

Fitness Guidelines for Federal Reserve Notes

Federal Reserve System
Cash Product Office (CPO)

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1 Introduction

The Federal Reserve uses detection equipment in its high-speed, currency processing operations to verify the acceptability of Federal Reserve Note (FRN) deposits for redistribution to the depository institutions and, subsequently, to the public. The Federal Reserve defines fit and unfit currency in Operating Circular # 2. Fit currency is defined as: “a note that is suitable for continued circulation and is sufficiently clean to allow its genuineness and denomination to be readily ascertained;” and unfit currency is defined as: “a note that is not suitable for further circulation because of its physical condition, such as torn, dirty, limp, worn or defaced.” This document is intended to more precisely define what is considered by the Federal Reserve to be fit and unfit notes. Banks and other depository institutions may use this document to facilitate conversations with equipment manufacturers, third party service providers and branch operations concerning the Federal Reserve’s Recirculation Policy. An FRN is acceptable for redistribution if it meets the following criteria:

- Is genuine, not a counterfeit note;
- Is a series-design approved for recirculation (old series-design notes are considered unfit after a certain period of time in circulation);
- Is free from excessive holes, tears, tape or missing or folded note portions and has acceptable area dimensions;
- Has uniform brightness and is free from excessive soiling;
- Is free from excessive print wear, particularly in the portrait area;
- Is free from excessive graffiti.

All of the fitness measurements are evaluated against fit/unfit parameters individually. An FRN must fail at least one fitness measurement to be considered unfit. Conversely, if an FRN marginally passes multiple fitness measurements the FRN is still considered fit.

This document describes the criteria that the Federal Reserve uses to determine the fitness of FRNs. Pictures have been included for reference purposes for twenties and tens in accordance with the Recirculation Policy.

2 FRN Surface Quality

2.1 Soiling

Soiling is a measure of the loss of reflectivity from the unprinted areas and the subtle background printing of the 2004 series design, on the portrait side and reverse side of an FRN. This includes soiling due to dirt, aging (yellowing), wear and extraneous markings. The soil level is a measure of the average amount of soiling on the portrait and reverse side of FRNs. When the amount of soiling on an FRN equals or exceeds the measurement criteria listed in the chart in Section 2.4 the FRN is considered unfit.

2.2 Ink Wear

Ink Wear is a measure of the improper reflectivity of the printed areas on the portrait side of an FRN. This includes ink wear due to aging, excessive folding wear and other wearing. Ink Wear level is determined by the percentage of printed pixels that are more than 2 percent reflectance lighter than the nominal reflective value. The ink wear level is a measure of the average amount of ink wear on the portrait side of the FRN. When the amount of ink wear on an FRN equals or exceeds the measurement criteria listed in the chart in Section 2.4 the FRN is considered unfit.

2.3 Graffiti

Graffiti is defined as visible markings greater than 9 mm² that have a contrast level of 10 percent darker as compared with the surrounding area. Graffiti and stains are detected in both printed and unprinted areas and on both the portrait side and reverse side of FRNs. When the amount of graffiti or stain on an FRN equals or exceeds the measurement criteria listed in the chart in Section 2.4 the FRN is considered unfit.

2.4 Surface Fitness Measurement Criteria Chart

Unfit Measurement Criteria

Currency	Soil Level Front	Soil Level Back	Ink Wear Front	Ink Wear Back	Graffiti Front	Graffiti Back
	L - value	L - value	% Worn Pixels	% Worn Pixels	sq mm	sq mm
\$1	< 84.30	< 83.38	≥ 25%	≥ 25%	≥ 40	≥ 40
\$5 Series 2006	< 77.44	< 79.32	≥ 25%	≥ 25%	≥ 40	≥ 40
\$10 Series 2004	< 79.14	< 80.89	≥ 25%	≥ 25%	≥ 40	≥ 40
\$20 Series 2004	< 77.43	< 75.35	≥ 25%	≥ 25%	≥ 40	≥ 40

3 FRN Substrate Defects

3.1 Length, Width, Tears, Corners and Tape

A genuine Federal Reserve note is considered unfit for redistribution if it has any one of these measured defects:

- length < 151mm (with greater than 50% of the note present)
- width < 63mm (with greater than 50% of the note present)
- total holes area > 15mm², includes open tears on the short edges (the hole areas are additive)
- total tear depth > 3mm, along the long edges (tears with a minimum length of 2mm and a minimum width of 2mm are detectable, the tear depths are additive)
- at least one missing corner > 72mm² (missing corners with a minimum area of 26mm² and a minimum horizontal or vertical dimension of 5mm are detectable)
- at least one folded corner > 182mm² or 4 folded corners regardless of area (folded corners with a minimum area of 26mm² and a minimum horizontal or vertical dimension of 5mm are detectable)
- tape length > 9mm, with minimum thickness of 0.05mm (this is the length along the long dimension of the note, a specific width along the short edge dimension is not used)

4 Older Series Designs

The Federal Reserve may determine that older series-designs of FRNs are unfit for circulation and destroy them when processed. The following is a list of all series-designs by denomination that are considered unfit no matter their physical condition:

\$ 20	Before 2004 series
\$ 10	Before 2004 series
\$ 5	Before 2006 series

5 FIT/Unfit Note Images

The following images represent Federal Reserve Notes that are fit and unfit. The pictures in this document are intended for visual and reference purposes only. Because of variances in electronic and hard copy appearances of these pictures, densitometer values cannot be accurately reproduced.

5.1 \$20: Soil Level Front & Back



Fit



Fit



Marginally Fit



Marginally Fit



Marginally Unfit



Marginally Unfit



Unfit



Unfit

5.2 \$10: Soil Level Front & Back



Fit



Fit



Marginally Fit



Marginally Fit



Marginally Unfit



Marginally Unfit



Unfit

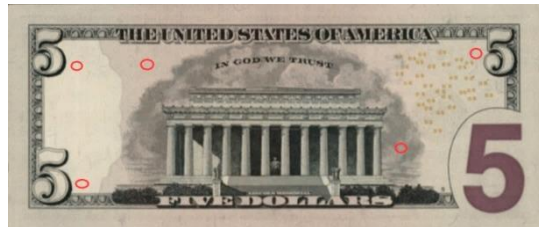


Unfit

6 Densitometer Measurement

The fitness measurements provided by the Federal Reserve fitness sensors are correlated with densitometer evaluations of the reflectivity of each note. The average L values of the notes are calculated by taking readings at different reference points on each note. Seven readings on the front and five readings on the back of each note are used to provide an average L value of the note. The average density values are used to correlate the density of notes to the soil levels used by the Federal Reserve sorting equipment. The following images show the reference points used on each denomination where the readings were taken. The density measurements are based on the X-Rite eXact Densitometer with a 2.0 mm aperture.

6.1 Densitometer Reading Locations



7 Document Review and Updates

This document will be reviewed and updated on a periodic basis by the Federal Reserve. Depository institutions should direct any questions regarding the implementation of these guidelines to their respective equipment manufacturer or supplier. Equipment manufacturers may submit requests for clarification or changes to this document in writing to the Currency Technology Office, Attention: Technology Services, P. O. Box 27622, Richmond, VA 23261.

8 Revision History

Version	Date	Updated by	Comments
1.0	December 11, 2008	Currency Technology Office	
1.1	December 8, 2017	Currency Technology Office	Includes the use of a new densitometer and fitness threshold changes.
1.2	February 7, 2019	Currency Technology Office	Includes changes to shred all pre 2004 series notes and fitness threshold changes for \$1s.