

CHAPTER 4

Checkweighing

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4.1 INTRODUCTION

Checkweighing is a service provided under the United States Grain Standards Act as amended (USGSA), or the Agricultural Marketing Act of 1946 (AMA). Official personnel weigh a specified number of commodity-filled containers taken from a lot of grain, rice, or other commodity and determine the estimated total gross, tare, and net weight of the lot or the estimated average gross or net weight of each container.

4.2 DEFINITIONS

- a. **Agency.** Any State or official agency or any person designated by the Administrator to conduct official inspection and/or Class X or Class Y weighing services.
- b. **Average Gross Weight.** The average weight of one unit of the commodity including the container(s).
- c. **Average Net Weight.** The average weight of one unit of the commodity excluding the container(s).
- d. **Average Tare Weight.** The average weight of one empty container or containers if the commodity is packaged as several primary containers within a secondary container.
- e. **Commodity.** Any grain, rice, hops, pulses, or processed product inspected or weighed by the Federal Grain Inspection Service (FGIS) under the USGSA or AMA.
- f. **Container.** An empty bag, package, box, sack, or receptacle used to hold a commodity.
- g. **Cooperator.** An agency or department of the Federal Government which has an interagency agreement or State agency which has a reimbursable agreement with the service.
- h. **Estimated Total Gross Weight.** The estimated weight of the entire lot including the weight of the containers.
- i. **Estimated Total Net Weight.** The estimated weight of the entire lot excluding the weight of the containers.

- j. **Estimated Total Tare Weight.** The estimated weight of all the containers in an entire lot.
- k. **Gross Product Target Weight.** The expected weight of one unit of the commodity including the container(s).
- l. **Lot.** An identified quantity of commodity.
- m. **Marked Scale.** Designated accuracy class, according to specific use (e.g., II, III, IIII)
- n. **Maximum Allowable Variance (MAV).** A value that limits negative deviations in individual unit weights to a specified range.
- o. **Scale.** An FGIS approved device or a device with Certificate of Conformance (CC) from the National Type Evaluation Program (NTEP) of the National Conference on Weights and Measures (NCWM) used to weigh commodities and containers.
- p. **Scale Division.** The smallest indicated value on a beam scale or the difference between two consecutively indicated or printed values on a digital scale.
- q. **Sublot.** A predetermined portion of an overall lot.
- r. **Test Weight.** A National Institute of Standards and Technology (NIST) - Class F weight that has been tested and certified by a State Weights and Measures metrology laboratory, FGIS or an FGIS approved metrology laboratory and is used to verify the accuracy of scales.
- s. **Unmarked Scale.** Scale not marked with an accuracy class designation.
- t. **Unit.** A filled container (or containers if the commodity is packaged in several primary containers within a secondary container).

4.3 REQUIREMENTS FOR SERVICE

- a. **Work Area.** The applicant must provide adequate workspace including a suitable table or bench on which to place the scale.
- b. **Accessibility.** The applicant must make all units of the lot accessible.
 - (1) **For Grain.** If the lot cannot be made fully accessible, dismiss the service.

- (2) **For All Other Commodities.** If the lot cannot be made fully accessible, issue a "partial inspection" certificate.

c. **Movement of Selected Units.**

- (1) **Labor.** When the scale cannot be located in the same area as the units to be weighed, the applicant must provide transportation and labor to move selected units from the production line or storage area to the scale.
- (2) **Official Lifting Requirement.** Official personnel are responsible for lifting units weighing 25 kilograms (55 pounds) net or less from the production line or pallet to the scale. The applicant may provide all or any part of this labor but is not required to do so.
- (3) **Applicant Lifting Requirement.** The applicant is responsible for lifting units weighing more than 25 kilograms (55 pounds) net from the production-line or pallet to the scale. Official personnel may provide all or any part of this labor but are not required to do so.

d. **Scales.**

- (1) **Applicant's Scales.** The applicant shall furnish scales for checkweighing sacked grain lots and for checkweighing other commodities when the unit size exceeds 50-kilograms. The applicant may also furnish scales for weighing commodities that weigh 50-kilograms or less but is not required to do so.
- (2) **Official Scales.** Official personnel shall furnish scales for checkweighing all sacked commodity lots, other than grain, provided the unit size is less than or equal to 50-kilograms.

4.4 SCALE SPECIFICATIONS AND TESTS

a. **Specifications.**

- (1) **GIPSA/NTEP Approval.** Scales used for checkweighing must be approved by FGIS or NTEP.

- (2) **Maximum Allowable Division Sizes.** Scales used for checkweighing must have the proper division size for the product being weighed. Table 1 (Below) provides the maximum allowable division sizes for various gross product target weight ranges. For example, if the gross product target weight is 110 pounds, then the scale must have a division size no larger than 0.1 pound.
- (3) **Special Contract Requirements.** If the contract specifies a maximum allowable variance (MAV) for the product, then the smallest division on the scale shall not exceed half of the MAV. For example, if a contract specifies an MAV of - .1 pound, the scale division shall not exceed 0.05 pound.

TABLE 1
DIVISION SIZE SELECTION

| Gross Product Target Weight Range Pounds | | | Maximum Allowable Division Size | | | |
|---|----|------|---------------------------------|-----|------|-----|
| | | | lb | kg | oz | g |
| 0.5 | or | less | - | - | - | 0.5 |
| > 0.5 | ≤ | 2 | - | - | 1/16 | 1 |
| > 2 | ≤ | 5 | - | - | 1/8 | 2 |
| > 5 | ≤ | 10 | .01 | - | 1/4 | 5 |
| > 10 | ≤ | 35 | .02 | .01 | 1/2 | 10 |
| > 35 | ≤ | 45 | .05 | .02 | 1 | 20 |
| > 45 | ≤ | 120 | .1 | .05 | 2 | 50 |
| > 120 | ≤ | 200 | .2 | .1 | 4 | 100 |
| > 200 | ≤ | 500 | .5 | .2 | 8 | 200 |

> = greater than
≤ = less than or equal to

b. Semiannual Tests.

- (1) **Frequency.** Test scales at least twice a year (approximately every 6 months) according to the procedures in Chapter 3 of this handbook.
- (a) Authorized FGIS personnel shall test FGIS-owned scales.
- (b) Industry-owned scales shall be tested by a State weights and measures agency, State-approved scale testing service, or authorized FGIS personnel.

- (2) **Approval Sticker.** Attach an approval sticker with the latest test date and the name of certifying official to each approved scale.
- (3) **Increased Frequency.** Scales found to be incapable of maintaining accuracy over a 6-month period should be tested more frequently to ensure accuracy or removed from service.
- (4) **Records.** Maintain scale test records as specified in Chapter 3.

NOTE: For automatic sacking scales, contact the Policies and Procedures Branch, Field Management Division, for applicable specifications and test procedures.

c. **Daily Checks.**

- (1) **Frequency.** Balance and check the scales:
 - (a) At the beginning of each work shift and at least one other time during each work shift,
 - (b) Each time the scale is moved to a new location, and
 - (c) When the scale is left unattended and the results or balance is questionable.
- (2) **Procedures.**
 - (a) **Setting Zero.**
 - 1 **Mechanical Scales.** Move all poises to zero and adjust the balance so that the beam swings an equal distance above and below the center mark on the indicator or the center of the trig loop.
 - 2 **Digital Scales.** Adjust the zero adjustment until the scale indication is a stable zero.

(b) **Sensitivity at Zero.**

- 1 **Mechanical Scales.** Balance the beam at zero. Move the poise two scale divisions. The beam should move to the bottom of the trig loop or balance indicator. If it does not, do not use the scale.

NOTE: For FGIS-owned, unmarked (manufactured prior to January 1, 1986) mechanical scales that have a capacity equal to or greater than 100 pounds, balance the scale at zero and then move the poise to .2 pound. The beam should move to the bottom of the trig loop or balance indicator. If it does not, do not use the scale.

- 2 **Digital Scales.** Place a test weight(s) equal to two scale divisions in the center of the platform. The digital display should read one or two scale divisions above zero. If it does not, do not use the scale.

(c) **Strain Test.**

- 1 **Mechanical Scales.** Balance the beam at zero and lock the beam. Place a test weight(s) that is approximately equal to the weight of the commodity to be weighed in the center of the platform. Move the poise(s) to the value of the weight and unlock the beam.

Use the poises to balance the beam so the beam moves an equal distance up and down. Read the weight from the beam. If the scale indication for the test load applied is within tolerance the scale may be used.

NOTE: For FGIS-owned, unmarked (manufactured prior to January 1, 1986) mechanical scales that have a capacity equal to or greater than 100 pounds, the tolerance allowed is: $\pm .05$ pound for test loads 0 - 50 pounds and $\pm .1$ percent of the test load for all test loads over 50 pounds.

- 2 **Digital Scales.** Set the indicator at zero and place a test weight(s) that is approximately equal to the weight of the commodity to be weighed in the center of the platform. Read the indicator and print the weight if applicable. Indications flashing between two divisions will be considered one-half a division. If the scale indication for the test load applied is within tolerance the scale may be used.

Table 2
MAINTENANCE TOLERANCES

| Tolerances are in Scale Divisions for Marked Devices | | | | |
|--|-----------|----------------|--|---------|
| Class | ±1 | ±2 | ±3 | ±5 |
| II | 0 – 5 000 | 5 001 – 20 000 | 20 001 + | |
| III | 0 – 500 | 501 – 2 000 | 2 001 – 4 000 | 4 001 + |
| IIIL | 0 – 500 | 501 – 1 000 | (Add 1d for each additional 500 d or Fraction thereof) | |

| Tolerances for Unmarked Devices | |
|---------------------------------|-----------------------------|
| Scale Divisions | Tolerance |
| n > 5 000 | 0.1 percent of test load |
| n ≤ 5 000 | as shown in the table above |

4.5 TARE WEIGHT

- a. **General.** Determine the average tare weight once for each contract, unless the containers are made by more than one manufacturer or a new shipment of containers is used for a portion of the contract.

b. **How to Find Single-Container Unit Tares.**

- (1) **Number.** Determine the average tare weight by averaging the weight of at least 10 empty containers selected at random.
- (2) **Containers Weight Less Than Minimum Tare.** If the combined weight of 10 containers is less than the minimum weight for tare determination (see Table 3), add empty containers to the scale until the total weight is equal to or greater than the minimum weight for tare determination.
- (3) **Average.** Divide the total weight of the containers by the total number of containers weighed to determine the average tare weight of one empty container.

TABLE 3
TARE WEIGHT REQUIREMENTS

| Scale Division Size | | | Minimum Weight for Tare Determination | | |
|---------------------|------|-----|---------------------------------------|-----|--------|
| lb | oz | G | lb | oz | g |
| - | - | .05 | - | - | 2.5 |
| - | 1/16 | 1 | - | 3 | 50 |
| - | 1/8 | 2 | - | 6 | 100 |
| .01 | 1/4 | 5 | .5 | 12 | 250 |
| .02 | 1/2 | 10 | 1.0 | 25 | 500 |
| .05 | 1 | 20 | 2.5 | 50 | 1 000 |
| .1 | 2 | 50 | 5.0 | 100 | 2 500 |
| .2 | 4 | 100 | 10.0 | 200 | 5 000 |
| .5 | 8 | 200 | 25.0 | 400 | 10 000 |

c. **How to Find Multiple-Container Unit Tares.**

- (1) **Number.** Determine the average tare weight by averaging the weight of at least 10 empty primary (inner) containers selected at random and by averaging the weight of at least 10 empty secondary (outer) containers selected at random.
- (2) **Container Weight Less Than Minimum Tare.** If, for either the primary or secondary containers, the combined weight of 10 containers is less than the minimum weight for tare determination (see Table 2), add empty containers to the scale until the total weight is equal to or greater than the minimum weight for tare determination.

- (3) **Average Primary.** Divide the total weight of the primary containers by the total number of primary containers weighed to determine the average tare weight of one empty primary container.
 - (4) **Average Secondary.** Divide the total weight of the secondary containers by the total number of secondary containers weighed to determine the average tare weight of one empty secondary container.
 - (5) **Finding Average Tare.** Multiply the average tare weight of one empty primary container by the number of primary containers in one unit. Add this total to the average tare weight of one empty secondary container to determine the average tare weight of one unit.
- d. **Very Light Containers.**
- (1) **Division Size.** If a large number of containers are needed to determine the tare weight, use a scale with a small scale division to weigh the containers.
 - (2) **Shrink-Wrap.** Determine the average tare weight of stretch-wrap and shrink-wrap plastic balers (secondary containers) once for each shipment of the baler material.
- e. **Warehouse Lots.**
- (1) **Earlier Established Tare Weights.** If empty containers are not available for determining tare weight and the lot was previously checkweighed (e.g., at origin), use the previously determined tare weight.
 - (2) **Finding Empty Container Tare Values.** If empty containers are not available for determining tare weight and the lot is not known to have been previously checkweighed, use the following table to determine the tare weight.

TABLE 4
SPECIAL TARE WEIGHTS

| Type of Sack | Net Weight | Tare Weight |
|----------------------|------------|-------------|
| Single polypropylene | 100 lb net | 0.25 lb |
| Single polypropylene | 50 kg net | 0.27 lb |
| Single burlap | 100 lb net | 0.70 lb |
| Single burlap | 50 kg net | 0.75 lb |
| Double burlap | 100 lb net | 1.20 lb |
| Double burlap | 50 kg net | 1.40 lb |

4.6 SAMPLE SIZE AND METHOD SELECTION

a. Sample Size.

- (1) **Minimum.** Checkweigh no less than minimum number of units required per subplot or lot. (See Table 5)
- (2) **Increased Number.** Checkweigh additional units if sample manipulation or gross packing inconsistency is suspected.
- (3) **Type Container.** When one lot consists of two different types of sacks (for example, polypropylene and burlap) with the same net weight, weigh the lot as two separate lots by type of sack and complete a worksheet for each. Use table 5 to determine the number of sacks of each type to weigh. Upon request, certificate the lots on one certificate.
- (4) **Special Contracts.** If a contract or agreement specifies that a greater number of units be check weighed than is specified in Table 5 (e.g., Defense Supply Center Philadelphia (DSCP) contracts), the sample size shall be as specified by the contract or agreement.

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TABLE 5
SAMPLE SIZE

| Number of Units in Sublot or Lot | Minimum Number of Units Check weighed |
|-------------------------------------|--|
| 0 – 1 500 | 12 |
| 1 501 – 3 000 | 20 |
| 3 001 – over | 36 |

b. Selection Methods.

When units are selected off the production line, use either the time method, the portion method, the random numbers method, or any other comparable method. In all other situations, use the random numbers method.

(1) Time Method.

- (a) Determine the normal number of hours or minutes it takes to pack the lot or subplot.
- (b) Determine the sample size.
- (c) Divide the number of hours or minutes it takes to pack the lot or subplot by the sample size.
- (d) Randomly select a unit(s)¹ at approximately the specified interval. Do not set a pattern of selecting units at any one particular time (e.g. every 15 minutes). If more than one line is operating, alternate selecting units between lines.

Example: The applicant is sacking a subplot of 8 100 50-kilogram sacks of corn over an 8-hour shift. The sample size is 36 sacks. To determine sample time intervals as follows: 8 hours (time required to pack the lot) ÷ 36 (sample size) = .22 hours per sack = 13 minutes per sack (.22 hrs X 60 min/hr = 13.2 minutes). Therefore, checkweigh 1 unit during every 13-minute interval.

¹ When a dual-scale, double-sided packer is used (e.g., a packer that alternately weighs and fills pairs of containers); weigh matched pairs of filled containers.

(2) **Portion Method.**

- (a) Determine the sample size (see Table 5).
- (b) Divide the number of units in the lot or subplot by the sample size.
- (c) Randomly select a unit(s)² at the specified interval; e.g., Checkweigh 1 unit for every 100 units that are packed. Do not set a pattern of selecting units at a preset frequency. If more than one line is operating, alternate selecting units between lines.

(3) **Random Numbers Method.**

- (a) Determine the sample size (see Table 5).
- (b) Use the attached random numbers table (Attachment 2) to determine which units to select.

NOTE: A random number may (1) designate the number of the selected unit or (2) designate the pallet from which a unit will be selected. When a random number is used to designate the number of the pallet from which a unit is selected, official personnel should randomly select one unit from the pallet.

- (1) **Starting Point.** Determine the starting point in the random numbers table. When the table is used for the first time, the starting point will be the upper left-hand block of numbers on the first page. When using the table on subsequent occasions, the starting point will be the row of numbers immediately following the last row of numbers used.

² When a dual-scale, double-sided packer is used (e.g., a packer that alternately weighs and fills pairs of containers); weigh matched pairs of filled containers.

- (2) **Number Selection.** Begin at the left of the first row of numbers used. Combine as many consecutive digits in the number as needed to coincide with the number of containers in the subplot or lot. For example, for lot sizes of 10 to 99, combine 2 digits to form a single number; for lot sizes of 100 to 999, combine 3 digits to form a single number; etc.
 - (3) **Reading Digits.** Begin reading digits from the starting point to the bottom of the page. When the end of a column is reached, continue to the top of the next column to the right. When the end of the page is reached, proceed to the beginning of the next page. When the end of the last page is reached, go back to the first page.
 - (4) **Consecutive Digits.** Discard groups of consecutive digits that are larger than the subplot or lot size and continue to the next row of digits.
 - (5) **Repeated Digits.** Discard groups of consecutive digits that are repeated.
 - (6) **List of Numbers.** Record the usable groups of consecutive digits until the appropriate number of groups have been identified.
 - (7) **Numerical Order.** List the numbers in numerical order on the worksheet.
- (c) Determine which units or pallets comprise each subplot or lot.
 - (d) Select the units or pallets that correspond to each random number.

NOTE: If the commodity is packaged in containers within containers, such as polyethylene package inside paper bales, obtain the random sample by selecting an equal number of the outer containers from each portion and weigh the outer containers together with their contents.

4.7 WEIGHING AND CERTIFICATION

- a. **Weighing Procedures.** Obtain the proper number of units (see Table 5) from the production line or pallets as applicable, using the proper selection method.
 - (1) **Selecting.** Select and weigh units that are representative of the lot. Do not weigh torn or leaking units.
 - (2) **Weighing.** Weigh selected units individually or in convenient multiples.
 - (3) **Worksheet Forms.** Record the results of each weighing and the number of units in each weighing, when weighed in multiples, on the worksheet Form FGIS-991, "General Services Worksheet," for rice, pulses, and grain; See Exhibit T, Chapter 2, or a Form FGIS-992, "Services Performed Report," for processed products). See Example Worksheet - Attachment 1.
 - (4) **Recording.** Record the results of each weighing on the worksheet to the proper division size for the product.
- b. **Weight Information.** Compute the results and record your findings on the appropriate worksheet. See Example Worksheet - Attachment 1.
 - (1) **Average Gross Weight.** Add the gross weights of all the units weighed, then divide the total by the number of units weighed. Round the result to the nearest hundredth unit.
 - (2) **Average Tare Weight.** Add the weights of all the containers weighed, then divide the total by the number of containers weighed. Round the result to the nearest hundredth unit.
 - (3) **Average Net Weight.** Subtract the average tare weight from the average gross weight. Round the result to the nearest hundredth unit.
 - (4) **Estimated Total Gross Weight.** Multiply the average gross weight by the total number of units in the lot. Round the result to the nearest kilogram or pound.
 - (5) **Estimated Total Tare Weight.** Multiply the average individual tare weight by the total number of units in the lot. Round the result to the nearest kilogram or pound.

- (6) **Estimated Total Net Weight.** Subtract the estimated total tare weight from the estimated total gross weight. Round the result to the nearest kilogram or pound.

NOTE: Refer to the Processed Commodities Handbook, Chapter 2, Attachment, Number 28, for reporting instructions as there are different procedures for reporting the net weight.

c. **Certification.**

- (1) **Select Applicable Program Handbook.** Issue a certificate following the procedures in the applicable handbook for each lot checkweighed.
- (2) **Information to Show.** Show the following information, as applicable, on each certificate.
- (a) **Identification.** The identification of the sublots or lot and, when applicable, the seal numbers.
 - (b) **Date.** The date(s) packing of the sublots or lot was completed.
 - (c) **Number.** The number of units in the subplot(s) or lot.
 - (d) **Markings.** A description of the bag markings.
 - (e) **Estimated Weights.** The estimated or average total gross, tare, and net weight of the lot.
 - (f) **Other Information.** Other related information.

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TABLE OF RANDOM NUMBERS

| | | | | | |
|--------|--------|--------|--------|--------|--------|
| 659156 | 034646 | 346480 | 021038 | 340229 | 043907 |
| 339770 | 290314 | 143688 | 354422 | 900012 | 760590 |
| 652044 | 207095 | 373834 | 997281 | 115078 | 716662 |
| 611444 | 708280 | 866070 | 910648 | 695118 | 311367 |
| 110968 | 687516 | 391094 | 909960 | 262444 | 487474 |
| 111915 | 611507 | 425447 | 157400 | 335774 | 071486 |
| 851530 | 207095 | 373874 | 273439 | 996536 | 285019 |
| 150568 | 170875 | 487757 | 747819 | 743117 | 739804 |
| 726277 | 473839 | 596930 | 070539 | 269265 | 087804 |
| 679120 | 812174 | 290054 | 354988 | 912359 | 585474 |
| 464782 | 557335 | 476317 | 352911 | 484005 | 870949 |
| 602112 | 587987 | 300584 | 911185 | 863961 | 639395 |
| 376150 | 263426 | 207152 | 738668 | 948411 | 254414 |
| 735635 | 150005 | 142274 | 916354 | 600718 | 271947 |
| 204354 | 125854 | 528863 | 356264 | 688128 | 824011 |
| 000557 | 528178 | 182821 | 692693 | 542295 | 218048 |
| 009409 | 933180 | 318040 | 953374 | 463100 | 480121 |
| 114919 | 339542 | 291124 | 607111 | 204584 | 766318 |
| 379602 | 660350 | 780628 | 137970 | 047943 | 750622 |
| 330422 | 991713 | 422284 | 015147 | 165306 | 117489 |
| 220588 | 848405 | 171778 | 476792 | 548954 | 356754 |
| 049989 | 553212 | 449279 | 742879 | 661439 | 460088 |
| 379700 | 467808 | 707323 | 800869 | 834471 | 312729 |
| 155939 | 224928 | 453673 | 188840 | 555956 | 220729 |
| 017807 | 706164 | 665123 | 987776 | 781819 | 761225 |
| 553427 | 184457 | 358926 | 524470 | 916395 | 509820 |
| 016168 | 755051 | 384587 | 972765 | 925887 | 862768 |
| 851524 | 731371 | 833053 | 605497 | 554063 | 549270 |
| 204917 | 784068 | 641878 | 280888 | 435342 | 674021 |
| 151493 | 056222 | 565821 | 087277 | 204956 | 931346 |
| 908728 | 911726 | 857092 | 611042 | 937856 | 351455 |
| 041776 | 466190 | 129324 | 676840 | 527197 | 292262 |
| 138039 | 814858 | 759662 | 383733 | 662609 | 799617 |
| 329071 | 664128 | 606642 | 727344 | 749813 | 895958 |
| 406473 | 439998 | 032398 | 388978 | 664972 | 340645 |
| 548321 | 849909 | 676377 | 810241 | 355630 | 059915 |
| 378866 | 900340 | 555925 | 313041 | 588990 | 600555 |
| 018893 | 130783 | 725123 | 705134 | 318525 | 547001 |
| 452251 | 373431 | 195667 | 644061 | 268222 | 877293 |
| 362662 | 330379 | 930324 | 275971 | 766010 | 862085 |
| 626364 | 197638 | 657972 | 864978 | 231215 | 947098 |
| 183701 | 199838 | 409792 | 333233 | 821235 | 724195 |
| 890460 | 655418 | 469721 | 977730 | 467257 | 231289 |
| 119041 | 550088 | 999560 | 219654 | 005876 | 005876 |
| 517543 | 386505 | 575827 | 963159 | 918977 | 304469 |
| 661366 | 343519 | 595822 | 856819 | 196561 | 968089 |
| 713933 | 714842 | 082929 | 595429 | 587982 | 069876 |
| 006847 | 669360 | 778282 | 665204 | 373982 | 205768 |

Attachment 2
 WEIGHING HANDBOOK
 Chapter 4
 9/1/03

TABLE OF RANDOM NUMBERS

| | | | | | |
|--------|--------|--------|--------|--------|--------|
| 117765 | 906701 | 425055 | 010152 | 471312 | 479957 |
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