can be harvested from any high frequency operated PCB's (mostly cell phones PCB's, telecommunication equipment, military circuit boards) and may yield over 2 g of gold per lb.



Palladium in Monolithic Capacitors (MLCCs)

Palladium (mainly), Silver and occasionally Platinum / Gold – 2 -2.5% per mass weight (clean, no solder). Depending on manufacturing year up to 1992 only 70-75% in the whole batch would contain precious metals – 15-25 g / kg



Tantalum Capacitors Scrap (electrolytic caps)

There are many flavors of tantalum capacitors both in thru hole or SMD packaging. These scrap capacitors sell for \$100-180/lb. Good to collect them and sell to a refiner!!!



SMD Resistors

SMD resistors & SMD resistor arrays are a nice small source of Silver and Palladium for patient people!



ECMs (cars, trucks, semi's with OBD type interface)

ECM's aka ECU's (Engine ECM, Transmission ECM, etc.) are hybrid CPU's that control your vehicle's engine, interact with sensors and so on. These yield good amount of gold, silver, palladium and platinum. ECM's casing is made out of Aluminum alloys – can be sold to base metals recyclers.



Cell Phones (without batteries)

10 lbs of cell phones scrap yields between 0.6 and 1.8 g of Gold (older cell phones models yield the most)

RECYCLING SCRAP VS DIGGING HOLES



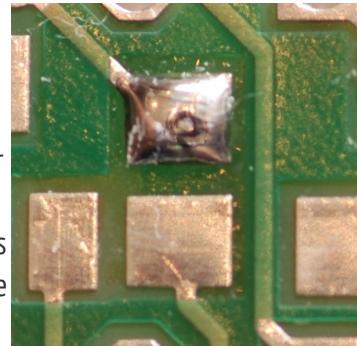
Other Important Things to Consider While Hunting

Definition of word “consider” in Oxford’s Dictionary:

think carefully about (something), typically before making a decision.

Solder Silver (from salvaged PCB's)

Solder is a “must use” element in assembled Printed Circuit Boards where hundreds or even thousands of electronics components reside. Nowadays most high quality PCB's (i.e. military, telecommunication applications, high-end computing/server systems) are soldered with Pb-Free solder that contains silver as an antioxidant, heat distributing/dissipating, and tension resistant agent. Applications, requiring high-temperature operation or for first assembly of items which must not become unsoldered during subsequent operations, often involve the use of silver enriched solder.



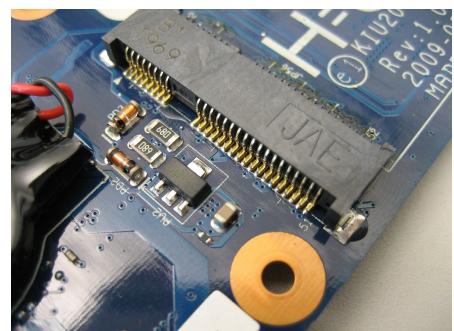
Alloying silver with other metals changes the melting point, adhesion and wetting characteristics, and tensile strength. Of all the brazing alloys, silver solders have the greatest strength and the broadest applications in majority of high-end vintage and modern electronics.

Most electronics components' tinned contacts/pins contain certain amount of Silver and/or Palladium on them. While the components are soldered at the stage of PCB assembly, most of silver is absorbed (transferred into) by the solder used in the soldering process. From this we may conclude that 99% of salvaged PCB's do contain silver in solder joints and can be recovered for a fraction of its cost.

When dismantling various PCB's, in order to recover electronics components for their value of precious metals, we often neglect so widely accessible source of Silver – used solder. It is very easy to recover vast amounts of solder from salvaged PCB's (using heat gun and spatula) for further recovery, reuse or “scrap silver solder” sale to a refinery.

Neglected Gold (from salvaged PCB's)

Many eScrap Recovery enthusiasts use fastest and most brutal methods of disconnecting gold plated components from PCB's, simply cutting off the components of interest with nippers or a chisel, while forgetting that about **10% of gold** content is left in solder joints where parts of cut off pins still reside.



Massive unsoldering (most efficient collection) of all components with a heat gun or a propane torch (with solder collecting off the PCB to follow) will ensure that most of precious metals are recovered from any type of PCB's (unless some are gold plated :)) in a form of electronics components to be sorted and processed properly.

Being diligent in proper dismantling of PCB's we decrease hazardous waste (fruit of our so called eWaste recycling) and increase our NET profits.

LAST, BUT NOT THE LEAST: SAFETY, SAFETY, SAFETY

FOREWORD: Wondering why safety issue is gonna be discussed on this page, but not on the first one? You've already answered the question. And now, its time to talk about safety... yours... mine... everyone's around you... public.

**IN NEXT REVISIONS OF THIS DOCUMENT WILL BE ADDED A BUNCH OF INFO
ON THE MOST IMPORTANT SUBJECT OF PERSONAL AND PUBLIC SAFETY,
SO BE PREPARED... FOR A SERIOUS TALK, BUDDY!**

WEIGHT MEASURES & PRECIOUS METALS PURITY SYSTEMS

Weight (Mass)

1 ozt (Troy ounce) = 31.1034768 grams

1 ozt (Troy ounce) = 1.09714 oz

1 oz (ounce) = 28.3495 grams or 0.0283495 kilogram

1 oz (ounce) = 0.91146 Troy ounce

1 g (gram) = 0.03215 ozt

1 g (gram) = 0.035274 oz

1 g (gram) = 0.001 kg

1 lb (pound) = 0.45359237 kilogram or 453.59237 grams

1 lb (pound) = 16 oz

1 lb (pound) = 14.5832224562 ozt (Troy)

1 kg (kilogram) = 2.20462 lbs

1 kg (kilogram) = 35.274 oz

1 kg (kilogram) = 32.1507 ozt (Troy)



Gold Purity (British Karat Standard)

The karat system is used to reveal the amount of pure gold found in an item. Only gold purity is measured by karat system.

- 24 karat (24K) gold is pure gold.
- 18 karat (18K) gold contains 18 parts gold and 6 parts another metal or metals, making it 75% gold.
- 14 karat (14K) gold contains 14 parts gold and 10 parts another metal or metals, making it 58.3% gold.
- 10 karat (10K) gold contains 10 parts gold and 14 parts another metal or metals, making it 41.7% gold. 10k gold is the minimum karat designation that can still be called gold in the US.



Precious Metals Purity – Gold, Platinum, Silver (Russian Standard)

- 375 assay – 9 parts of PM and 15 parts of another metals in the alloy, making it 37.5% of PM.
- 500 assay – 12 parts of PM and 12 parts of another metals in the alloy, making it 50.0% of PM.
- 583 assay – 14 parts of PM and 10 parts of another metals in the alloy, making it 58.3% of PM.
- 750 assay – 18 parts of PM and 6 parts of another metals in the alloy, making it 75.0% of PM.
- 875 assay – 21 parts of PM and 3 parts of another metals in the alloy, making it 87.5% of PM.
- 958 assay – 23 parts of PM and 1 parts of another metals in the alloy, making it 95.8% of PM.
- 999 assay – 24 parts of PM and 0 parts of another metals, making it pure 99.9% of PM.

Conversion of lower Karat Gold into 24K of Gold (applicable to other precious metals)

1. First we must convert Karat system into metric one, dividing Karat assay of metal alloy by 24, and then multiply by 1000.

- For example, 18K of gold equates into the following: $(18/24) \times 1000 = 750$ metric assay (75% gold purity) of precious metal.

2. Then we can figure out Troy ounce portion of 24K pure precious metal based on the previous Karat equation:
(Troy ounce portion x metric assay) / 1000 = pure precious metal portion in reference to 1 Troy ounce.

- For example, we have 4 Troy ounces of 18K Gold that equals to 750 metric assay. The equation will look like this: $(4 \times 750) / 1000 = 3.0$ Troy ounces of pure 24K gold.
- Then we can further convert Troy ounce portion into grams or standard ounces for our convenience:
Troy ounce portion x 31.1034768 = X grams (i.e. $3 \text{ ozt} \times 31.1034768 = 93.3104304$ grams), or
Troy ounce portion x 1.09714 = X ounces (i.e. $3 \text{ ozt} \times 1.09714 = 3.29142$ ounces).

TO BE CONTINUED ...

DO YOU HAVE ANYTHING SPECIAL TO ADD HERE?
SEND IT TO INFO@REWR.ORG