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# The Permanent Record of Gemstone Identification

John M. Aldrich

George T. Davey

# THE PERMANENT RECORD OF GEMSTONE IDENTIFICATION*

## John M. Aldrich and George T. Davey

The authors, partners in the firm of Aldrich & Davey, Lapidaries, at Van Nuys, California, have through research started in 1947 developed a method of identifying gemstones and maintaining a file of these identifications by means of a code classification. John M. Aldrich holds a certificate as a Graduate Gemologist from the Gemological Institute of America; while George T. Davey is a professional lapidary who while attending the Pennsylvania State College and the University of Texas majored in Geology and Machine Design. The Aldrich and Davey Central File of gemstones is being developed as a clearing house of gemstone identification, and its services are available to all tax supported law enforcement agencies.— EDITOR.

It is well recognized by law enforcement agencies and insurance companies that gemstones are particularly vulnerable to theft. Once they have been removed from their mountings (and many times without removal from their mountings) it has formerly been almost impossible to identify these stones when found in the hands of the thief, his fence, or the subsequent purchaser,—or for that matter, after a mere loss.

Recutting operations for the average gemstone are impractical for the thief or his fence as such operations are costly, and in all but a very few cases result in the reduction of the value of the stone. For all gemstones and in particular the larger sizes, however, recutting is always a possibility.

To counteract all of the above vulnerabilities a system was finally originated that provides for a method of gemstone identification:

    1.   Which may be used to identify with a certainty corresponding to a human fingerprint, all gemstones regardless of style or cut;

    2.   Which does not depend upon photographs of the gemstone, but on simple, easily obtained scientific data which may be sent in simple code form by letter, telegram, or telephone;

    3.   Whereby the necessary data may be easily obtained and quickly recorded at low cost and without removing the gemstone from its mounting;

    4.   And whereby an unknown gemstone may be quickly and easily compared with previous records, thereby making a registering service possible even for moderately priced gemstones.

## GENERAL EXPLANATION OF METHOD

The various facets (small plane surfaces on a diamond or other cut gemstone) are formed by a series of grinding, and in some cases polish-

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ing, operations. During the cutting (grinding) of a diamond, and the polishing of the other gemstones, the examination of the facet inter- sections is done by eye with or without the aid of from $2\frac{1}{2}$X to 20X magnification. Only the finest possible material is ever cut under 20X because the excessive length of time involved and the correspondingly high labor cost prohibits the sale of these stones to other than the most discriminating clientele.

These intersections may appear perfect up to the magnification under which they were polished or cut, but with greater magnification intersection errors can easily be detected, and with still greater magnifi- cation these errors can be accurately measured. In practice it is virtu- ally impossible to cut or polish a gemstone so that all intersections are perfect. In theory, however, the corners of the facets always intersect in points.

Similarly, inside the gemstone, the natural imperfections may be so small that they cannot even be detected with a trained eye aided by a corrected 10X magnifier (Federal Trade Commission requirement for a flawless diamond), yet if a high enough magnification is used natural imperfections can be easily detected, located, and measured.

To clearly explain the procedure it is divided into five parts: Instru- ments needed, Codifying the gemstone, Classifying the internal imper- fections, Classifying the external errors, and How to use the recorded data.

## INSTRUMENTS NEEDED

Besides the pen and ink, or a typewriter, the identifying person must also have or have access to a microscope equipped with a screw- type micrometer eyepiece, and, if not a member of a law enforcement agency he must also have or have access to the instruments necessary to make mineralogical classifications, determine natural gemstones from the synthetics and imitation stones, and have the qualified experience to make such determinations.

## CODIFYING THE GEMSTONE

*Step 1.* Select a blank Aldrich & Davey Identification Card. While it is not necessary to use this card for future records, the data must be recorded on a stiff, white card form, six inches long by four inches wide, and the form of entry must be preserved.

*Step 2.* Where the card states "name," type or print in ink the requestor's name and association. "Association" means jeweler, such and such police department, such and such insurance company, etc.

*Step 3.*   Where the card states "address," record the requestor's address.

*Step 4.*   Directly below the requestor's address, record the owner's name and address. If not known, record "unknown." If the same as the requestor, record "same."

*Step 5.*   Directly below where the card states "article," record a very brief description of the article. What it is, a loose stone, a ring, a bracelet, etc. What the color is of the metal if the gemstone is mounted, the colors of the stones, which gemstone is being recorded.

*Step 6.*   Thoroughly clean the gemstone and mounting, if mounted, of all surface dirt, grease, lint etc.

*Step 7.*   Directly below the description, record any outstanding peculiarities of the gemstone being examined. Is the top cut unpleasingly high or low, is the color noticeably unevenly distributed, is the stone flawless with the naked eye, or do the flaws show up distinctly? What is the predominate color of the stone, or is it colorless? Is the table or the culet (the bottom tip, usually flat) noticeably off center?

Steps 8, 9, and 10 may be OMITTED by all law enforcement agencies.

*Step 8.*   Determine the mineralogical classification of the gemstone. Do not dismount.

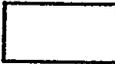*Step 9.*   Obtain the mineralogical code from the table below:

| Code | Mineral | Code | Mineral |
|------|---------|------|---------|
| B | Beryl, except emerald | Q | Quartz |
| C | Corundum except ruby | R | Ruby |
| CH | Chrysoberyl | S | Spinel |
| D | Diamond | SYN | Synthetic |
| E | Emerald | T | Topaz |
| G | Garnet | TQ | Turquoise |
| J | Jade, either kind | TR | Tourmaline |
| O | Olivine | Z | Zircon |

For other stones abbreviate as necessary and make a note in the space below description.

*Step 10.*   Record the mineralogical code in the upper left hand corner of the card after the notation "Code No."

*Step 11.*   Determine from Table I the proper code for the shape of the gem and record as the numerator of the first fraction immediately to the right of the mineralogical code.

*Step 12.*   Determine from figures 1, 2, 3, 4, 5 and 6 the proper code or codes for the cut of the gemstone and record as the denominator of the first fraction.

| Shape | Code | Picture |
|-------|------|---------|
| Round | R | |
| Oval | O | |
| Pear | P | |
| Marquise | M | |
| Semi-Marquise | SM | |
| Triangle | T | |
| Square | S | |
| Cushion | C | |
| Octagon | OCT | |
| Antique Square | AS | |
| Antique Cushion | AC | |

If the  shape is  not shown,  the code  is F,
draw an outline in the description.

*Table I.*

*Brilliant.* A brilliant cut (figure 1) is any cut that has the same number of star facets enclosing the table as main facets, regardless of the outline of the stone or the number of star facets, although it
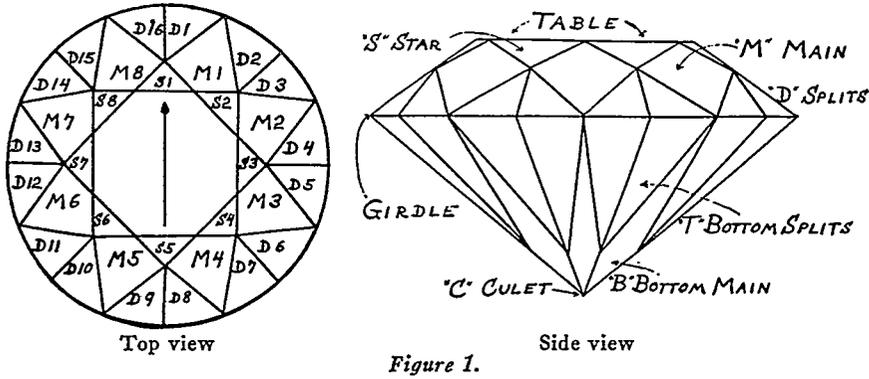
Top view          Side view

*Figure 1.*

is commonly found on round, oval, marquise, and pear shapes. The code is B. The arrow through the illustration shows the orientation of the stone for examination and classification, the point of the arrow is always away from the observer. The numbers in the facets are the facet numbers, counted clockwise from the orientation arrow. The letters in the facets are the facet letters.
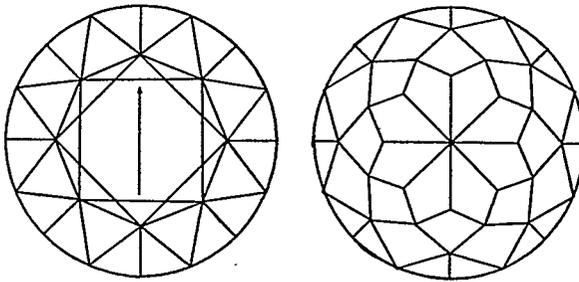


*Figure 2.*

The left figure represents the Marcher double diamond cut; the right, Twentieth Century cut.

*Variations of Brilliant Cuts* (figure 2). There are many variations of brilliant cuts. The Marcher double diamond cut (the mains are "broken" horizontally), and the Twentieth Century Brilliant (the extension of the star facets eliminates the table). The code is B.

*Split-Facet Brilliant* (figure 3). A split-facet brilliant cut has half as many star facets as main facets regardless of the shape of the stone or the number of star facets. All of the mains are triangles, excepting on octagons with short corners where the cutter may add fancy cuts. Although originally intended as a means of gaining greater brilliancy ·for square and cushion shaped stones, it is now used on any shape (for example the "Magna-Cut" figure 4); as a means of removing chips: and for disguising step-cut stones. The code is S/F.
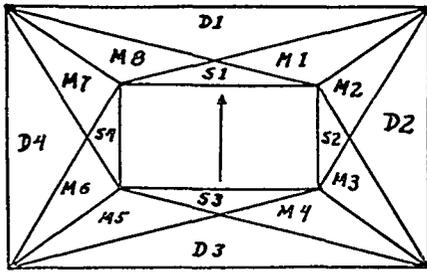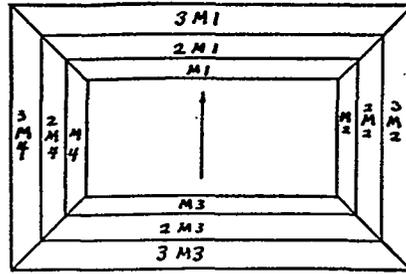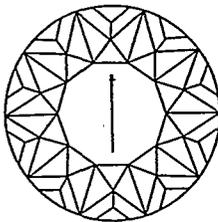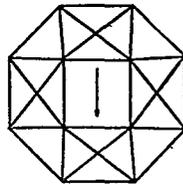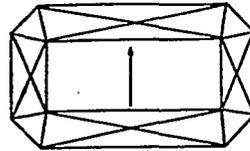
Figure 3.



Figure 5.

*Variations of Split-Facet Brilliants.* Figure 4 shows merely a few of the many kinds of shapes this cut has been applied to. The code is S/F.



Magna-Cut    Octagon S/F Brilliant    Octagon S/F Brilliant

*Figure 4.*

*Step Cut.* A step cut stone (figure 5) has parallel rows of facets cut parallel to the girdle. This cut may be on any shaped stone. The code is S.

*Mixed Cut* (figure 6). A mixed cut is a combination of one or more of the preceding cuts, with one cut on top and a different cut on the bottom of the stone. Use the preceding codes as are necessary, with the code for the top to the left, and the code for the bottom to the right.
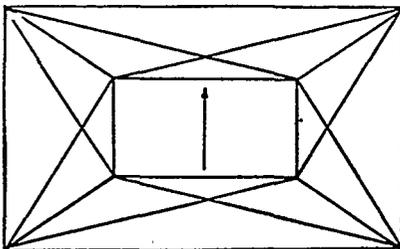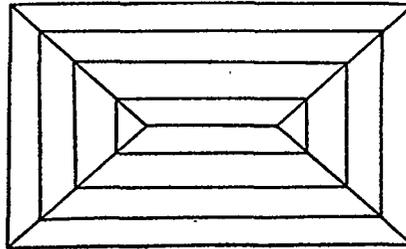


Top    Bottom

*Figure 6.*

*Step 13.* Measure and record the length of the gemstone to at least 0.01 mm as the first part of the numerator of the second fraction. If this measurement cannot be accurately made because of interference from the mounting, then approximate and add "app" after that measurement.

*Step 14.* Measure and record the width of the gemstone as the second part of the numerator of the second fraction similarly as was done in step 13. Be sure to measure all stones for maximum and minimum diameters.

*Step 15.* Measure and record the thickness of the stone from table to culet in the same manner as step 13, as the denominator of the second fraction.

### CLASSIFYING INTERNAL IMPERFECTIONS

An internal imperfection is faulty structure inside the stone when seen by eye with or without the aid of magnification. It may consist of one or more of the following: An inclusion, cleavage, or a crack.

An *inclusion* may be a crystal, a pebble, a spot, "silk" (needles that are parallel, sometimes all pointing in one direction, often pointing in two or three directions), "Garden" (mossy appearance), feather (looks like a feather under magnification), fingerprint (looks like a fingerprint under magnification), or any other foreign matter inside a gemstone.

A *cleavage* is a clean, flat, smooth separation in a gemstone.

A *crack* is any other separation in a gemstone, usually appearing white when viewed broadside, and as a line when viewed from the edge.

*Step 16.* Determine the power of magnification necessary to triangulate three imperfections as seen through the table. Triangulate means to measure the distances separating three imperfections. This triangulation is designated "TOI" on the record. Use only sufficient power to make ONE triangulation.

*Step 17.* Record that power as the numerator of the third fraction.

*Step 18.* On the back of the card with the four inch side at the top, record the imperfections as seen through the table when using the power recorded in step 17, locating these imperfections as such and such o'clock. The illustrated example, figure 7, would have for a table classification:—Table—Center, crack .64mm long; 12:30 o'clock, spot; 2 o'clock, TOI (1 o'clock, spot; .45 mm to crystal at 3 o'clock; 53 mm to fingerprint at 11 o'clock; .61mm to spot) ; 6 o'clock, spot; 9 o'clock, fracture, (may be called crack).
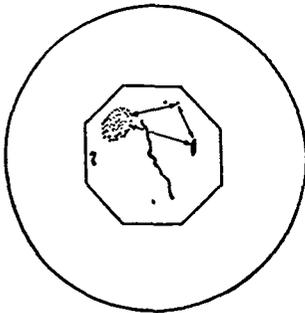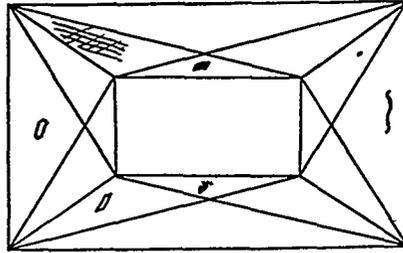
Figure 7.



Figure 8.

*Step 19.* Record the other imperfections in the stone that are visible under the same magnification and orientation of the stone as step 18. Locate them clock-wise by facet number and facet row letter. Facets through which no imperfections are visible are omitted from the record. All views are taken with the table at right angles to the line of sight. For example in the split-facet cushion, figure 8:

$$S - \frac{4}{8} \quad \text{S1 crystal, S3 1.37mm feather, S 4 spot.}$$

M8   M2 spot, M5 crystal, M8 silk.

$$D - \frac{4}{8} \quad \text{D2 crack, D 4 crystal.}$$

Explanation of the above fractions:

There are half as many star facets as main facets. The four star facets give the four in the fraction, the eight main facets give the eight in the fraction. Similarly in this case, although not always, there are four D facets and eight main facets.

## CLASSIFYING THE EXTERNAL ERRORS

It was noted in the general explanation of the method why it is virtually impossible to manufacture (cut, or cut and polish) a perfect stone, regardless of the time or care used, which would alone make the cost prohibitive.

Because the thief receives only a very low percentage of the value of the stone and because the recutting costs would have to come out of his own "profit," average sized gemstones are too uneconomical to recut, also, because of the personal risk involved, any recutting is done by the fence. The same applies to gemstones of any size.

The fence is the person who must decide if a stone should be recut.

For average sized stones the same things that applied to the thief apply to him. Because of this high cost of recutting, stolen gemstones are seldom recut. Large stones that have a "history" and so are known in the trade by sight or heresay, have probably rightly been declared recut in the past, and there is no reason to assume that such a practice has been eliminated. All stones, however, will be moved if possible without recutting. Because although the value increases with the size of the stone and the number of potential customers decreases, the recutting risk increases, thus making the fee higher and thus making the potential "profit" lower as the stone must still be sold in an attractive price range. The loss of weight which still further reduces the value, and the increased personal risk to the fence is higher the more recutting he has done.

To recut a gemstone such that the internal imperfections will not identify the gemstone if a TOI has been made, approximately 56% of the stone must be removed, and if TOI's are made in two orientations, then 76% of the stone must be removed. Again the loss of weight, plus the cost of recutting prohibits a fence from recutting a gemstone that has a "Permanent Record of Gemstone Identification" whether classified and registered by a licensee, or classified by a law enforcement agency, or protectively classified for a store, to the point where identification is no longer possible or practicable.

Because of this and the other foregoing reasons, the first quick rechecking of a gemstone's identification is made from the sequence and measurement of the external facet errors. The codifying portion of the procedure sets the maximum limits the stone can have; records of ownership and history; type of jewelry the stone was or is in when previously recorded; the shape; the cut; and for purposes of exposing past, present, or future damage or fraud, what it is.

These errors in manufacture may have an infinite number of variations, particularly when in combination with each other. To reduce this unwieldy number of possible errors to a useful quantity capable of classification, only basic errors are coded and used.

Fourteen possible different basic facet intersection errors are practicable on brilliant cut gemstones, eighteen on split-facet brilliants, and no coding is needed to classify the errors on step cut gemstones.

These basic errors are coded by letter, "A" being the most common error, "B" the next most common error, and so forth. Illustrations of these errors are included with the explanation as needed.

## BASIC FACET ERRORS

*Basic Error A* is an overlap of two facets resulting in an intersection line instead of a point as in the case of a perfect intersection. The basic error A is shown with two variations of this same error A to the right. The measurement of this error is the length of the overlap intersection line.
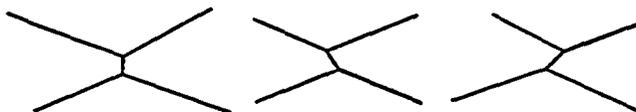
This same error may be found at the intersection between two main facets, as shown below with variations at the right.
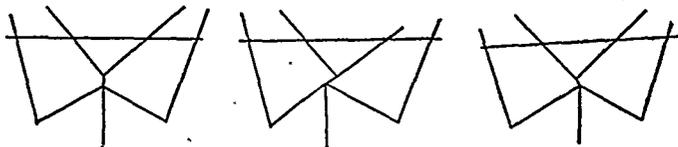
This error may also be found at the intersection of the split facets with the bottom of the main facet as shown below, or between any other pair of facets when intersecting a third facet.
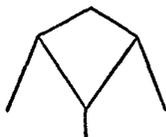
*Basic Error B* results from too little material being removed so the facets do not meet. Below is shown the basic B error, and two variations to the right. The B error may be found in any facet row except the M (main top facet) row. Measurements of the B error are taken from point to point of the separated facets.

*Basic Error C,* regardless of small variations, is found if the star, left hand main, and left hand split facet form an apparently perfect junction, but, the right hand split overlaps both the right hand main

and star facets. The error measurement is made from end to end of the line separating the right hand split facet and the star facet.

*Basic Error D* is the reverse of basic error C.   (Below left.)

*Basic Error E* is caused by the right hand split facet not reaching the intersection of the star, left hand main, and left hand split facets.



Basic Error D          Basic Error E          Basic Error F
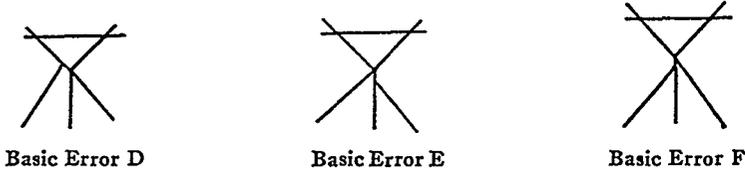
Measure the distance from the star facet to the point of the split facet nearest the star.   (Above center.)

*Basic Error F* is the reverse of basic error E. (Above right.)

*Basic Error G* is caused by neither D facet (split facet) touching the star facet, both D facets ending at different levels, with the left hand D facet closest to the star facet. In measuring these errors the upper error junction line is recorded for length first and the lower error junction line is recorded for length to the right of the first recording. (Left.)



Basic Error G          Basic Error H

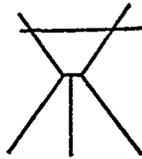*Basic Error H* is the reverse of error G. (Above right.)

*Basic Error K.* The right hand D facet not only overlaps the star and right hand main facet as in error C, the left hand D facet does not reach the star facet.  The error measurements are made as in error G.



Basic Error K          Basic Error M

*Basic Error M* is the reverse of error K. (Above right.)

*Basic Error P.* Both D facets overlap the star facet S and may or may not have the same amount of overlap.  Record the measurement
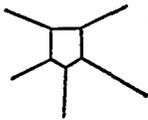
of the left hand error to the left of the denominator and the right hand error to the right of the denominator. (See below.)

*Basic Error R.* This error may be found in any row and has been added to the stone to cover a manufacturing fault. Do NOT measure.
*Basic Error S* shows a decided clock-wise rotation. Do NOT measure.
*Basic Error V* is the reverse of error S.

Basic Error R          Basic Error S          Basic Error V

These fourteen basic errors are all applicable to the brilliant cut as is demonstrated in figure 9. The classification of the pictured errors is shown beneath the oval to illustrate the classification of facet inter-section errors. The explanation is below the classification.
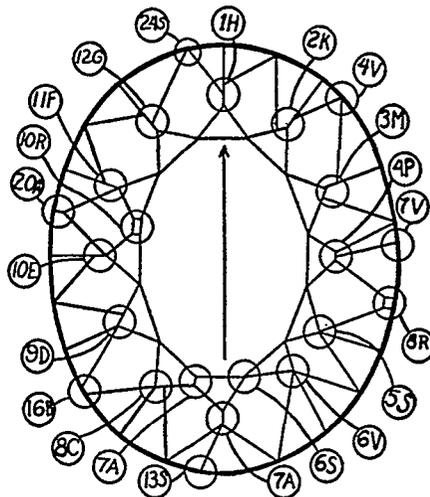


*Figure 9.*

The classification of the oval in figure 9:

$$S12-\quad \frac{6S\quad 7A\quad 10R}{.25}$$

The S designates the star facet row, the 12 states there are twelve star facets.

6S means the sixth star facet clock-wise is elongated in a clock-wise manner, making the sixth star facet intersection have a basic S error. The 6S is the numera-

tor of the classification fraction. The blank underneath means that the error was not measured.

$\dfrac{7A}{.25}$ means that at the seventh star facet intersection clock-wise from the orientation arrow, an A error exists that is measurable and that the measurement is .25mm.

10R means that at the tenth star facet intersection clock-wise from the orientation arrow there is a false facet. The blank underneath means that the error was not measured.

Continuing the classifications:

M12—

| 1H | 2K | 3M | 4P | 5S | 6V |
|---|---|---|---|---|---|
| .28* .21 | .22* .25 | .31* .32 | .12* .10 | | |

| 7A | 8C | 9D | 10E | 11F | 12G |
|---|---|---|---|---|---|
| .37 | .24 | .31 | .29 | .33 | .20* .26 |

The M designates the main top facet intersection row, and the 12 states that there are twelve top main facets. The numerators of the fractions following locate and code the facet intersection errors, and the denominators state the measurements of these errors. Similarly, the rest of the classification is

D24—

| 4V | 7V | 8R | 16B | 20A | 24S |
|---|---|---|---|---|---|
| | | | .21 | .22 | |

In considering the split-facet brilliant we find that only basic errors A, B, R, S, and V of the foregoing fourteen errors are applicable to the split facet cut. None of the errors involving adjacent top main facets can be used.

However, if we substitute the table of the split-facet brilliant for the star facet of the brilliant, and substitute the star facets of the split facet brilliant for the top main facets of the brilliant, and substitute the top main facets of the split-facet brilliant for the D facets of the brilliant, that all of the previously pictured errors are applicable to the split-facet brilliant. In addition, four extra basic error intersection designations must be made to classify the D row at the girdle.

*Basic Error J* is characterized by the right hand D facet overlapping the right hand M facet. The left hand M facet and the left hand D facet intersect correctly.
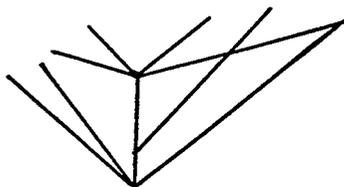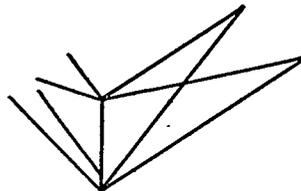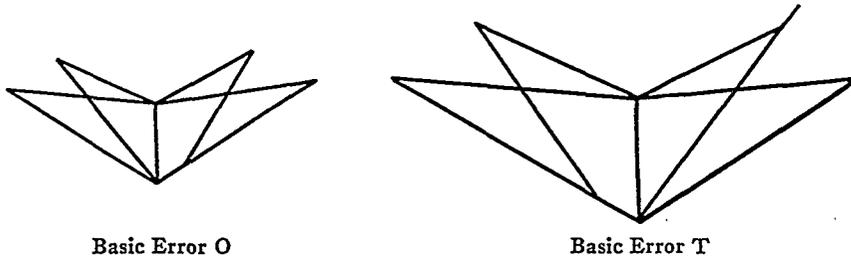


Basic Error J          Basic Error W

*Basic Error W* is the reverse of error J.

*Basic Error O* is when the right hand M facet overlaps the right hand D facet, and the left hand M facet and left hand D facet intersect correctly.

Basic Error O                                          Basic Error T

*Basic Error T* is the reverse of error O.

It is, of course, possible to combine these last four basis errors and in this case the code for the left hand error precedes the code for the right hand error when recorded as the numerator of the code fraction, with their respective error measurements below in the denominator, the measurement for the left hand error on the left hand, and the measurement for the right hand error on the right hand. As in the case for the brilliant cut, if one portion of the error is measurable and the other is not, then recording an error code with two errors inherent in it record the measurable portion in the correct side of the denominator.

The number following the letter designating the facet intersection row is the same as when used for the recording of imperfections and is a fraction that indicates that there is a different number of star and D facets than M facets, and, of course, a different number of facet intersections.

This is clearly shown in the figure 10, a split-facet brilliant that contains the four errors not possible on the brilliant cut, and the manner in which brilliant cut error codes are also applicable to the split-facet brilliant. The classification of this picture follows, but no explanation is necessary as the reader may always refer back to the explanations given for the brilliant cut.
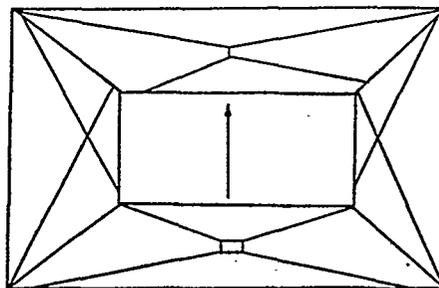
*Figure 10.*

The classification of figure 10 follows.

There is no S row in the classification of a Split-Facet Brilliant.

M8 — 1A 2E 3V 4C 5R 6D 7S 8M

  4

D— — 1W 2T 3O 4J

  8

(Measurement denominators are not shown in this picture as it is for the illustration of the errors only.)

The step cut facet intersection error classification is entirely different from the two previous cuts. Here there is no A, B, C, D, E, etc. Either the steps match at their intersection or they do not. If they match, no record is made. If they do not match, one measurement can be made or detached. Locate the intersection by row designation and clock-wise count. When recording, the numerator is the error location of the intersection, and the denominator is the measurement of that error. If not enough junctions are possible on the top of the stone, use the ones on the bottom that are visible through the table.

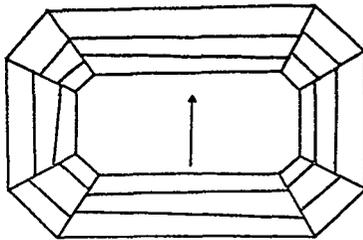A sample step cut is shown in figure 11, and its classification is illustrated below.



*Figure 11.*

The classification of the step cut stone in figure 11, not including the measurement denominators, lists no errors at the table intersections, at the girdle intersections, or at the culet intersections. Any measurements on the bottom of the stone are taken on the intersections of the first row away from the culet.

2M — 1 2 4 5 6 7 8

3M — 1 2 3 4 5 6 7

*Step 20.* Determine the magnification necessary to measure eleven facet errors. All measurements are taken with the table at right angles to the line of sight and are measured with a microscope equipped with a screw-type micrometer eyepiece.

*Aldrich & Davey*

Code No. *D* *R* 6.111- 6.24                    *100* Serial No.
         *B*    *3.67 MM*      *11-22-50*

NAME                *Aldrich & Davey*

ADDRESS *14430 Victory Blvd, Van Nuys, Calif.*
                    *SAME*

ARTICLE:

*ONE DIAMOND, 6.24, UNMOUNTED, FINE COLOR, CUT; FLAWLESS AT 10X*

*SEPT. 15, 1950*
*JOHN M. ALDRICH*                    *John M. Aldrich*

*Figure 12.*

Front of specimen classification card showing sample entries

*Step 21.* Record that power as the denominator of the third fraction. This power may or may not be the same as the numerator power.

*Step 22.* On the back of the card directly below the classification of the internal imperfections draw a separating line.

*Step 23.* Directly below the separating line, record by facet row from the table to the girdle ALL facet intersection basic errors visible at the power recorded in step 21 as numerators with their respective measurements as denominators, similarly to the examples previously shown. Do NOT record denominators that are not easily measurable. Do NOT record intersections apparently not in error.

*Step 24.* Record your name and address on the lower left hand corner of the face of the card. (See figure 12.)

*Step 25.* Record the date and sign your name on the lower right hand corner of the face of the card.

*Step 26.* Send the card (you certainly may keep a copy for yourself if you wish) to Aldrich & Davey, 14430 Victory Boulevard, Van Nuys, California, United States of America.

The Aldrich & Davey Central File urgently suggests that the data card be sent by some means that gives the sender a receipt, such as registered mail, return receipt requested, etc.

## How to Use the Recorded Data[1]

*Law Enforcement Agencies* in the event of the recovery of gemstones, gemstone bearing jewelry, or suspected recovery of the same will be notified by the Aldrich & Davey Central File of the information on the file records, to the requesting agency.

In the event that gemstones or gemstone bearing jewelry are reported as missing, fill out the data card as completely as possible, including the certificate serial numbers and codes if the gemstones were registered by the "Permanent Record of Identification" method. On receipt of the card the Central File will notify the requesting agency of the information on record at the Central File.

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1. Others than law enforcement agencies wishing to use this classification system, or information contained in the Central Files, are required to hold special license from the authors, who have U. S. Patent pending (No. 147984) on this process. For information concerning license privileges readers should address the authors at the address given in Step 26 above.