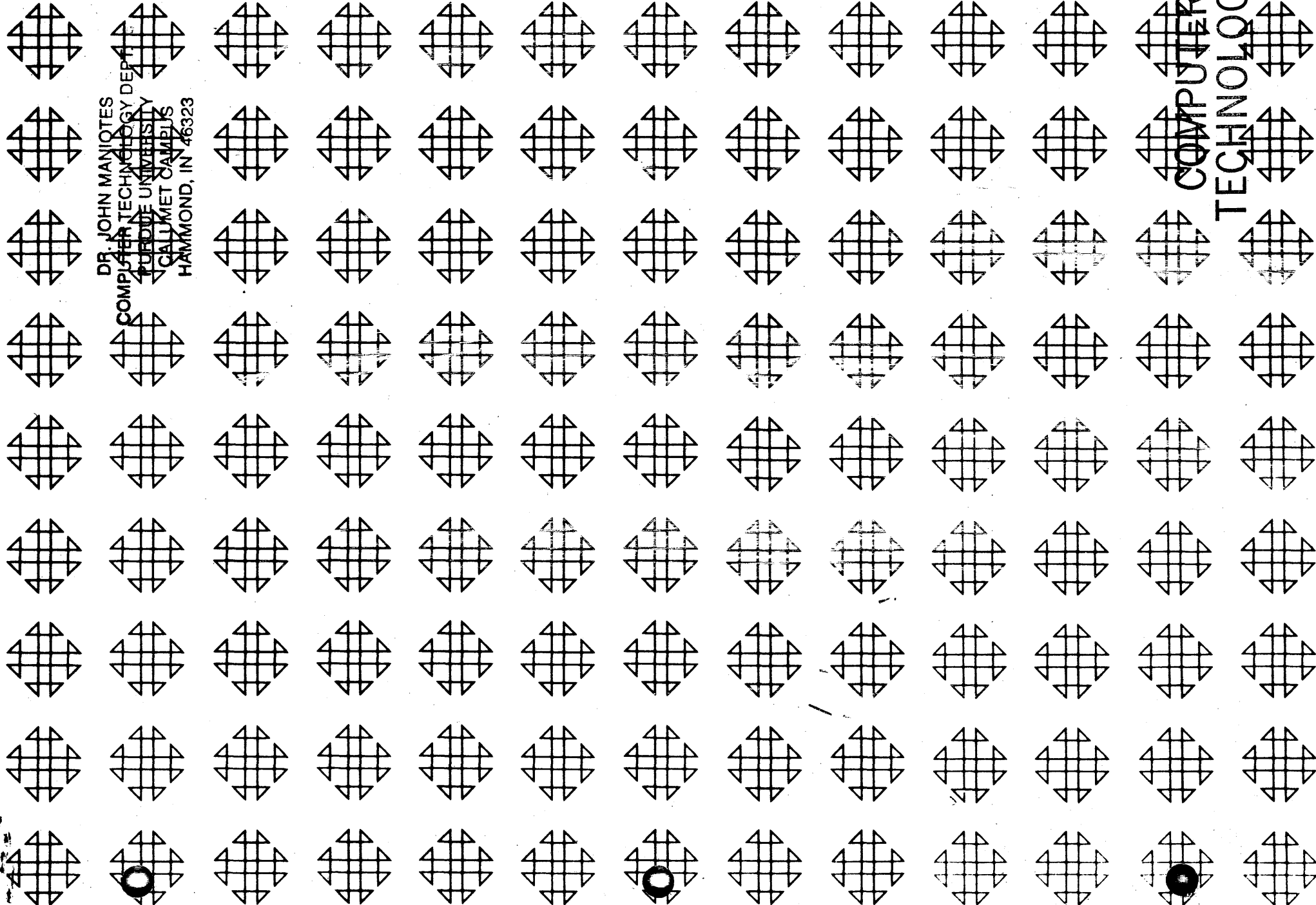


1620 GENERAL PROGRAM LIBRARY

Elementary German-to-English Translation 11.0.053 (Card)

11.0.054 (Paper Tape)



DR. JOHN MANIOTES  
COMPUTER TECHNOLOGY DEPT.  
Purdue University  
CALUMET CAMPUS  
HAMMOND, IN 46323

COMPUTER  
TECHNOLOGY

DR. JOHN HARRISON  
COMPUTER PROGRAMS  
PUBLISHED BY  
CALIFORNIA  
HARRISON

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COMMON USERS GROUP PROGRAM REVIEW AND EVALUATION

(fill out in typewriter, ink or pencil)

Program No. \_\_\_\_\_

Date \_\_\_\_\_

Program Name: \_\_\_\_\_

1. Does the abstract adequately describe what the program is and what it does? Yes \_\_\_ No \_\_\_  
Comment \_\_\_\_\_
2. Does the program do what the abstract says? Yes \_\_\_ No \_\_\_  
Comment \_\_\_\_\_
3. Is the description clear, understandable, and adequate? Yes \_\_\_ No \_\_\_  
Comment \_\_\_\_\_
4. Are the Operating Instructions understandable and in sufficient detail? Yes \_\_\_ No \_\_\_  
Comment \_\_\_\_\_  
Are the Sense Switch options adequately described (if applicable)? Yes \_\_\_ No \_\_\_  
Are the mnemonic labels identified or sufficiently understandable? Yes \_\_\_ No \_\_\_  
Comment \_\_\_\_\_
5. Does the source program compile satisfactorily (if applicable)? Yes \_\_\_ No \_\_\_  
Comment \_\_\_\_\_
6. Does the object program run satisfactorily? Yes \_\_\_ No \_\_\_  
Comment \_\_\_\_\_
7. Number of test cases run \_\_\_\_\_. Are any restrictions as to data, size, range, etc. covered adequately in description? Yes \_\_\_ No \_\_\_  
Comment \_\_\_\_\_
8. Does the Program meet the minimal standards of COMMON? Yes \_\_\_ No \_\_\_  
Comment \_\_\_\_\_
9. Were all necessary parts of the program received? Yes \_\_\_ No \_\_\_  
Comment \_\_\_\_\_
10. Please list on the back any suggestions to improve the usefulness of the program. These will be passed onto the author for his consideration.

Please return to:

Mr. Richard L. Pratt  
Data Corporation  
7500 Old Xenia Pike  
Dayton, Ohio 45432

Your Name \_\_\_\_\_  
Company \_\_\_\_\_  
Address \_\_\_\_\_  
Users Group Code \_\_\_\_\_

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ELEMENTARY GERMAN-TO-ENGLISH TRANSLATION

by

Ronald C. Read  
Computing Centre,  
Mathematics Department,  
University of the West Indies,  
Kingston 7,  
JAMAICA.

User No. 1323.

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Modifications or revisions to this program, as they occur, will be announced in the appropriate Catalog of Programs for IBM Data Processing Systems. When such an announcement occurs, users should order a complete new program from the Program Information Department.

TAPE KEY

1. Main program. Source tape.  
Hash total: 87325 32167 17478 76945
2. Complete program tape.  
Hash total: 62499 71910 56031 21413
3. Tape duplicator.  
Hash total: 29967 03450 10892 12574

DECK KEY

1. Complete program deck.  
(This is a self-loading dump  
prepared from the tape version).  
Hash total: 37119 34198 70406 56621

PROGRAM ABSTRACT

Title : Elementary German-to-English Translation.  
 Author : Dr. Ronald C. Read,  
 Mathematics Department,  
 University of the West Indies,  
 Kingston 7, Jamaica.

Direct enquiries to the author.

Description/purpose: This is a demonstration program the purpose of which is to illustrate the basic ideas of machine translation of languages by translating elementary German sentences into English. The vocabulary consists of about 150 different words (or about 330 words if inflected forms of the same word are counted separately). The built-in grammar is capable of handling many problems of word-order and multiple meaning, and will also cope to a reasonable extent with such difficulties as the use of DER, DIE and DAS as relative pronouns, and the correct handling of separable prefixes. This program is not of any use for practical translation, and is not intended to be. It is for demonstration purposes only. It has, however, been found to be of great interest to German speakers and teachers, and serves to indicate the sort of way in which practical machine translation of languages could be effected on large computers.

The method used is an elaboration of that described by V.H. Yngve (The Machine Translation of Languages, Essay 14, Ed. Locke and Booth, Technology Press of M.I.T. and

J. Wiley (1955), and by the author (Elementary Language Translation on the 1620, Proceedings of the Eastern-Midwestern meeting of the 1620 Users Group, Pittsburgh, October 1963).

Specification: Basic 20K tape or card 1620. No special features. The program is known to be compatible with indirect addressing, and should be compatible with any special features. The whole of storage is used.

The main program is in S.P.S., but is loaded in the form of a dump from 00300 in order to allow the multiplication table area to be used for additional storage (multiplication is not required). The data for the program (glossaries, grammar, etc.) follow the main program on the program tape or deck.

Language used in the write-up is English.

## DESCRIPTION OF THE PROGRAM

### INTRODUCTION

(This introduction has been adapted from the paper read at the Joint Eastern-midWestern region meeting of the 1620 Users Group, Pittsburgh, October 1963).

The idea of translating from one language into another is one that has received a great deal of attention for more than a decade now. The problems that it gives rise to are extremely interesting, but also exceedingly difficult; so much so that many experts in this field have declared that the highest aim of machine translation, namely fully automatic, high quality translation, is not only practically difficult but theoretically impossible to achieve. Not everyone agrees with this, but certainly it is clear that any program that is to be of practical use in translating from one language into another will have to be for a very fast machine with a very large storage. One need only consider that, apart from anything else, such a program would have to store the complete vocabularies of both languages. This alone would take up a considerable amount of storage and this is only the beginning..

It might seem pointless, therefore, to attempt to do anything in this field on a small and comparatively slow computer like the 1620. We could not hope to be able to set up, on such a machine, the complicated structure that is required for any useful machine

translation program. Nevertheless it is possible that the 1620 could be used for investigating some of the subsidiary problems which arise in research on machine translation, problems whose solution would be of assistance to those who, on larger machines, are working towards programs that are intended for practical translation.

For the investigation of these subsidiary linguistic problems it would not normally be necessary to store the complete vocabularies of the languages in question; in fact one could probably manage with a very small selection of words. And since the results of these investigations would be of theoretical rather than practical interest, the slowness of the machine would not be a handicap. Even so, for effective study of linguistic problems a fairly large 1620 installation would probably be advisable, - 60K with a disk drive or two, or something like that.

The present program is nothing like as elaborate as this. It is for the basic 20K tape 1620, and is consequently a very modest program. Although it will translate correctly quite a wide variety of sentences, it is quite possible (indeed, it is not even very difficult) to concoct sentences which will fool it completely. The program should be regarded merely as a tentative venture into what is, for the 1620, new territory. The program is called "Elementary translation from German to English", and by 'elementary' is meant just that. It should be made clear that this program is of no practical

use whatever; it is for demonstration purposes only. The reason for submitting it is that it may give some hints on how a larger 1620 installation might be used to perform a useful role in this very interesting branch of computer research.

#### THE THEORY OF THE PROGRAM

The first problem to be tackled is that of storing the dictionary, or glossary, that the program is to use, and programming a dictionary look-up technique. As far as the present program is concerned very little need be said about this. It is no great programming task to store pairs of words, one German, one English, and to devise a routine which, given a German word, will pick out the corresponding English word. The only complication is that there may be several English words corresponding to a given German word, so that provision must be made to pick out a particular one from several alternatives. This again is easy, provided that the rest of the program has successfully determined which of the alternatives is the one to be chosen. The determination of which equivalent is correct in a given context is a major problem, however, and is one of the two problems that this program is meant to illustrate, the other being the problem of the correct determination of word order. Let us look at how these two problems are handled.

The method used is that described in a paper by V.H. Yngve (1) included in the book "Machine Translation of Languages" which appeared in 1955. In fact this program started off as a machine



realization of a hand-simulated translation program described by Yngve in his paper. Briefly, the method is a recursive one, which progressively simplifies the input sentence, making changes in meaning and word order as it goes, until no further simplification is possible.

If every sentence to be translated were of the simple subject-verb-object type, machine translation would present few difficulties, but unfortunately most sentences are not so simple. Nevertheless, even in a sentence which is very complicated, there will be an underlying structure which may be simple. If we can uncover this simple structure we shall be well on the way to being able to handle the sentence for the purpose of machine translation. To illustrate how this can be done, let us consider the following sentence:

THE STOUT BANK-MANAGER WHO OWNS THE BLUE CADILLAC FREQUENTLY VISITS THE CHARMING YOUNG LADY WHO LIVES NEXT DOOR.

Now this is a fairly complicated sentence, but if we look at it we can see certain recognizable patterns. For example, STOUT BANK-MANAGER is an adjective-plus-noun combination which is common in English. BLUE CADILLAC and YOUNG LADY are two further examples of this pattern of parts of speech. If we think of STOUT BANK-MANAGER as a single unit rather than two separate words, then we would have to treat this unit as if it were a noun, since this is the function that it performs in the sentence. Let us do this. Similarly we can amalgamate the

two words BLUE CADILLAC into a single unit, which we shall henceforth treat as a noun, and, by a twofold application of this idea, we can amalgamate the three words CHARMING YOUNG LADY into yet another of these composite nouns.

The words FREQUENTLY VISITS exemplify another common pattern of parts of speech, viz. adverb plus verb. We can imagine these two words to be amalgamated into one unit, which will behave like a verb. Similarly NEXT DOOR is a unit which one could describe as a "post-adverb", coming after the verb, and this in turn will amalgamate with the verb LIVES to form a unit which we can treat as a verb.

The relative clauses WHO OWNS THE BLUE CADILLAC and WHO LIVES NEXT DOOR, when subjected to this amalgamation process, will finally form single units which can be called 'post-adjectives' - they are adjectival, but follow the noun. These post-adjectives will in turn amalgamate with the nouns to which they refer, and we shall then have a sentence of the form

The (NOUN) (VERB) the (NOUN).

Further amalgamation of the article "the" with the following noun will result in a sentence having the simple structure (subject) (verb) (object) which was mentioned earlier.

When used for machine translation this procedure of converting a long sentence of short units into a short sentence of long units has to be amplified. As each amalgamation is performed two other

processes have to be considered and, if necessary, effected. It may be necessary to alter the order of the words which are being amalgamated, and it may be necessary to make a note that some of the words will have to be translated by an English equivalent other than the one which appears first in the glossary. Thus in the German sentence

DAS FRÄULEIN SIEHT DIE KINDER NICHT.

(= The young lady does not see the children.)

the word patterns DAS FRÄULEIN and DIE KINDER can be recognised and treated as single units. There is no difficulty here. But then we have the three-word pattern

SIEHT (DIE KINDER) NICHT.

These three units can be amalgamated to form one unit (it will be a verb), but in doing so we must note the fact that, whereas in the German sentence the negative NICHT comes at the end, in the English sentence the negative comes before the verb. The order of these three units must therefore be altered (by a cyclic permutation) so that the negative comes before the other two units. At the same time we must note that this same word NICHT is to be translated by "does not" rather than by its 'basic' meaning of "not", which comes first in the glossary.

Thus the method is basically one of recognising patterns of successive parts of speech, followed by the three processes of

of amalgamation, permutation and modification (or rather, as we shall see, preparation for modification at a later stage). The sentence is repeatedly scanned, and whenever a pattern of parts of speech is recognised the above operations are performed. Each composite unit formed is allocated a part of speech, and this opens up the possibility of further patterns being present. When the stage has been reached at which there are no further patterns to be detected, each word in the sentence (which is probably by now somewhat rearranged) is replaced by the appropriate English equivalent (of which note has been kept) and these words are printed out as the translation.

This method is not, of course, anything like a full answer to the question of how to translate from one language to another; it does not suffice even for the purposes of the present program, which uses some other stratagems to be described later. Nevertheless it is surprising how much can be done by the use of this method alone. Much depends on how detailed is the classification of words into various parts of speech (which, incidentally, may not be at all like the grammarian's parts of speech), and on the range and comprehensiveness of the lists of patterns (syntax lists) that are included in the program.

Description of data areas

(a) German glossary - There are two glossaries in the program, - a German and an English glossary. A typical entry in the German glossary is as follows:

485645596368009470945  
(H O E R T)

First comes the German word, flagged to form a field. Then comes three digits which form a "syntax number", which corresponds roughly to a part of speech; in the example shown 680 is the syntax number for the third person singular, present tense of a verb. After the syntax number comes a string of 4-digit fields, which give the addresses at which the possible equivalents to the German word are stored. All English words being stored in the first half of memory, it is necessary only to list the final 4 digits of their addresses; the leading zero is supplied by the program when required. The final 4-digit field in each entry has a flag on the low order digit, serving to signal the end of that particular entry.

The first digit of the syntax number always has a flag; the second has a flag if the word is a verb which may be modified by a separable prefix (as here); and the third digit is flagged if the word is an animate noun.

(b) The Index - The last four digits of the address of each

German word are stored in a separate part of memory, - the index. All German words are stored in the upper half of memory, so that when an entry from the index is used, a leading 1 is supplied by the program to give the address of the corresponding German word.

On the following pages is given a typeout of the contents of the German glossary and its index. The first column gives the address of the German word, regarded as a field. The second column gives the German word, and column three its syntax number. Column 4 gives the entries corresponding to the English words i.e. their addresses without the initial zero, and the last column gives the English words themselves.

Thus the entry

10751	AUF	923	0410	
10751	AUF	923	6803	ON
10751	AUF	923	6615	UPON
10751	AUF	923	603R	IN

in this type-out corresponds to the entry

4164469230410680366156039  
↑  
10751

in the glossary. The words ON, UPON and IN are stored as fields with addresses 06803, 06615 and 06039 respectively; 00410 is the address of an alphameric blank.

(c) English Glossary - Since the English words are referenced by their addresses, as stored with the corresponding German word, they can be put anywhere in the first half of memory, and they take the form of fields with an even number of digits. Most of these occur in locations 05800 to 07055, but others will be found in the multiplication table area and squeezed into odd gaps in the main program. (In the program listing the presence of these words is indicated by a comment in parentheses). Some words are included in others. Thus the words, I, IN and INTO are all contained in the field 49556356; the choice of address determines the choice of word.

(d) The syntax lists - There are three of these, for 2-word, 3-word and 4-word groups. An entry consists of

- (i) a 6-, 9- or 12-digit field consisting of the 2, 3, or 4 syntax numbers (with no flags except on the first digit).
- (ii) 2, 3 or 4 digits. Each of these digits represents a choice from the possible alternative translations of the German word. Thus '0' means "take the first English equivalent", a '1' means "take the second", and so on.
- (iii) A 3-digit field. This consists of the last three digits of the address of a routine which effects the required permutation of the group of words. These routines all occur between locations 04000 and 04999, and the leading '04' is supplied by the program when the branch to the routine is made.

(iv) A 3-digit syntax number. This is the syntax number which will be assigned to the word-group when it has been amalgamated into a single unit.

Each syntax list is terminated by a dummy field of 6, 9 or 12 nines.

Typeouts of the three syntax lists, in which the various entries are displayed with spaces for greater clarity, are given later in this write-up. The addresses on the left are those of the left-hand digits of the entries.

(e) The verb-changer - If a separable prefix is encountered, the address of the last verb capable of having a separable prefix is altered to that of the prefix+verb combination. Thus if the word HOERT occurs, the address of the corresponding entry in the German glossary is saved. If the word ZU is later encountered as a separable prefix, this address is changed to that of the word ZUHOERT. The verb-changer lists the necessary changes.

Each entry in the verb-changer consists of

- (i) A 4-digit field giving the address of the verb in the glossary (i.e. that of HOERT).
- (ii) A single digit. This is the last digit of the syntax number of the prefix. These are all the form 92x, so that 10 separable prefixes could be accommodated by the program as it stands.
- (iii) A 4-digit field giving the address of the prefix+verb combination in the glossary.

The verb-changer is terminated by the dummy entry 99999.

A listing of the verb-changer is given later in this write-up.

THE WORKING OF THE PROGRAM

PHASE 1. The first phase of the program is the analysis of the input sentence. The first word is isolated (by detecting the following blank) and is looked up in the German glossary. If it is found, then the information concerning its syntax number and its English equivalent is stored in a manner described below. If the word is not in the glossary, it is stored, treated as its own equivalent, and the syntax number 777 is given to it.

Each word in the sentence is treated in this way until a period is reached, or until the record mark at the end of the input area is detected. Each word is examined to see whether it ends with a comma (which will not normally be separated from the preceding word), and if a word is a verb which might have to be modified by a separable prefix, the address of its entry in STORE (see below) is saved.

If a comma or period is detected, the previous word is examined to see whether it was a separable prefix. If it was, then the entry in STORE is modified according to the verb-changer list.

As each word is processed, entries are added to three data areas, STORE, SYNTAX and ADDRESSES as follows:

To STORE is added a five digit field, the last digit of which is a

zero. The first four digits give the address (assuming a leading 1) of the first four-digit field following the syntax number of the word in the glossary. (As mentioned above, this - with a leading zero supplied - is the address of the first English equivalent).

To SYNTAX is added the syntax number of the word, as a three-digit field.

To ADDRESSES is added the address of the entry that has just been put in STORE. In fact, only the last three digits of this address are put into ADDRESSES; the program supplies the digits 05 needed to complete the address when it is required.

The only flag on the entry in SYNTAX is that on the left-most digit. If the syntax number (as given in the glossary) also has a flag on its middle digit (indicating a verb that might be modified) this flag will have already served its purpose (the address in STORE has been saved) and it is removed. A flag on the right-most digit (denoting an animate noun) is also removed, but the information that it was present is preserved by setting a flag on the right-most digit of the corresponding entry in ADDRESSES.

When the end of the sentence is reached, STORE, SYNTAX and ADDRESSES are terminated by dummy entries 5, 3 and 3 digits respectively, each ending in a record mark.

Thus, after phase 1 is completed for the sentence

DER VATER KOMMT NICHT

these three data areas will look as follows:

STORE 16790 63880 42980 48890 0000+

SYNTAX 003 024 680 870 00+

ADDRESSES 005 010 015 020 00+

PHASE 2. In phase 2 the syntax numbers in SYNTAX are examined to see which amalgamations and permutations of the units of the sentence are possible.

Flags are cleared to make the first four entries in SYNTAX into a single 12-digit field. This is looked up in the 4-word syntax list. If it is not found there, the first three entries in SYNTAX are looked up in the 3-word syntax list. If this is not found, the first two entries are checked against the 2-word list.

If none of these look-ups produces a result, the whole procedure is repeated, ignoring the first entry in SYNTAX. (This is done by moving SYNTAX and ADDRESSES one entry to the left).

If an entry is found, then the digits which follow it in the syntax list entry are put in the units positions of the corresponding fields in STORE. A branch is then made to the appropriate permutation instruction, which permutes the entries in STORE. The relevant entries in STORE are then merged into one field, and all except the last of the corresponding entries in ADDRESSES are eliminated. The group of syntax numbers is replaced by the equivalent syntax number as given by the last field in the entry in the syntax list.

Thus after the first change has been made in the sentence quoted above, the data areas will read

STORE 1679063880 42980 48890 0000+

SYNTAX 060 680 870 00+

ADDRESSES 010 015 020 00+

(The relevant 2-word syntax list entry is 003024 00 208 060)

Thus the entries in STORE will, in general, be of variable length, but tally is kept of them in ADDRESSES. After these changes have been made, SYNTAX and ADDRESSES are again moved to the left and the process continues.

Thus the next operation, with the syntax list entry 680870 13 196 680 will produce

STORE 1679063880 4889342981 0000†  
 SYNTAX 060 080 00†  
 ADDRESSES 010 020 00†

Note that the entry 196, initiating a branch to 04196, has caused the two fields 42980 and 48890 to be interchanged before amalgamation. Note also the modification to the final digits of the entries in STORE.

Eventually (as here) the end of the sentence will be reached. If any changes have been made during this run through the sentence then SYNTAX and ADDRESSES are restored to their original positions and phase 2 is repeated. When a run through of the sentence is completed without any changes being made, phase 2 ends and phase 3 begins.

For our specimen sentence this occurs on the second run through, with the data areas reading as above.

PHASE 3. This copes with the possible use of DER, DIE, DAS as relative pronouns. At this stage any of these words that are, in fact, articles will have been amalgamated with nouns, and their syntax numbers will not appear in SYNTAX. Thus the syntax numbers 003, 002, 004 appearing at this stage will indicate relative pronouns.

The SYNTAX and ADDRESSES areas are scanned, entry by entry, and whenever a noun or pronoun is met (syntax No. < 060) note is made of whether it is animate (a flag in the ADDRESSES entry) or not. If a relative pronoun (detected as above) is met, the units digit of the entry in STORE is modified to give the translation WHO or WHICH (as the case may be according to the last noun or pronoun encountered) and the syntax number is changed to 400 (= relative pronoun).

The changing of this syntax number opens up the possibility of further amalgamations, and the program therefore goes back and repeats phase 2. If no relative pronouns are detected, the program goes on to phase 4.

PHASE 4. This is the output phase.

The entries in STORE are now in the correct order for the output sentence, and the flags are put back on each five-digit field. In each field the final digit is used to modify the first four digits so as to get the correct field for the English equivalent. Thus STORE, for our example, becomes 16790 63880 49010 43020 0000† . Via the addressed entry in the German glossary, the English word is now found, and is printed. A cumulative total of the lengths of the words is kept, and if the printing of the word would cause the line to exceed 70 characters a new line is started. A blank equivalent to a German word is suppressed, and the preceding blank is suppressed for " , " " \*S " and " S\* ". (The asterisk does duty for an apostrophe).

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After the sentence has been printed, the program clears the data areas and returns to read another sentence.

Map of Storage Area Used

00062 - 00299	English words.
00300 - 00400	Addition tables.
00401 - 04499	Program.
04500 - 05000	English words
05001 - 05799	Working areas
05800 - 07055	English words.
07056 - 08671	Three-word syntax list.
08672 - 09999	Index to German Glossary.
10000 - 10039	Space for unknown words.
10040 - 16946	German Glossary.
16947 - 17312	Verb changer.
17313 - 19084	Two-word syntax list.
19085 - 19999	Four-word syntax list.

OPERATING INSTRUCTIONS

1. Clear storage, as follows:

Set PARITY switch to program.

INSERT 260000200003

RELEASE AND START

After at least one second, press INSTANT STOP, RESET

Set PARITY and I/O switches to STOP

Set O'FLOW switch to PROGRAM.

For tape input

2. Load the complete program tape (Tape No. 2).
3. INSERT 3600000003; RELEASE and START.

For card input

2. Load the program deck (deck No. 1) in the hopper.
3. Press LOAD button
4. When the program tape or deck has been read, the carriage of the typewriter will return twice.
5. Type in a German sentence in the normal manner. An umlaut should be represented by a following 'E', i.e. "hören" should be typed as "HOEREN", and so on. Only commas and periods are available for punctuation, and a period will always be taken to denote the end of the input sentence.



Anything typed after a period will be ignored. In fact it is not necessary to finish the sentence with a period, though this would normally be done.

Note: If the sentence runs to more than one line, remember to space after the last word of the line. Otherwise this word will not be separated, in storage, from the first word of the next line.

6. If no error has been made, press RELEASE and START. To correct an error, put SWITCH 4 ON, press RELEASE and START, and turn SWITCH 4 OFF. Then repeat from step 5.
7. In the absence of an error condition (see 9), and after a time depending on the length and complexity of the sentence, the typewriter carriage will return and the translation will be typed out.
8. The carriage returns twice, and the program is ready to accept another sentence. Repeat from step 5.
9. The word UNVERDAULICH (= indigestible) will be typed out if any of the following conditions obtain:
  - (a) The sentence contains more than 33 words
  - (b) Any one word contains more than 15 characters
  - (c) The total length of the sentence (including blanks) exceeds 200 characters
  - (d) The sentence includes more than 10 words that are not in the glossary.

After this error message the program returns to step 5. The typing of a period alone, or of a separable prefix alone causes an immediate return to step 5. No error message is typed. Except with erroneous input of this kind, some "translation" will always be typed. What is typed may or may not be a valid translation of the input German sentence, since the program is by no means infallible. Input words that are not found in the glossary are reproduced unchanged on output.

10. As far as is known it is not possible for this program to arrive at a check stop, or to hang up, under normal conditions. If for any reason it is required to restart the program manually, RESET and INSERT 4900402, RELEASE and START.

NOTE: When the card program is first loaded the English words that are to be stored from 00062-00399 will be found in locations 50019 and up, preceded by the following pair of instructions:

```
05000 31 00062 05019
05012 49 00402
```

which, on execution, transmits these data (and the addition tables) to their final resting place at 00062 and up, and branches to the beginning of the program. The purpose of this is to obviate the difficulties that would otherwise arise in loading the card program because of the use, by the program, of the load area. Since 05000 is the beginning of the working area of the program, the above instructions and data are overwritten as soon as the program is run.

To duplicate the tape program, load tape 3 in the same way as the program tape and follow the typed instructions.

PROGRAM LISTING

```

* GERMAN TO ENGLISH TRANSLATION 24 MARCH 1966
*
*
00001 DORG 402
00002 START RCTY 26463,,17, %BUT
00003 TFM CLEAR66,AREA-4,, PREPARE WORKING AREAS
00004 AM CLEAR66,4,10
00005 CLEAR TR ,NRC-5
00006 CM CLEAR66,ADDST-4
00007 BNI CLEAR-12,1206,11
00008 READ RCTY 84163,, %THAT

* PHASE 1. READ IN AND SORT OUT THE GERMAN SENTENCE.
*
00009 RATY INPUT,156,10, %OF AM
00010 BC4 START612,415,9, %AM
00011 BNR ERROR,ADDST

* INITIALIZE STORE, SYNTAX, AND ADDRESSES.
*
00012 TFM STORE,,9
00013 TFM ADDS,ADDST-1
00014 TFM SYNTAX,SYNST-1
00015 TFM SIND,UNWDST,8
00016 TFM GO66,43,8
00017 TFM DIGIT,INPUT-1
00018 GD TDM GUARD,49620,7, %IS
00019 DC 1,@,*

* TEST FOR RECORD MARK. END PHASE 1 IF PRESENT.
*
00020 RM BNR ZERO
00021 B LAP,50000,7
00022 DORG *-3
00023 ERROR RCTY 14468,, %LADY
00024 WATY ERM
00025 B START
00026 DORG *-5
00027 ZERO TF *623,DIGIT,, TEST FOR ZERO
00028 BD FLAG
00029 FLSTP AM DIGIT,1,10, TEST FOR FULL STOP.
00030 TF *623,DIGIT
00031 BD LAP
00032 TB AM DIGIT,1,10
00033 B RM,, TAKE NEXT LETTER.
00034 DORG *-3
00035 FLAG TF *618,DIGIT,, NONZERO FOUND. FLAG IT
00036 SF ,6345,8
00037 NOP 43484,55962,, %TEACHERS
00038 TFM LENGTH
00039 LOOP AM DIGIT,2,10,LOOK FOR NEXT ZERO.
00040 AM LENGTH,2,10
00041 TF *623,DIGIT
00042 BD LOOP
00043 TF WORD,DIGIT,, NOTE PREVIOUS DIGIT.
00044 SM WORD,1,10
00045 TF CHECK66,WORD
00046 TF FLDD611,DIGIT

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00047 SM FLDD611,2,10
00048 FLDD BNF HERE,, IS PREVIOUS DIGIT FLAGGED.
00049 B FLGOFF636,, %MISS
00050 DORG *63
00051 HERE TF *618,FLDD611,, NO. SET FLAG ON IT.
00052 SF ,4845,8
00053 NOP 59625,55666,6, %HEARS NOW
00054 CHECK CM ,2323,8910, TEST FOR COMMA
00055 BNE FLGOFF
00056 TFM SWITCH66,COMMA
00057 SM WORD,2,10
00058 FLGOFF TF *618,HERE618,, REMOVE FLAG
00059 CF ,5753,8
00060 NOP 68626,24166,6, %PLAYS,SAW

*
* UPGRADE STORE, SYNTAX, AND ADDRESSES.
*
00061 BTM UPGRAD,4,10
00062 CM SYNTAX,SYNST698
00063 BNN ERROR

*
* PUT ADDRESS OF FIRST GLOSSARY ENTRY INTO ENTRY
*
00064 TFM COMP-1,ILA63
00065 UNITE TF ENTRY
00066 COMP C 10000,, COMPARE ENTRY AND WORD
00067 BV *624,1462,811,%S
00068 BE STACK,, WORD FOUND IN GLOSSARY.
00069 AM COMP-1,4,10
00070 TF *623,COMP-1
00071 BNR UNITE,, WAS THAT THE LAST ENTRY.

*
* WORD NOT IN GLOSSARY. ARRANGE TO STORE IT.
*
00072 NOTIN CM LENGTH,34,, TEST FOR LONG WORD
00073 BP ERROR
00074 SF LENGTH-1,48496,7, %HIS
00075 A SIND,LENGTH
00076 TF MARK&11,WORD,, STORE WORD.
00077 MARK TF
00078 SM GO66,4,10
00079 BN ERROR
00080 GO TF 10000,SIND,, STORE ITS ADDRESS.
00081 TF ENTRY,GO66
00082 TFM BOX,777,9
00083 TFM KEY,777,9
00084 B SYN,, INCLUDE IN STORE.
00085 DORG *-3

*
* DEAL WITH SYNTAX NUMBER.
*
00086 STACK AM ENTRY,1,10,ENTER SYNTAX NUMBER.
00087 TF *623,ENTRY
00088 TD KEY-2,10000,,EXTRACT 1ST DIGIT OF SYN. NO.
00089 AM ENTRY,2,10
00090 TF *623,ENTRY,,EXTRACT REST OF SYN. NO.
00091 TF KEY,10000
00092 TF BOX,KEY,, PUT END OF SYN. NO. INTO BOX

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00880 12 00903 00002
00892 44 00918 00000
00904 49 01038 00000
00918
00918 26 00936 00903
00930 32 00000 0M845
00942 41 5962N 55666
00954 14 00000 0K1K3
00966 47 01002 01200
00978 16 01544 01590
00990 12 01109 00002
01002 26 01020 00936
01014 33 00000 0N753
01026 41 68620 24166

01038 17 01780 00004
01050 14 01448 05799
01062 46 00626 01300

01074 16 01097 08675
01086 26 01104 00000
01098 24 10000 00000
01110 46 01134 0J46K
01122 46 01322 01200
01134 11 01097 00004
01146 26 01169 01097
01158 45 01066 00000

01170 14 01429 00034
01182 46 00626 01100
01194 32 01428 M8496
01206 21 01236 01429
01218 26 01241 01109
01230 26 00000 000
01242 12 01272 00004
01254 47 00626 01300
01266 26 10000 01236
01278 26 01104 01272
01290 16 00669 00P77
01302 16 00435 00P77
01314 49 01442 00000
01322

01322 11 01104 00001
01334 26 01357 01104
01346 25 00433 10000
01358 11 01104 00002
01370 26 01393 01104
01382 26 00435 10000
01394 26 00669 00435

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00093 CF KEY-1,48566,7, %HOT 01406 33 00434 M8566 00142  
00094 CF KEY 01418 33 00435 00000 00143  
00095 AM ENTRY,4,10 01430 11 01104 00004 00144  
00096 SYN TF ,KEY,, ENTER FLAGLESS SYNTAX NUMBER. 01442 26 00000 00435 00145  
\*  
\* ENTER RELEVANT GERMAN GLOSSARY ADDRESS INTO STORE.  
\*  
00097 PUT TF AREA,ENTRY 01454 26 05001 01104 00149  
00098 TF PEN,STORE 01466 26 00725 01460 00150  
00099 AM STORE,1,10 01478 11 01460 00001 00151  
00100 TRIOS TF ,STORE 01490 26 00000 01460 00152  
00101 BNF VERB,BOX 01502 44 01552 00689 00153  
00102 TF \*618,ADDS 01514 26 01532 01496 00154  
00103 SF ,48414,7, %HAD 01526 32 00000 M8414 00155  
00104 SWITCH B FLSTP,, %FROM 01538 49 00680 00000 00156  
00105 DORG \*63 01552 00157  
00106 VERB BNF SWITCH,BOX-1,, IS THE WORD A MODIFIABLE VERB 01552 44 01538 00688 00158  
00107 TF GUARD,PEN 01564 26 02049 00725 00159  
00108 B SWITCH,, %SEES 01576 49 01538 00000 00160  
00109 DORG \*63 01590  
00110 COMMA TF TRUNK&6,SYNTAX 01590 26 01620 01448  
00111 SM TRUNK&6,1,10 01602 12 01620 00001  
00112 TRUNK CM ,92,10, PREFIX BEFORE COMMA. 01614 14 00000 000K2 00161  
00113 BE PRECOM,01243,10, GO TO MODIFICATION ROUTINE. 01626 46 01818 012M3  
00114 NOP 63434,84562,, %CATCHES 01638 41 63434 84562  
\*  
\* UPGRADE STORE, SYNTAX, AND ADDRESSES.  
\*  
00115 BTM UPGRAD,5,10 01650 17 01780 00005  
00116 NINES SM STORE,1,10 01662 12 01460 00001 00165  
00117 TF \*618,ADDS 01674 26 01692 01496 00166  
00118 TF ,STORE 01686 26 00000 01460 00167  
00119 TF \*618,SYNTAX 01698 26 01716 01448 00168  
00120 TFM ,995,9, PUT SYNTAX NO. # 995. 01710 16 00000 00R95 00169  
00121 TF \*618,STORE 01722 26 01740 01460 00170  
00122 TFM AREA,GLA68,8 01734 16 05001 10048 00171  
00123 TFM SWITCH&6,FLSTP 01746 16 01544 00680 00172  
00124 AM STORE,1,10 01758 11 01460 00001  
00125 B FLSTP 01770 49 00680 00000  
00126 DORG \*-1 01780  
00127 UPGRAD A STORE,UPGRAD-1,, UPGRADING SUBROUTINE. 01780 21 01460 01779 00173  
00128 AM ADDS,3,10 01792 11 01496 00003 00174  
00129 AM SYNTAX,3,10 01804 11 01448 00003 00175  
00130 BB 01816 42 00000 00000  
00131 DORG \*-9 01818  
00132 PRECOM TFM BRANCH&6,NINES 01818 16 02026 01662  
\*  
\* SUBROUTINE TO MODIFY VERB BY SEPARABLE PREFIX  
\*  
00133 SPMOD TF SEP&11,SYNTAX 01830 26 01903 01448  
00134 BNR PR,GUARD 01842 45 01868 02049 00180  
00135 B BRANCH,, NO VERB SAVED. %THIS 01854 49 02020 00000 00181  
00136 DORG \*63 01868 00182  
00137 PR TF \*623,GUARD 01868 26 01891 02049 00183  
00138 TF TARGET-1,AREA 01880 26 02616 05001 00184  
00139 SEP TD TARGET,, WHICH PREFIX 01892 25 02617 00000 00185  
00140 TFM LOOKUP&11,TARGET 01904 16 04077 02617 00186  
00141 TFM LOOKUP&6,VBCHG&6 01916 16 04072 J6951 00187

TFM LOOKUP&18,GOTIT 01928 16 04084 01960  
BTM LOOKUP,9,10 01940 17 04066 00009  
B CHANGE&12 01952 49 02008 00000  
DORG \*-3 01960  
GOTIT TF CHANGE&11,LOOKUP&6,, COMBINATION FOUND. 01960 26 02007 04072  
AM CHANGE&11,4,10 01972 11 02007 00004  
TF CHANGE&6, GUARD,, MAKE THE CHANGE 01984 26 02002 02049  
CHANGE TF AREA 01996 26 05001 00000  
TD GUARD,400 02008 25 02049 00400  
BRANCH B 02020 49 00000 00000  
DORG \*-3 02028  
LAP TF WIND&6,SYNTAX,, WIND JP PHASE 1. 02028 26 02058 01448  
SM WIND&6,1,10 02040 12 02058 00001  
WIND CM ,92,10, TEST FOR SEPARABLE PREFIX. 02052 14 00000 000R2  
BNE UPSSA 02064 47 02108 01200  
SM STORE,1,10 02076 12 01460 00001  
TFM BRANCH&6,FINAL 02088 16 02026 02120  
B SPMOD 02100 49 01830 00000  
DORG \*-3 02108  
\*  
\* UPGRADE STORE, SYNTAX AND ADDRESSES.  
\*  
00161 UPSSA BTM UPGRAD,4,10 02108 17 01780 00004  
\*  
\* TERMINATE STORE, SYNTAX AND ADDRESSES.  
\*  
00162 FINAL TF \*618,STORE 02120 26 02138 01460  
00163 TR AREA,ZRM-1 02132 31 05001 03616  
00164 TF \*618,ADDS 02144 26 02162 01496  
00165 TDM ,54450,7, %ME 02156 15 00000 N4450  
00166 DC 1,@,\* 02167  
00167 TF \*618,SYNTAX 02168 26 02186 01448  
00168 TDM ,42680,7, %BY 02180 15 00000 M2680  
00169 DC 1,@,\* 02191  
00170 BNR BEGIN,5005 02192 45 02210 05005  
00171 B START 02204 49 00402 00000  
00172 DORG \*-5 02210  
\*  
\* PHASE 2. WORD ORDER AND WORD MODIFICATION.  
\*  
00173 BEGIN TF ADTOP,0&6 02210 26 02452 02288  
00174 TFM SYNTOP,SYNST 02222 16 02488 05701  
00175 AGAIN BNR NRA,SYNST&5 02234 45 02350 05706  
\*  
\* RESTORE ADDS AND SYNTAX TO ORIGINAL POSITIONS.  
\*  
00176 TF \*623,ADTOP 02246 26 02269 02452  
00177 TR SPACE 02258 31 05500 00000  
00178 TF \*623,SYNTOP 02270 26 02293 02488  
00179 TR ADDST,\*2 02282 31 05601 00000  
00180 TR SYNST,ADDST 02294 31 05701 05601  
00181 TR ADDST,SPACE 02306 31 05601 05500  
00182 BD CUT,FIND,, ANY CHANGES IN LAST RUN. 02318 43 02948 02061  
00183 TDM FIND,48495,7, RESET FIND. %HIM 02330 15 02061 M8495  
00184 B BEGIN 02342 49 02210 00000  
00185 DORG \*-3 02350  
00186 NRA CF SYNST&3,5655,8, %ONE 02350 33 05704 0N655  
00187 BNR NRB,SYNST&8,, ARE ONLY TWO WORDS LEFT 02362 45 02514 05709

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00188 LB TFM LOOKUP611,SYNST&5 02374 16 04077 05706
00189 TFM LOOKUP66,WL2&5 02386 16 04072 J731b
00190 TFM LOOKUP618,EQB 02398 16 04084 04128
00191 BTM LOOKUP,14,10 02410 17 04066 000J4
*
* LOOK AT NEXT PART OF SENTENCE.
*
00192 RESUME TF HEAD611,ADTOP 02422 26 02457 02452
00193 SM ADTOP,3,10 02434 12 02452 00003
00194 HEAD TR ,,, SHIFT ADDRESSES AND SYNTAX. 02446 31 00000 000
00195 TF CAPUT611,SYNTOP 02458 26 02493 02488
00196 SM SYNTOP,3,10 02470 12 02488 00003
00197 CAPUT TR 02482 31 00000 00000
00198 SF SYNST,56534,7, %OLD# 02494 32 05701 N6534
00199 B AGAIN 02506 49 02234 00000
00200 DORG *-3 02514
00201 NRB CF SYNST66,6248,8, %SHE# 02514 33 05707 00248
00202 BNR NRC,SYNST611,, ARE ONLY THREE WORDS LEFT 02526 45 02606 05712
00203 LC TFM LOOKUP611,SYNST&8 02538 16 04077 05709
00204 TFM LOOKUP66,WL3&8 02550 16 04072 07064
00205 TFM LOOKUP618,EQC 02562 16 04084 04140
00206 BTM LOOKUP,18,10 02574 17 04066 000J8
00207 SF SYNST66,41554,7, NO LUCK. TRY 2-WORD LIST 02586 32 05707 M1554
00208 B LB,,, %AND# 02598 49 02374 00000
00209 DORG *-3 02606
00210 NRC CF SYNST69 02606 33 05710 00000
00211 DC 1,@,* 02617
00212 TFM LOOKUP611,SYNST&11 02618 16 04077 05712
00213 TFM LOOKUP66,WL4&11 02630 16 04072 J9096
00214 TFM LOOKUP618,EQD 02642 16 04084 04152
00215 BTM LOOKUP,22,10 02654 17 04066 000K2
00216 SF SYNST69,621,9, NO LUCK. TRY 3-WORD LIST 02666 32 05710 00021
00217 B LC,0, %S*# 02678 49 02538 00000
00218 DORG *-1 02688
*
* WORD GROUP FOUND %SUBROUTINE#
*
00219 GROUP TF NEWSYN66,*-2 02688 26 02922 02686
00220 TF HOLD611,LOOKUP66 02700 26 02783 04072
00221 TD *623,GROUP-1 02712 25 02735 02687
00222 AM HOLD611,,10 02724 11 02783 00000
00223 TF HOLD623,GROUP-2 02736 26 02795 02686
00224 RTN TF BRCH611,HOLD611 02748 26 02939 02783
00225 AM BRCH611,3,10 02760 11 02939 00003
*
* ADD TAGS FOR LATER WORD-MODIFICATION
*
00226 HOLD TFM TAG611 02772 16 02843 00000
00227 TF TAG66,ADDST 02784 26 02838 05601
00228 CF TAG66,4963,8, TO AVOID INDIRECT ADDRESS %IT# 02796 33 02838 0M963
00229 TF TAG-1,TAG66 02808 26 02831 02838
00230 BD TAG612,AREA,,DONT TAG IF TAGGED ALREADY 02820 43 02844 05001
00231 TAG TD AREA 02832 25 05001 00000
00232 SM TAG611,1,10 02844 12 02843 00001
00233 SM HOLD623,3,10 02856 12 02795 00003
00234 BD HOLD612,HOLD623 02868 43 02784 02795
00235 TDM FIND,41630,7, NOTE FINDING OF GROUP. %AT# 02880 15 02061 M1630
00236 TF NEWSYN611,HOLD611 02892 26 02927 02783

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00237 AM NEWSYN611,6,10 02904 11 02927 00006
00238 NEWSYN TF SYNST,,, ENTER RESULTANT SYNTAX NUMBER 02916 26 05701 00000
00239 BRCH TF *618 02928 26 02946 00000
00240 B P21,,, GO TO A PERMUTATION INSTRUCTION 02940 49 04196 00000
00241 DORG *-3 02948
*
* PHASE 3. TRANSMUTATION OF RELATIVE PRONOUNS.
*
00242 CUT TFM M,SYNST62,, LOOK FOR RELATIVE PRONOUNS. 02948 16 02983 05703
00243 TFM N,ADDST&2 02960 16 03198 05603
00244 MISRMK BNR RELPRN,,, IS SEARCH FINISHED. 02972 45 02992 00000
00245 B OUTPUT 02984 49 03236 00000
00246 DORG *-3 02992
00247 RELPRN TF *618,M,, IS WORD A REL. PRONOUN. 02992 26 03010 02983
00248 CM ,10,9 03004 14 00000 00010
00249 BNN NOUN 03016 46 03132 01300
00250 DGT TDM W,54681,7, YES. MAKE MODIFICATIONS. %MY# 03028 15 02059 N4681
00251 BNF ALTER,SWAN 03040 44 03064 00401
00252 TDM W,03002,7, %,@# 03052 15 02059 03002
00253 DC 1,@,*-1 03062
00254 ALTER TF *623,N 03064 26 03087 03198
00255 TF *618 03076 26 03094 00000
00256 TD AREA,W 03088 25 05001 02059
00257 TF *618,M 03100 26 03118 02983
00258 TFM ,400,9,CHANGE SYNTAX NO. TO 400. 03112 16 00000 00M00
00259 B BEGIN,,, GO BACK TO PHASE 2. 03124 49 02210 00000
00260 DORG *-3 03132
00261 NOUN TF *618,M,, IS THE WORD A NOUN. 03132 26 03150 02983
00262 CM ,60,9 03144 14 00000 00060
00263 BP UPMN,,, IF NOT, TAKE NEXT WORD. 03156 46 03204 01100
00264 NFLAG TF *623,N,, IF SO, IS IT ANIMATE. 03168 26 03191 03198
00265 TD SWAN 03180 25 00401 00000
00266 CF ,48416,7, %HAS# 03192 33 00000 M8416
00267 UPMN A M,*623 03204 21 02983 03227
00268 AM N,3,10 03216 11 03198 00003
00269 B MISRMK,60000,7 03228 49 02972 00000
00270 DORG *-3 03236
*
* PHASE 4. WORD MODIFICATION AND OUTPUT.
*
00271 OUTPUT RCTY 84568,,, %THEY# 03236 34 84568 00102
00272 TF OUT&2,ZRM 03248 26 05549 03617
00273 TFM LINE,0,9, START CHARACTER COUNT. 03260 16 00793 00000
00274 TFM SCAN611,AREA&4 03272 16 03295 05005
00275 SCAN BD MOD,,, NEED TO MODIFY WORD. 03284 43 03672 00000
00276 TF *635,SCAN611 03296 26 03331 03295
00277 SM *623,1,10 03308 12 03331 00001
00278 TF KEEP 03320 26 03343 00000
00279 OVER TF XTRACT611,10000 03332 26 03367 10000
00280 CF XTRACT611,66416,7, %WAS# 03344 33 03367 06416
*
* MOVE ENGLISH WORD TO OUTPUT AREA
*
00281 XTRACT TF OUT 03356 26 05547 00000
00282 BD LEFT-24,OUT,7, TEST FOR BLANK 03368 43 03390 05547
00283 B FULL,49600,7 03380 49 03582 M9600
00284 DORG *-1 03390

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* FIND BEGINNING OF OUTPUT WORD.
*
00285 TF CHUG&11,XTRACT&23 03390 26 03449 03379
00286 TFM COUNT,2,9 03402 16 03473 00002
00287 LEFT SM CHUG&11,1,10 03414 12 03449 00001
00288 AM COUNT,1,10 03426 11 03473 00001
00289 CHUG BNF LEFT *3438 44 03414 00000
00290 AM CHUG&11,1,10 03450 11 03449 00001
00291 UPLINE AM LINE,,, ADD WORD LENGTH TO CHAR. COUNT. 03462 11 00793 00000
00292 CM LINE,140,9, WILL LINE OVERRUN. 03474 14 00793 00J40
00293 BN EX 03486 47 03522 01300
00294 RCTY 65659,,1, YES. START NEW LINE. %FOR#. 03498 34 65659 00102
00295 TF LINE,COUNT 03510 26 00793 03473
00296 EX TF WRITE&66,CHUG&11 03522 26 03576 03449
00297 BNF WRITE-12,OUT 03534 44 03558 05547
00298 B WRITE,54590,7, %MR.# 03546 49 03570 N4590
00299 SPTY 15945,,1, %ARE# 03558 34 15945 00101
00300 WRITE WATY ,,, TYPE ENGLISH WORD. 03570 39 00000 00100
00301 FULL AM SCAN&11,1,10, IS SENTENCE FINISHED. 03582 11 03295 00001
00302 TF *618,SCAN&11 03594 26 03612 03295
00303 UPUP SF ,300,8, %FULL STOP# 03606 32 00000 00300
00304 DC 1,@,* 03617
00305 AM SCAN&11,4,10 03618 11 03295 00004
00306 TF *623,SCAN&11 03630 26 03653 03295
00307 BNR SCAN,AREA,, IF NOT, REPEAT PHASE 4 03642 45 03284 05001

* IF SO, PRINT A FULL STOP AND RESTART.
*
00308 P WATY ADSTOP 03654 39 03615 00100
00309 B START 03666 49 00402 00000
00310 DORG *-5 03672
00311 MOD TF TRANS&11,SCAN&11 03672 26 03707 03295
00312 SM TRANS&11,1,10 03684 12 03707 00001
00313 TRANS TF NOMORE&11 03696 26 03719 00000
00314 NOMORE BNF STEP,10000 03708 44 03728 10000
00315 B SCAN&12 03720 49 03296 00000
00316 DORG *-3 03728
00317 STEP TF *618,SCAN&11 03728 26 03746 03295
00318 AM ,39,10 03740 11 00000 000L9
00319 B SCAN 03752 49 03284 00000

* SUBROUTINE FOR INTERCHANGING TWO WORD GROUPS.
*
00320 SBRTN TF *623,*-1 03764 26 03787 03763
00321 TF HIDE&11 03776 26 03811 00000
00322 CF HIDE&11,4162,8, %AS# *3788 33 03811 0M162
00323 HIDE TF SPACE-1,AREA,, COPY SECOND GROUP 03800 26 05499 05001
00324 TF SEEK&66,HIDE&11 03812 26 03878 03811
00325 TF SEEK-13,SBRTN-1 03824 26 03859 03763
00326 SM SEEK-13,3,10 03836 12 03859 00003
00327 TF SEEK&11,AREA 03848 26 03883 05001
00328 CF SEEK&11,,, TO AVOID INDIRECT ADDRESS 03860 33 03883 00000
00329 SEEK TF AREA,AREA,, FIRST GROUP TO NEW PLACE 03872 26 05001 05001
00330 TF HUNT&11,HIDE&11 03884 26 03907 03811
00331 HUNT BNF MISS,AREA,, FIND WHERE ITS FLAG IS NOW 03896 44 03992 05001
00332 SM HUNT&11,1,10, MOVE TO LEFT. 03908 12 03907 00001
00333 TF *618,HUNT&11 03920 26 03938 03907
00334 TF AREA,SPACE-1,, SECOND GROUP TO NEW PLACE 03932 26 05001 05499

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00335 TF AWAY&6,SBRTN-1 03944 26 03974 03763
00336 SM AWAY&6,3,10 03956 12 03974 00003
00337 AWAY TF ,HUNT&11 03968 26 00000 03907
00338 BB 45474,95562,0, %BEGINS# 03980 42 45474 95562
00339 MISS SM HUNT&11,1,10 03992 12 03907 00001
00340 B HUNT 04004 49 03896 00000
00341 DORG *-1 04014

* SUBROUTINE FOR AMALGAMATING TWO WORD GROUPS
*
00342 MERGE CF *-1 04014 33 04013 00000
00343 TF CL&66,MERGE-1 04026 26 04056 04013
00344 AM CL&66,1,10 04038 11 04056 00001
00345 CL CF AREA,59454,7, %RED# 04050 33 05001 N9454
00346 BB 04062 42 00000 00000
00347 DORG *-7 04066

* LOOKUP SUBROUTINE
*
00348 LOOKUP C 04066 24 00000 C0000
00349 BE 04078 46 00000 01200
00350 BP CL&12 04090 46 04062 01100
00351 A LOOKUP&66,LOOKUP-1 04102 21 04072 04065
00352 B LOOKUP,,, %TOO# 04114 49 04066 00000
00353 DC 6,635656,*62 04127
00354 DORG 04128
00355 EQB BTM GROUP,062,9, TWO-WORD GROUP FOUND 04128 17 02688 00052
00356 EQC BTM GROUP,093,9, THREE-WORD GROUP FOUND 04140 17 02688 00093
00357 EQD BTM GROUP,124,9, FOUR-WORD GROUP FOUND 04152 17 02688 00J24

* ROUTINES FOR EFFECTING PERMUTATIONS OF WORD GROUPS.
*
00358 P1342 BTM SBRTN,ADDST&8 04164 17 03764 05609
00359 BTM SBRTN,ADDST&11,, PERM 1243 04176 17 03764 05612
00360 B IDENT4 04188 49 04404 00000
00361 DORG *-3 04196
00362 P21 BTM SBRTN,ADDST&5 04196 17 03764 05606
00363 IDENT2 BT MERGE,ADDST&2 04208 27 04014 05603
00364 TR ADDST,ADDST&3 04220 31 05601 05604
00365 TR SYNST,SYNST&3 04232 31 05701 05704
00366 B RESUME 04244 49 02422 00000
00367 DORG *-3 04252
00368 P312 BTM SBRTN,ADDST&5 04252 17 03764 05606
00369 BTM SBRTN,ADDST&8,, PERM 321 04264 17 03764 05609
00370 BTM SBRTN,ADDST&5,, PERM 231 04276 17 03764 05606
00371 BTM SBRTN,ADDST&8,, PERM 132 04288 17 03764 05609
00372 IDENT3 BT MERGE,ADDST&2 04300 27 04014 05603
00373 BT MERGE,ADDST&5 04312 27 04014 05606
00374 TR ADDST,ADDST&6 04324 31 05601 05607
00375 TR SYNST,SYNST&6 04336 31 05701 05707
00376 B RESUME 04348 49 02422 00000
00377 DORG *-3 04356
00378 P3412 BTM SBRTN,ADDST&8 04356 17 03764 05609
00379 BTM SBRTN,ADDST&11,, PERM2413 04368 17 03764 05612
00380 BTM SBRTN,ADDST&5,, PERM 2314 04380 17 03764 05606
00381 BTM SBRTN,ADDST&8,, PERM 1324 04392 17 03764 05609
00382 IDENT4 BT MERGE,ADDST&2 04404 27 04014 05603
00383 BT MERGE,ADDST&5 04416 27 04014 05606

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00384	BT	MERGE,ADDST&8	04428	27	04014	05609
00385	TR	ADDST,ADDST&9	04440	31	05601	05610
00386	TR	SYNST,SYNST&9	04452	31	05701	05710
00387	B	RESUME	04464	49	02422	00000
00388	DORG	*-3	04472			
00389	STORE	DS ,PUT&6	01460			
00390	SYNTAX	DS ,SYNG&6	01448			
00391	ERM	DAC 14,UNVERDAULICH	04473			
00392	ADDS	DS ,TRIOS&6	01496			
00393	COUNT	DS ,UPLINE&11	03473			
00394	PERIOD	DS ,WIND&8	02060			
00395	DIGIT	DS ,RM&11	00617			
00396	SIND	DS ,MARK&6	01236			
	* %SEES					
00397	DC	8,62454562,COMMA	01590			
	* %FROM					
00398	DC	8,46595654,VERB	01552			
	* %MISS					
00399	DC	8,54496262,HERE	00918			
	* %THIS					
00400	DC	8,63484962,SEP-24	01868			
00401	LENGTH	DS ,SYN-13	01429			
00402	ENTRY	DS ,COMP&6	01104			
00403	WORD	DS ,COMP&11	01109			
00404	ILA	DS ,8672	08672			
00405	BOX	DS ,FLSTP&9	00689			
00406	KEY	DS ,CLEAR-3	00435			
00407	GUARD	DS ,WIND-3	02049			
00408	PEN	DS ,TB&9	00725			
00409	TARGET	DS ,NRC&11	02617			
00410	ADTOP	DS ,HEAD&6	02452			
00411	SYNTOPI	DS ,CAPUT&6	02488			
00412	FIND	DS ,WIND&9	02061			
00413	M	DS ,MISRMK&11	02983			
00414	N	DS ,UPMN-6	03198			
00415	KEEP	DS ,OVER&11	03343			
00416	ADSTOP	DS ,UPUP&9	03615			
00417	ZRM	DS ,ADSTOP&2	03617			
00418	SWAN	DS ,401	00401			
00419	LINE	DS ,LOOP&9	00793			
00420	W	DS ,WIND&7	02059			
00421	AREA	DS ,5001	05001			
00422	ADDST	DS ,5601	05601			
00423	SYNST	DS ,5701	05701			
00424	INPUT	DS ,5201	05201			
00425	UNWDST	DS ,5167	05167			
00426	OUT	DS ,5547	05547			
00427	SPACE	DS ,5500	05500			
00428	VBCHG	DS ,16947	16947			
00429	WL2	DS ,17313	17313			
00430	WL3	DS ,7056	07056			
00431	WL4	DS ,19085	19085			
00432	GLA	DS ,10040	10040			
00433	DEND	START	00402			

LISTING OF THE GERMAN GLOSSARY.

10041	,	995	096L	,
10056	ABER	980	040Q	BUT
10069	ALS	899	3799	AS
10069	ALS	899	685L	THAN
10086	ALT	820	628N	OLD
10101	ALTE	750	628N	OLD
10118	ALTEM	750	628N	OLD
10135	ALTEN	750	628N	OLD
10152	ALTER	750	6285	OLD
10152	ALTER	750	628R	OLDER
10173	ALTES	750	628N	OLD
10184	AN	921	6803	ON
10184	AN	921	2890	AT
10211	ANFAENGT	680	3991	BEGINS
10211	ANFAENGT	680	398R	BEGIN
10238	ANFANGEN	660	398R	BEGIN
10265	ANGEFANGEN	641	465J	BEGUN
10290	ANGEHOERT	641	492N	LISTENED TO
10317	ANGEKOMMEN	642	490L	ARRIVED
10340	ANGENEHM	820	630N	PLEASANT
10365	ANGESEHEN	641	488R	LOOKED AT
10388	ANHOEREN	660	611P	LISTEN TO
10409	ANHOERT	680	6137	LISTENS TO
10409	ANHOERT	680	611P	LISTEN TO
10436	ANKOMMEN	660	013L	ARRIVE
10457	ANKOMMT	680	0135	ARRIVES
10457	ANKOMMT	680	013L	ARRIVE
10482	ANSEHEN	660	615J	LOOK AT
10503	ANSIEHT	680	6167	LOOKS AT
10503	ANSIEHT	680	615J	LOOK AT
10534	ANZUFANGEN	070	646R	TO BEGIN
10561	ANZUHOEREN	070	655J	TO LISTEN TO
10588	ANZUKOMMEN	070	645L	TO ARRIVE
10613	ANZUSEHEN	070	657J	TO LOOK AT
10636	ARBEITEN	660	671N	WORK
10659	ARBEITET	680	6717	WORKS
10659	ARBEITET	680	671N	WORK
10688	ARBEITETE	685	4871	WORKED
10688	ARBEITETE	685	486P	WORK
10719	ARBEITETEN	665	4871	WORKED
10719	ARBEITETEN	665	486P	WORK
10738	AUCH	990	010R	ALSO
10751	AUF	923	0410	
10751	AUF	923	6803	ON
10751	AUF	923	6615	UPON
10751	AUF	923	603R	IN
10784	AUFGABE	025	606P	LESSON
10807	AUFGABEN	022	606R	LESSONS
10838	AUFGESTANDEN	641	484N	GOT UP
10863	AUFSTEHEN	660	589J	GET UP
10886	AUFSTEHT	680	5905	GETS UP

10886	AUFSTEHT	680	589J	GET UP
10919	AUFZUHOEREN	070	492N	LISTENED TO
10948	AUFZUSTEHEN	070	648P	TO GET UP
10961	AUS	924	155K	FROM
10990	AUSGEGANGEN	642	464J	GONE OUT
11013	AUSGEHEN	660	591P	GO OUT
11034	AUSGEHT	680	5949	GOES OUT
11034	AUSGEHT	680	591P	GO OUT
11065	AUSZUGEHEN	070	650N	TO GO OUT
11078	BEI	940	2890	AT
11078	BEI	940	6707	WITH
11078	BEI	940	2190	BY
11107	BESUCHE	690	702P	VISIT
11130	BESUCHEN	660	702P	VISIT
11151	BESUCHT	680	7029	VISITS
11151	BESUCHT	680	702P	VISIT
11178	BESUCHTE	701	7017	VISITED
11178	BESUCHTE	701	702P	VISIT
11207	BESUCHTEN	665	7017	VISITED
11207	BESUCHTEN	665	702P	VISIT
11224	BIN	590	0510	AM
11224	BIN	590	598N	HAVE
11243	BLAU	820	009J	TODAY
11260	BLAUE	750	009J	TODAY
11279	BLAUDEM	750	009J	TODAY
11298	BLAUEN	750	009J	TODAY
11317	BLAUER	750	009J	TODAY
11336	BLAUES	750	009J	TODAY
11361	BLEISTIFT	024	626K	PENCIL
11388	BLEISTIFTE	022	627J	PENCILS
11405	BRIEF	024	684N	LETTER
11424	BRUDER	02M	022N	BROTHER
11445	BRUDERS	02P	022N	BROTHER
11460	BUCH	024	020R	BOOK
11479	BUCHES	027	020R	BOOK
11500	BUECHER	022	021J	BOOKS
11511	DA	840	642N	THERE
11526	DANN	980	450P	THEN
11539	DAS	004	6421	THE
11539	DAS	004	6683	WHICH
11539	DAS	004	6689	WHO
11539	DAS	004	1121	*S
11539	DAS	004	2678	S*
11539	DAS	0 4	0410	
11574	DASS	401	0480	THAT
11587	DEM	006	6421	THE
11587	DEM	006	6683	WHICH
11587	DEM	0 6	6691	WHOM
11587	DEM	006	1121	*S
11587	DEM	006	2678	S*
11587	DEM	006	0410	
11587	DEM	006	622N	OF THE
11624	DEN	007	6421	THE
11624	DEN	007	6683	WHICH
11624	DEN	0 7	6691	WHOM
11624	DEN	007	1121	*S
11624	DEN	007	2678	S*
11624	DEN	007	0410	

11659	DENN	890	350M	FOR
11672	DER	003	6421	THE
11672	DER	003	6683	WHICH
11672	DER	003	6689	WHO
11672	DER	003	1121	*S
11672	DER	003	2678	S*
11672	DER	003	0410	
11672	DER	003	622N	OF THE
11709	DES	500	6225	OF THE
11709	DES	500	642J	THE
11734	DEUTSCH	930	587R	GERMAN
11747	DIE	002	6421	THE
11747	DIE	002	6683	WHICH
11747	DIE	002	6689	WHO
11747	DIE	002	1121	*S
11747	DIE	002	2678	S*
11747	DIE	002	0410	
11784	DIESE	002	186Q	THIS
11803	DIESEM	006	186Q	THIS
11822	DIESEN	007	186Q	THIS
11841	DIESER	003	186Q	THIS
11860	DIESES	50J	186Q	THIS
11875	DORT	840	642N	THERE
11890	DREI	888	643N	THREE
11907	DURCH	927	458R	THROUGH
11920	EIN	810	010L	A
11935	EINE	810	010L	A
11952	EINEM	813	010L	A
11969	EINEN	814	010L	A
11986	EINER	815	010L	A
12003	EINES	812	0103	A
12003	EINES	812	050L	OF A
12026	ELTERN	02K	625P	PARENTS
12049	ENGLISCH	930	496P	ENGLISH
12060	ER	020	598R	HE
12071	ES	020	280P	IT
12090	FAENGT	60Q	1649	CATCHES
12090	FAENGT	60Q	164N	CATCH
12109	FAND	685	6777	FOUND
12109	FAND	685	494L	FIND
12132	FANDEN	665	6777	FOUND
12132	FANDEN	665	494L	FIND
12155	FANGEN	600	164N	CATCH
12170	FAST	731	660P	ALMOST
12187	FEDER	025	627P	PEN
12206	FEDERN	022	627R	PENS
12223	FINDE	690	494L	FIND
12242	FINDEN	660	494L	FIND
12261	FINDET	680	4945	FINDS
12261	FINDET	680	494L	FIND
12280	FING	605	4817	CAUGHT
12280	FING	605	1645	CATCH
12280	FING	605	4935	BEGAN
12280	FING	605	398R	BEGIN
12311	FINGEN	605	4817	CAUGHT
12311	FINGEN	605	164N	CATCH
12340	FRAEULEIN	010	6737	YOUNG LADY
12340	FRAEULEIN	010	091Q	MISS

12375	FRANZOESISCH	930	497R	FRENCH
12390	FRAU	01P	0632	LADY
12390	FRAU	01P	6187	MRS.
12390	FRAU	01P	669R	WIFE
12417	FREUND	02M	499R	FRIEND
12438	FREUNDE	02K	499R	FRIEND
12455	FRUEH	735	456N	EARLY
12472	FUENF	888	582L	FIVE
12495	GEFANGEN	641	481P	CAUGHT
12518	GEFUNDEN	641	677P	FOUND
12541	GEGANGEN	642	463L	GONE
12558	GEHEN	600	590R	GO
12579	GEHOERT	641	480N	HEARD
12594	GEHT	600	594I	GOES
12594	GEHT	600	590R	GO
12619	GEKAUFT	641	678R	BOUGHT
12642	GEKOMMEN	642	687J	COME
12663	GELERNT	641	477N	LEARNT
12684	GELESEN	641	636J	READ
12699	GERN	880	6099	LIKES TO
12699	GERN	880	6083	LIKE TO
12699	GERN	880	698L	LIKED TO
12736	GESCHRIEBEN	641	683L	WRITTEN
12757	GESEHEN	641	462N	SEEN
12782	GESTANDEN	641	473J	STOOD
12803	GESTERN	830	624L	YESTERDAY
12826	GESUNGEN	641	704N	SUNG
12855	GEWOEHNLICH	730	662R	USUALLY
12870	GING	605	4695	WENT
12870	GING	605	4837	GO
12870	GING	605	4833	WENT OUT
12870	GING	605	5917	GO OUT
12870	GING	605	4707	WENT UP TO
12870	GING	605	593L	GO UP TO
12909	GINGEN	605	4695	WENT
12909	GINGEN	605	483P	GO
12926	GUT	820	5977	GOOD
12926	GUT	820	667L	WELL
12945	GUTE	750	597P	GOOD
12962	GUTEM	750	597P	GOOD
12979	GUTEN	750	597P	GOOD
12996	GUTER	750	597P	GOOD
13013	GUTES	750	597P	GOOD
13028	HABE	693	598N	HAVE
13045	HABEN	663	598N	HAVE
13058	HAT	683	3204	HAS
13058	HAT	683	598N	HAVE
13079	HATTE	688	1538	HAD
13079	HATTE	688	598N	HAVE
13102	HATTEN	668	1538	HAD
13102	HATTEN	668	598N	HAVE
13121	HAUS	024	601J	HOUSE
13138	HAUSE	029	6011	HOUSE
13138	HAUSE	029	600J	HOME
13161	HAUSES	027	601J	HOUSE
13178	HEISS	820	1410	HOT
13193	HERR	010	5849	GENTLEMAN
13193	HERR	010	3550	MR.

13216	HERREN	02K	586P	GENTLEMEN
13233	HEUTE	830	0091	TODAY
13233	HEUTE	830	186Q	THIS
13252	HIER	840	599L	HERE
13269	HOERE	6R0	094N	HEAR
13288	HOEREN	600	094N	HEAR
13305	HOERT	600	0947	HEARS
13305	HOERT	600	094N	HEAR
13328	HOERTE	605	4805	HEARD
13328	HOERTE	605	4803	HEAR
13328	HOERTE	605	4925	LISTENED TO
13328	HOERTE	605	611P	LISTEN TO
13361	HOERTEN	605	4805	HEARD
13361	HOERTEN	605	480L	HEAR
13378	ICH	010	603P	I
13391	IHM	064	234K	HIM
13404	IHN	061	234K	HIM
13421	IMMER	730	012J	ALWAYS
13432	IN	945	6039	IN
13432	IN	945	2890	AT
13432	IN	945	604L	INTO
13469	INTERESSANT	820	603N	INTERESTING
13500	INTERESSANTE	750	603N	INTERESTING
13533	INTERESSANTEM	750	603N	INTERESTING
13566	INTERESSANTEN	750	603N	INTERESTING
13599	INTERESSANTER	750	6035	INTERESTING
13599	INTERESSANTER	750	690N	MORE INTERESTING
13616	IST	530	0604	IS
13616	IST	530	320M	HAS
13631	JA	666	623J	YES
13648	JETZT	830	095L	NOW
13663	JUNG	820	672P	YOUNG
13680	JUNGE	750	672P	YOUNG
13699	JUNGEM	750	672P	YOUNG
13718	JUNGEN	750	6727	YOUNG
13718	JUNGEN	750	676J	YOUNG PEOPLE
13741	JUNGER	750	6727	YOUNG
13741	JUNGER	750	691R	YOUNGER
13764	JUNGES	750	672P	YOUNG
13779	KALT	820	024R	COLD
13796	KALTE	750	024R	COLD
13815	KALTEM	750	024R	COLD
13834	KALTEN	750	024R	COLD
13853	KALTER	750	0249	COLD
13853	KALTER	750	025L	COLDER
13870	KAM	605	4795	CAME
13870	KAM	605	687I	COME
13870	KAM	605	4903	ARRIVED
13870	KAM	605	490J	ARRIVE
13899	KAMEN	605	4795	CAME
13899	KAMEN	605	687J	COME
13920	KAUFE	690	495J	BUY
13939	KAUFEN	660	495J	BUY
13956	KAUFT	680	4953	BUYS
13956	KAUFT	680	495J	BUY
13979	KAUFTE	685	6789	BOUGHT
13979	KAUFTE	685	495J	BUY
14004	KAUFTEN	665	495J	BUY



14019	KIND	02M	023N	CHILD
14038	KINDER	02K	024J	CHILDREN
14059	KINDERN	02L	024J	CHILDREN
14078	KINDES	02P	023N	CHILD
14095	KLEIN	820	637L	SMALL
14114	KLEINE	750	637L	SMALL
14135	KLEINEM	750	637L	SMALL
14156	KLEINEN	750	637L	SMALL
14177	KLEINER	750	6373	SMALL
14177	KLEINER	750	637P	SMALLER
14202	KLEINES	750	637L	SMALL
14219	KNABE	02M	657P	BOY
14238	KNABEN	02K	657R	BOYS
14255	KOMME	690	687J	COME
14274	KOMMEN	600	687J	COME
14291	KOMMT	600	6873	COMES
14291	KOMMT	600	687J	COME
14308	LAS	685	636J	READ
14325	LASEN	665	636J	READ
14344	LEHREN	660	076N	TEACH
14363	LEHRER	02K	0771	TEACHERS
14363	LEHRER	02K	076R	TEACHER
14388	LEHRERN	02L	077J	TEACHERS
14409	LEHRERS	02P	076R	TEACHER
14426	LEHRT	680	6415	TEACHES
14426	LEHRT	680	641J	TEACH
14449	LEHRTE	685	4787	TAUGHT
14449	LEHRTE	685	641J	TEACH
14474	LEHRTEN	665	4787	TAUGHT
14474	LEHRTEN	665	641J	TEACH
14495	LERNE	690	605L	LEARN
14514	LERNEN	660	605L	LEARN
14531	LERNT	680	6055	LEARNS
14531	LERNT	680	605L	LEARN
14554	LERNTE	685	4775	LEARNT
14554	LERNTE	685	477L	LEARN
14579	LERNTEN	665	4775	LEARNT
14579	LERNTEN	665	477L	LEARN
14598	LESE	690	636J	READ
14615	LESEN	660	636J	READ
14630	LIED	024	700J	SONG
14649	LIEDER	022	700L	SONGS
14666	LIEST	680	6363	READS
14666	LIEST	680	636J	READ
14693	MAEDCHEN	02M	658P	GIRL
14708	MANN	02M	676P	MAN
14723	MEIN	810	3030	MY
14740	MEINE	811	3030	MY
14755	MICH	061	2160	ME
14768	MIT	926	670P	WITH
14787	MORGEN	835	4547	TOMORROW
14787	MORGEN	835	453J	MORNING
14808	MUSIK	025	016L	MUSIC
14827	MUTTER	02N	617R	MOTHER
14842	NACH	941	0085	TO
14842	NACH	941	0101	AFTER
14842	NACH	941	0410	
14865	NEIN	666	619J	NO

14882	NICHT	870	6193	NOT
14882	NICHT	870	0410	
14882	NICHT	870	0271	DO NOT
14882	NICHT	870	0287	DOES NOT
14882	NICHT	870	476L	DID NOT
14917	NICHTS	555	620J	NOTHING
14938	NIEMALS	730	451P	NEVER
14951	NUN	980	095L	NOW
14964	NUR	730	680P	ONLY
14977	OFT	730	699L	OFTEN
14990	ROT	820	406K	RED
15005	ROTE	750	406K	RED
15022	ROTEM	750	406K	RED
15039	ROTEM	750	406K	RED
15056	ROTEN	750	406K	RED
15073	ROTES	750	406K	RED
15086	SAH	605	1037	SAW
15086	SAH	605	1588	SEE
15086	SAH	605	4889	LOOKED AT
15086	SAH	605	6151	LOOK AT
15086	SAH	605	4687	WATCHED
15086	SAH	605	664P	WATCH
15123	SAHEN	605	1037	SAW
15123	SAHEN	605	158Q	SEE
15142	SANG	685	7037	SANG
15142	SANG	685	705L	SING
15165	SANGEN	665	7037	SANG
15165	SANGEN	665	705L	SING
15188	SCHOEN	820	015L	BEAUTIFUL
15209	SCHOENE	750	015L	BEAUTIFUL
15232	SCHOENEM	750	015L	BEAUTIFUL
15255	SCHOENEN	750	015L	BEAUTIFUL
15278	SCHOENES	750	015L	BEAUTIFUL
15301	SCHOENER	750	0153	BEAUTIFUL
15301	SCHOENER	750	694P	MORE BEAUTIFUL
15328	SCHREIBE	690	681P	WRITE
15353	SCHREIBEN	660	681P	WRITE
15376	SCHREIBT	680	6819	WRITES
15376	SCHREIBT	680	681P	WRITE
15401	SCHRIEB	685	6799	WROTE
15401	SCHRIEB	685	681P	WRITE
15430	SCHRIEBEN	665	6799	WROTE
15430	SCHRIEBEN	665	681P	WRITE
15457	SCHUELER	02K	6317	PUPILS
15457	SCHUELER	02K	631N	PUPIL
15486	SCHUELERN	02L	631P	PUPILS
15511	SCHUELERS	02P	631N	PUPIL
15530	SCHULE	025	632R	SCHOOL
15555	SCHWESTER	02N	634J	SISTER
15572	SECHS	888	025R	SIX
15589	SEHEN	600	158Q	SEE
15604	SEHR	850	663P	VERY
15619	SEIN	911	0139	BE
15619	SEIN	911	6863	TO BE
15619	SEIN	911	1200	HIS
15644	SEINE	811	1200	HIS
15663	SEINEM	813	1200	HIS
15682	SEINEN	814	1200	HIS

15701	SEINER	815	1200	HIS
15720	SEINES	812	1200	HIS
15733	SIE	020	2527	SHE
15733	SIE	020	324K	THEY
15754	SIEHT	600	1590	SEES
15754	SIEHT	600	1580	SEE
15773	SIND	540	3564	ARE
15773	SIND	540	598N	HAVE
15794	SINGE	690	705L	SING
15813	SINGEN	660	705L	SING
15830	SINGT	680	7055	SINGS
15830	SINGT	680	705L	SING
15849	SOHN	02M	699R	SON
15868	SOHNES	02P	699R	SON
15889	SONDERN	980	040Q	BUT
15906	SPAET	735	455N	LATE
15927	SPIELEN	660	473R	PLAY
15946	SPIELT	680	1031	PLAYS
15946	SPIELT	680	102R	PLAY
15971	SPIELTE	685	4743	PLAYED
15971	SPIELTE	685	473R	PLAY
15998	SPIELTEN	665	4743	PLAYED
15998	SPIELTEN	665	473R	PLAY
16019	STAND	605	4731	STOOD
16019	STAND	605	6351	STAND
16019	STAND	605	4845	GOT UP
16019	STAND	605	5891	GET UP
16019	STAND	605	4673	BELONGED TO
16019	STAND	605	018J	BELONG TO
16060	STANDEN	605	4731	STOOD
16060	STANDEN	605	635J	STAND
16083	STEHEN	600	635J	STAND
16100	STEHT	600	6353	STANDS
16100	STEHT	600	635J	STAND
16125	STRASSE	025	696P	STREET
16148	STUDIERE	690	640J	STUDY
16173	STUDIERN	660	640J	STUDY
16196	STUDIERT	680	6391	STUDIES
16196	STUDIERT	680	640J	STUDY
16225	STUDIERTE	685	4721	STUDIED
16225	STUDIERTE	685	640J	STUDY
16256	STUDIERTEN	665	4721	STUDIED
16256	STUDIERTEN	665	640J	STUDY
16277	TISCH	024	485P	TABLE
16296	TISCHE	022	485R	TABLES
16317	TOCHTER	02N	581N	DAUGHTER
16334	UEBER	940	498P	OVER
16347	UND	800	2590	AND
16364	UNTER	940	457N	UNDER
16381	VATER	02M	029R	FATHER
16400	VATERS	02P	029R	FATHER
16415	VIER	888	583J	FOUR
16428	VON	940	1552	FROM
16428	VON	940	2190	BY
16428	VON	940	049R	OF
16449	WAR	685	3350	WAS
16466	WAREN	665	695N	WERE
16485	WETTER	024	666N	WEATHER

16498	WIR	020	666R	WE
16513	WOHL	735	667L	WELL
16534	ZEITUNG	025	707L	
16559	ZEITUNGEN	022	007R	NEWSPAPER
16570	ZU	920	0085	TO
16570	ZU	920	4127	TOO
16570	ZU	920	2890	AT
16605	ZUGEGANGEN	642	460R	GONE UP TO
16626	ZUGEHEN	660	593L	GO UP TO
16651	ZUGEHOERT	641	492N	LISTENED TO
16670	ZUGEHT	680	5969	GOES UP TO
16670	ZUGEHT	680	593L	GO UP TO
16699	ZUGEGEHEN	641	468P	WATCHED
16728	ZUGESTANDEN	641	467L	BELONGED TO
16751	ZUHOEREN	660	611P	LISTEN TO
16772	ZUHOERT	680	6137	LISTENS TO
16772	ZUHOERT	680	611P	LISTEN TO
16797	ZUSEHEN	660	664P	WATCH
16818	ZUSIEHT	680	6651	WATCHES
16818	ZUSIEHT	680	468P	WATCHED
16845	ZUSTEHEN	660	018J	BELONG TO
16866	ZUSTEHT	680	0201	BELONGS TO
16866	ZUSTEHT	680	018J	BELONG TO
16895	ZUZUGEHEN	070	652P	TO GO UP TO
16922	ZUZUHOEREN	070	655J	TO LISTEN TO
16937	ZWEI	888	474R	TWO

TWC-WORD SYNTAX LIST.

ADDRESS      E N T R Y .

17313 002017 00 208 060  
 17327 002022 00 208 060  
 17341 002025 00 208 060  
 17355 002777 00 208 060  
 17369 003017 60 208 063  
 17383 003018 00 208 060  
 17397 003022 01 208 060  
 17411 003024 00 208 060  
 17425 003025 00 208 063  
 17439 003777 00 208 060  
 17453 004016 00 208 060  
 17467 004024 00 208 060  
 17481 004777 00 208 060  
 17495 006022 00 208 064  
 17509 006024 00 208 064  
 17523 006025 00 208 064  
 17537 007022 01 208 061  
 17551 007023 00 208 068  
 17565 007024 00 208 061  
 17579 016777 10 208 060  
 17593 017777 10 208 060  
 17607 018777 10 208 060  
 17621 020540 10 244 550  
 17635 020660 10 244 570  
 17649 020663 10 244 573  
 17663 020665 10 244 575  
 17677 020668 10 244 578  
 17691 060070 00 196 060  
 17705 060060 00 244 570  
 17719 060755 00 208 060  
 17733 500027 00 208 062  
 17747 530642 10 208 685  
 17761 540642 10 208 665  
 17775 550642 10 208 685  
 17789 660730 00 196 660  
 17803 660870 02 196 660  
 17817 660880 01 196 660  
 17831 663730 00 196 663  
 17845 663870 00 208 663  
 17859 663880 01 196 663  
 17873 665730 00 196 665  
 17887 665870 04 196 660  
 17901 665880 12 196 665  
 17915 668730 00 196 668  
 17929 668870 00 196 668  
 17943 668880 01 196 668  
 17957 670730 00 196 670  
 17971 670870 02 196 670  
 17985 670880 01 196 670  
 17999 673730 00 196 673  
 18013 673870 00 208 673  
 18027 673880 01 196 673  
 18041 675730 00 208 675

18055 675870 14 196 670  
 18069 678730 00 196 668  
 18083 678870 00 208 678  
 18097 678880 12 196 678  
 18111 680730 00 196 680  
 18125 680870 13 196 680  
 18139 680880 10 196 680  
 18153 683730 00 196 683  
 18167 683870 00 208 683  
 18181 683880 10 196 680  
 18195 685730 00 196 685  
 18209 685870 14 196 680  
 18223 685880 12 196 685  
 18237 688730 00 196 688  
 18251 688870 00 208 688  
 18265 688880 10 196 688  
 18279 690730 00 196 690  
 18293 690870 02 196 690  
 18307 690880 01 196 690  
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 18363 750016 00 208 024  
 18377 750017 00 208 025  
 18391 750018 00 208 024  
 18405 750022 00 208 022  
 18419 750023 00 208 023  
 18433 750024 00 208 024  
 18447 750025 00 208 025  
 18461 750027 00 208 027  
 18475 750029 00 208 029  
 18489 750750 00 208 750  
 18503 750899 11 208 760  
 18517 760020 00 208 750  
 18531 760060 00 208 750  
 18545 800750 00 208 750  
 18559 810016 00 208 060  
 18573 810018 00 208 060  
 18587 810022 01 208 060  
 18601 810024 00 208 060  
 18615 811017 02 208 060  
 18629 811022 00 208 060  
 18643 811025 00 208 060  
 18657 812027 00 208 062  
 18671 813024 00 208 064  
 18685 814023 00 208 064  
 18699 814024 00 208 061  
 18713 815022 00 208 068  
 18727 815025 00 208 063  
 18741 830835 11 208 830  
 18755 840070 00 196 070

TWC-WORD SYNTAX LIST (CONTINUED).

18769 850750 00 208 750  
 18783 850820 00 208 820  
 18797 870641 00 208 641  
 18811 870642 00 208 642  
 18825 888022 00 208 022  
 18839 888023 00 208 023  
 18853 911024 20 208 060  
 18867 920029 21 208 840  
 18881 920064 00 208 840  
 18895 920660 00 208 070  
 18909 920820 10 208 820  
 18923 920911 00 208 070  
 18937 921064 00 208 840  
 18951 923068 10 208 840  
 18965 923920 30 208 730  
 18979 924064 00 208 840  
 18993 926064 00 208 840  
 19007 940029 21 208 840  
 19021 940064 00 208 840  
 19035 941029 21 208 840  
 19049 995750 00 208 750  
 19063 999999

THREE-WORD SYNTAX LIST.

07056	002750540	010	300	430
07074	002750660	010	300	430
07092	003750018	000	300	060
07110	004750016	000	300	060
07128	020800020	000	300	060
07146	020800030	000	300	060
07164	024800024	000	300	024
07182	025920660	000	276	470
07200	400060670	001	288	755
07218	400060680	000	288	755
07236	400060685	000	288	755
07254	400061670	001	288	755
07272	400061680	000	288	755
07290	400061685	000	288	755
07308	400820530	000	288	755
07326	400820540	000	288	755
07344	400840530	000	288	755
07362	400840540	000	288	755
07380	430830642	100	288	685
07398	430840642	100	288	685
07416	430870642	100	300	685
07434	660020870	103	252	660
07452	660060870	002	252	660
07470	660061870	002	252	660
07488	660870880	021	276	670
07506	663060641	000	288	660
07524	663061641	000	288	660
07542	665020870	104	252	660
07560	665060870	104	252	660
07578	665061870	104	252	660
07596	665870880	141	276	660
07614	668060641	000	288	665
07632	670020870	103	252	670
07650	670060870	002	252	670
07668	670061870	002	252	670
07686	670870880	021	276	670
07704	673060641	000	288	670
07722	673061641	000	288	000
07740	675020870	104	252	660
07758	675060870	104	252	660
07776	675061870	104	252	660
07794	675870880	141	276	660
07812	678060641	000	288	675
07830	680020870	103	252	680
07848	680060870	103	252	680
07866	680061870	103	252	680
07884	680870880	131	276	680
07902	683060641	000	288	680
07920	683061641	000	288	670
07938	685020870	104	252	680
07956	685060870	104	252	680

THREE-WORD SYNTAX LIST (CONTINUED).

07974	685061870	104	252	680
07992	685870880	141	276	680
08010	688060641	000	288	685
08028	688070880	021	276	670
08046	683060641	000	288	690
08064	730660020	000	288	430
08082	730660060	000	288	430
08100	730665020	011	288	430
08118	730665060	000	288	430
08136	730680020	000	288	430
08154	730680060	000	288	430
08172	730685020	000	288	430
08190	730685060	000	288	430
08208	830530020	000	288	430
08226	830530060	000	288	430
08244	830540030	000	288	430
08262	830660060	000	288	430
08280	830665060	000	288	430
08298	830665060	000	288	730
08316	830680060	000	288	430
08334	830685060	000	288	430
08352	840530020	000	288	430
08370	840530060	000	288	430
08388	840540060	000	288	430
08406	840660060	000	288	430
08424	840665020	000	288	430
08442	840680060	000	288	430
08460	830920660	000	276	060
08478	845003025	150	300	840
08496	899999999			

FCUR-WORD SYNTAX LIST.

T0085	002022003022	4001	356	060
T0107	002022003025	3000	356	060
T0129	002022004027	3000	356	060
T0151	002022500027	3010	356	060
T0173	002022500027	3010	356	060
T0195	002022812027	3010	356	060
T0217	002022815025	3000	356	060
T0239	002025003022	4001	356	060
T0261	002025003025	3000	356	060
T0283	002025004027	3000	356	060
T0305	002025500027	3010	356	060
T0327	002025812027	3010	356	060
T0349	002025815025	3000	356	060
T0371	003024003022	4001	356	060
T0393	003024003025	3000	356	060
T0415	003024004027	3000	356	060
T0437	003024500027	3010	356	060
T0459	003024812027	3010	356	060
T0481	003024815025	3000	356	060
T0503	004024003022	4001	356	060
T0525	004024003025	3000	356	060
T0547	004024500027	3010	356	060
T0569	004024812027	3000	356	060
T0591	004024815025	3000	356	060
T0613	007024003022	4001	356	060
T0635	007024003025	3000	356	061
T0657	007024500027	3010	356	060
T0679	018800017777	1010	404	060
T0701	530870840642	1000	176	685
T0723	540870840642	1000	176	665
T0745	665060870880	1041	356	660
T0767	665061870880	1041	356	660
T0789	670060870880	0021	356	660
T0811	670061087880	0021	356	660
T0833	675060870880	1041	356	660
T0855	680060870880	1031	356	680
T0877	680061870880	1031	356	680
T0899	683060870641	0000	164	680
T0921	685060870880	1041	356	680
T0943	685061870880	1041	356	680
T0965	830540060082	0000	302	330
T0987	999999000000			

VERB-CHANGER LISTING.

ADDRESS	E	N	T	R	Y
16050	2097	1	0218		
16050	2162	1	0245		
16068	2287	1	2295		
16077	2318	1	2205		
16086	2565	0	6633		
16095	2565	4	1020		
17004	2601	0	6677		
17013	2601	4	1041		
17022	2877	0	2893		
17031	2877	4	2885		
17040	2916	0	2803		
17049	2916	4	2885		
17058	3205	0	6758		
17067	3295	1	0305		
17076	3312	0	6770		
17085	3312	1	0416		
17094	3335	0	3343		
17103	3335	1	3343		
17112	3368	0	3343		
17121	3368	1	3343		
17130	3877	1	3885		
17130	3906	1	3885		
17148	4281	1	0443		
17157	4298	1	0464		
17166	5093	0	5109		
17175	5093	1	5101		
17184	5130	0	5109		
17193	5130	1	5101		
17202	5596	0	6804		
17211	5596	1	0480		
17220	5761	0	6825		
17220	5761	1	0510		
17238	6026	0	6042		
17247	6026	3	6034		
17256	6067	0	6042		
17265	6067	3	6034		
17274	6000	0	6852		
17283	6000	3	0870		
17292	6107	0	6873		
17301	6107	3	0893		
17310	9999	9	9002		

Table of Syntax Numbers and Their Meanings

002	DIE, DIESE, etc.
003	DER
004	DAS
006	DEM
007	DEN
010	ICH
016	FRAÜLEIN
017	FRAU
018	HERR
020	ER, ES, SIE (if singular)
022	plural noun
023	dative plural noun
024	masculine/neuter singular noun
025	feminine singular noun
027	masculine/neuter genitive singular noun
029	dative singular
060	article + noun
061	ICH, DEM + noun
062	masculine/neuter genitive article + noun combination
063	feminine genitive singular article + noun combination
064	ICH
068	dative plural combination

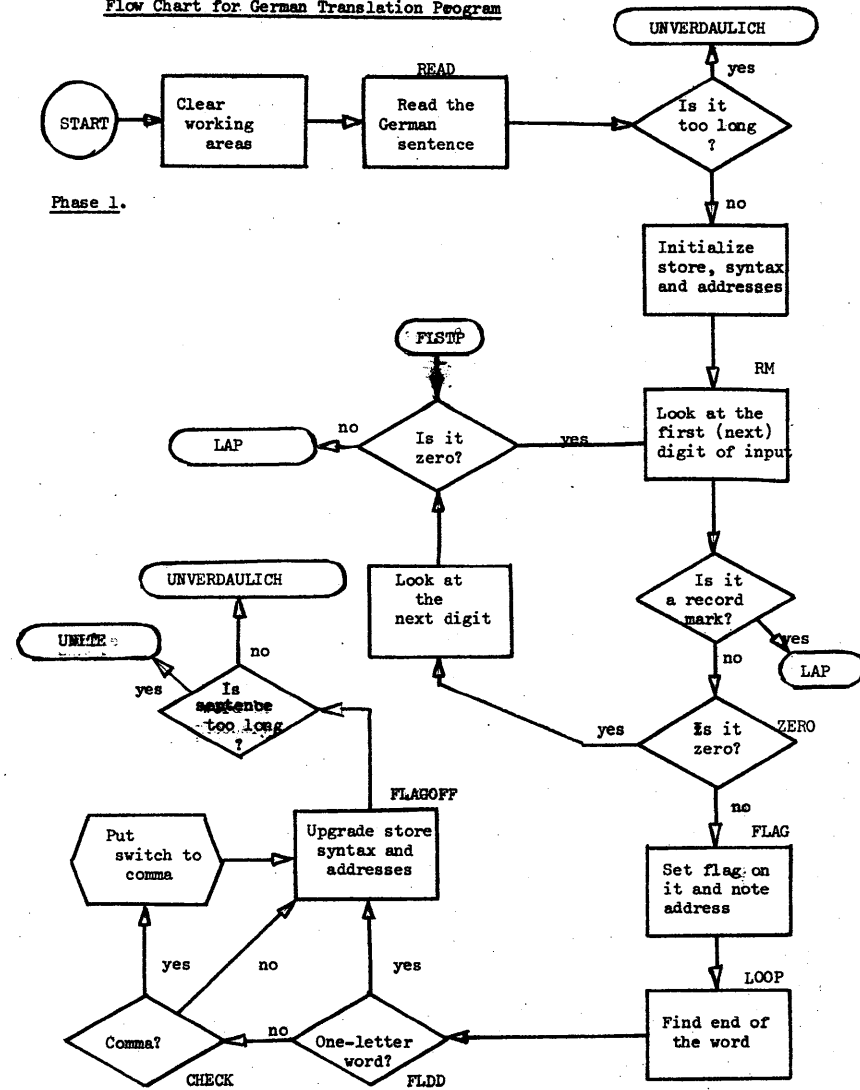
Table of syntax numbers and their meanings (cont'd)

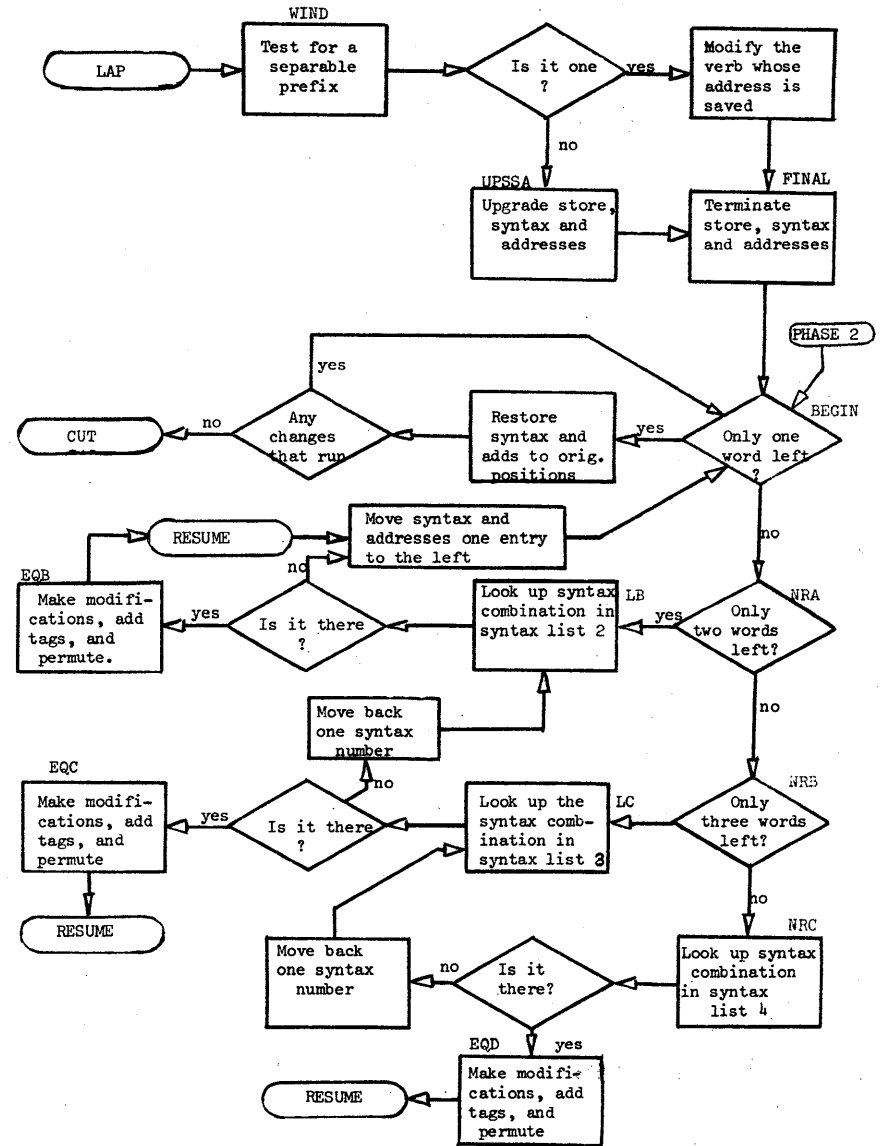
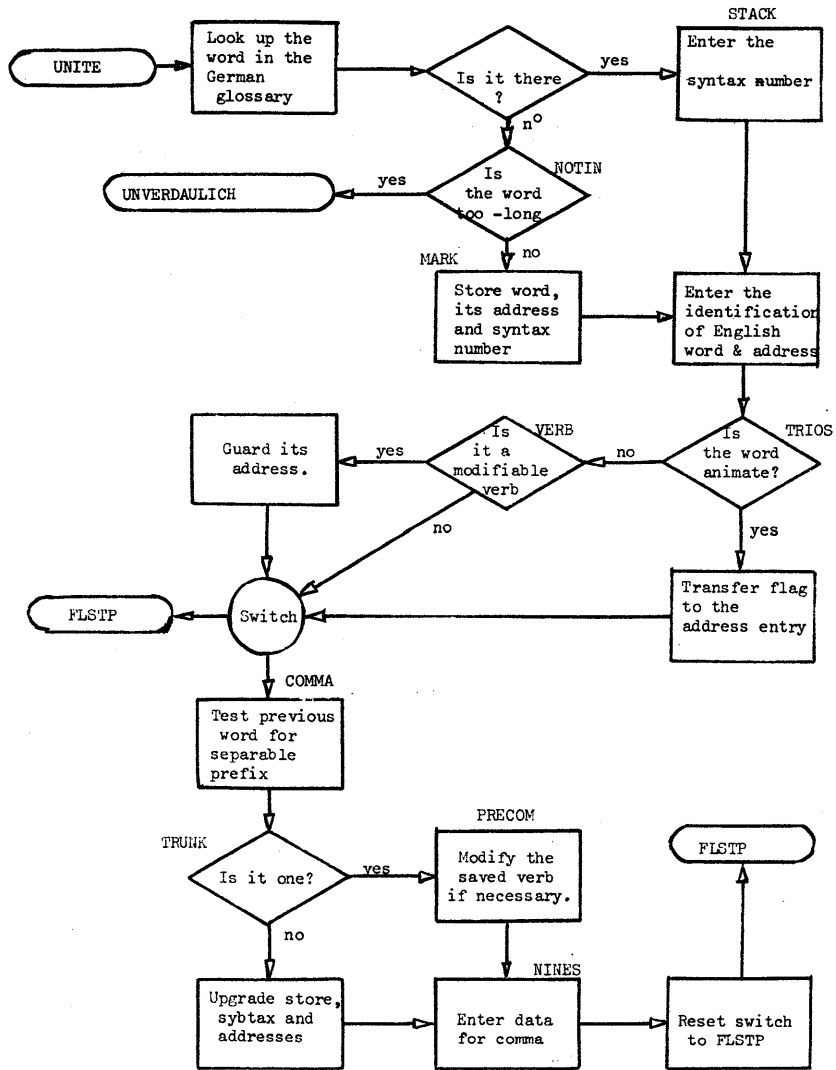
070	infinitive
500	DES
530	IST
540	SIND
555	NICHTS
564	SIE WAREN
565	WAREN
585	WAR
641	past participle (with HABEN)
642	past participle (with SEIN)
660	third person plural present verb (also infinitive)
663	HABEN
665	past tense plural
668	HATTEN
680	third person singular present verb
683	HAT
685	past tense singular
688	HATTE
690	first person singular present verb
693	HABE
730	GEWÖHNLICH
750	attributive adjective, all forms
755	relative clause
800	UND

Table of syntax numbers and their meanings (cont'd)

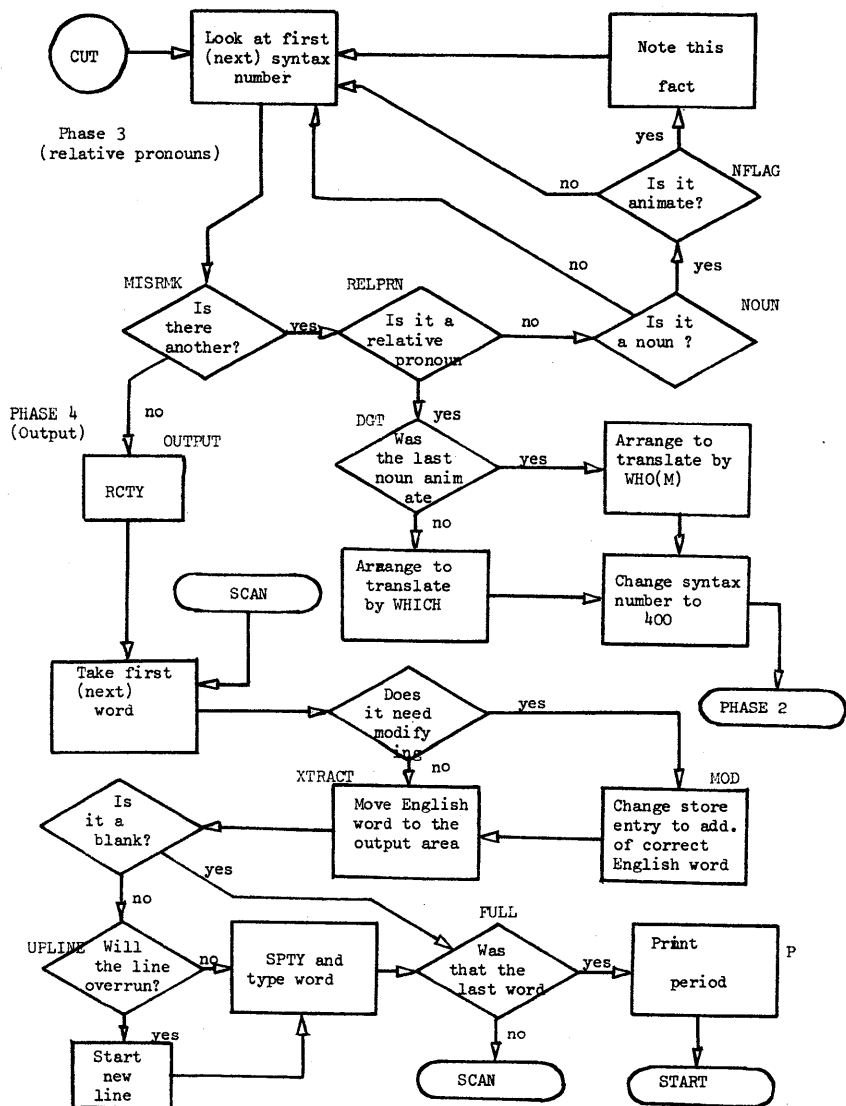
810 - 815	EIN, and its inflected forms
820	Predicative adjectives
830	HEUTE
835	MORGEN
840	HIER
850	SEHR
870	NICHT
880	GERN
888	numerals
890	DENN
920	ZU
921	AN
923	AUF
924	AUS
926	MIT
927	DURCH
930	DEUTSCH, etc.
940	VON, BEI
941	NACH
945	IN
980	NUN, DAMM
990	AUCH
995	comma

Flow Chart for German Translation Program









SPECIMEN SENTENCES.

DIE KLEINEN KINDER SPIELEN IMMER, UND ARBEITEN NICHT.  
THE SMALL CHILDREN ALWAYS PLAY, AND DO NOT WORK.

GESTERN WAR DAS WETTER KALT, ABER HEUTE MORGEN IST ES SEHR KALT.  
YESTERDAY THE WEATHER WAS COLD, BUT THIS MORNING IT IS VERY COLD.

DIE ELTERN HABEN DIE BUECHER DES KINDES NICHT GESEHEN.  
THE PARENTS HAVE NOT SEEN THE CHILD'S BOOKS.

HERR BRAUN IST NICHT DER LEHRER, ER ARBEITET NICHT UND SEINE KINDER SPIELEN NICHT.  
MR. BRAUN IS NOT THE TEACHER, HE DOES NOT WORK AND HIS CHILDREN DO NOT PLAY.

ZU HAUSE IST ES SEHR ANGENEHM MUSIK ZU SPIELEN, ABER MEINE KINDER HOEREN NICHT GERN DER MUSIK ZU, DENN SIE SIND SEHR JUNG.  
AT HOME IT IS VERY PLEASANT TO PLAY MUSIC, BUT MY CHILDREN DO NOT LIKE TO LISTEN TO THE MUSIC, FOR THEY ARE VERY YOUNG.

HERR BRAUN UND SEINE FRAU SEHEN FRAU SCHMIDT UND DIE ALTE FRAU.  
MR. BRAUN AND HIS WIFE SEE MRS. SCHMIDT AND THE OLD LADY.

DER LEHRER HAT DIE KINDER NICHT GESEHEN.  
THE TEACHER HAS NOT SEEN THE CHILDREN.

POLLY PEACHUM IST NICHT NACH HAUSE GEKOMMEN.  
POLLY PEACHUM HAS NOT COME HOME.

DER LEHRER IST ANGEKOMMEN, UND HERR UND FRAU BRAUN SIND AUCH HIER.  
THE TEACHER HAS ARRIVED, AND MR. AND MRS. BRAUN ARE ALSO HERE.

DER VATER KOMMT DIE SCHULE SEINES SOHNES ZU SEHEN.  
THE FATHER COMES TO SEE HIS SON'S SCHOOL.

DER LEHRER IST ALTER ALS MEINE BRUDER.  
THE TEACHER IS OLDER THAN MY BROTHER.

DIE FRAU DIE SEHR JUNG IST IST FRAU SCHMIDT.  
THE LADY WHO IS VERY YOUNG IS MRS. SCHMIDT.

DIE SCHUELER ARBEITEN GERN IN DER SCHULE, UND AUCH ZU HAUSE.  
THE PUPILS LIKE TO WORK AT SCHOOL, AND ALSO AT HOME.

ES IST SEHR INTERESSANT DEUTSCH ZU LERNEN.  
IT IS VERY INTERESTING TO LEARN GERMAN.

DIE KINDER SPIELEN OFT UND HOEREN DIE MUSIK AN.  
THE CHILDREN OFTEN PLAY AND LISTEN TO THE MUSIC.