UBC INDIC

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Background and acknowledgements:

1.1 The credit for initiating and making most of the efforts for computer printing of Nāgarī at the University of British Columbia goes to Dr. Kenneth E. Bryant, my colleague in the Department of Asian Studies. In 1979, when he embarked upon the difficult project of preparing a critical edition of the Sūr-sāgar (a medieval Hindi collection of devotional poems), he thought of the possibility of harnessing the services of a computer for the project. Almost immediately thereafter, he was thinking in terms of using a computer not only for processing the data preserved in the various manuscripts of the Sūr-sāgar but also for getting an output in the Nāgarī script, so that data processing as well as eventual publication of the critical edition would be facilitated. He spent many long months devising the Nāgarī fonts he needed for his work. As his system was reaching completion, UBC purchased the powerful Xerox 9700 laser printer to go with its computer network. Therefore, he again expended much effort and adapted his system to the new immensely superior technology. In determining individual Nāgarī font shapes he was assisted by Dr. Vidyut Aklujkar.

1.2 The MTS Nāgarī laser printing system established by Dr. Bryant is still being used in his project, but the recent efforts at UBC have mainly been in the direction of using Macintosh personal computers for Nāgarī printing. Again, it was due to Dr. Bryant's knowledge of the computer world that several scholars associated with the Department of Asian Studies purchased Macintoshes for use in their work and the Department of Asian Studies purchased an Apple LaserWriter. At present, Dr. Bryant is developing LaserWriter fonts for Nāgarī as time permits him in the midst of other professional activities.

1.3 Before the LaserWriter fonts are ready, and probably even after they are ready, Imagewriter fonts will continue to be in use. It is on these and on what may be the scheme of arrangement of Nāgarī fonts in the LaserWriter that I have mainly worked. I have also been especially concerned with producing a start-up disk which would meet the needs of specialists working with Indic language materials, both in the original scripts of Brāhmī origin and in Roman transliteration. In this respect, my effort remains confined to Nāgarī as it is used for Sanskrit, Hindi, and Marathi, but the results of that effort could easily be adapted for printing in varieties of Nāgarī such as Bengali, Gujarati, and Gurmukhi and also for printing in the scripts of south India.

1.4 My knowledge of computers is extremely limited. I do not know any programming language. The outcome of my effort, which I shall present below, owes a great deal to others, particularly to Dr. Bryant, Dr. George L. Hart, and to Mr. Hardeep Khabra. My son Muktak also helped me at times.

1.5 After I purchased a Macintosh computer, I received a copy of the Nāgarī and Tamil fonts prepared by Hart and of the Nāgarī fonts called Kanchi (Kāñcī).[1] It was clear to Dr. Bryant and me that, while this material constituted a significant achievement, it needed to be integrated with the 'easy-to-remember' distribution of Nāgarī fonts on the MTS Roman keyboard that Dr. Bryant had established; there was just too much effort required, on the part of users of the Hart disk, to remember the positions of Nāgarī fonts in relation to the Roman letters of the Macintosh keyboard. Therefore, starting with Kanchi, Bryant first changed the positions on the keyboard of many of the elementary or basic characters, so that they would essentially correspond to the 'logical' positions he had assigned to those characters on the UBC main-frame computer.[2] As he was occupied with other pressing

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1. See illustration 1. The creator of Kanchi, on which UBC Nāgarī is partly based, was not known to me and my associates in the development of UBC Nāgarī for a long time. Recently, while I was in Winnipeg attending a conference, I happened to meet him through a series of happy coincidences. He is Dr. R. Padmanabhan, Professor in the Department of Mathematics and Astronomy, University of Manitoba, Winnipeg, Canada. Dr. Padmanabhan has to his credit several other excellent Indic fonts in addition to Kanchi: Madurai for Tamil (to be printed on the ImageWriter as well as the LaserWriter); Varanasi (revised version of Kanchi, which Dr. Padmanabhan has now reserved for drawings of cultural significance useful in printing announcements, etc.) for Nāgarī; Thanjavoor; and Gurmukhi.

2. The implication here is not that the Kanchi arrangement or Hart's arrangement is not logical; principles behind them are simply different.

matters, he suggested at that time that I should carry out the further improvement needed for my specific research projects. However, since I was then heavily involved in administrative responsibilities at the university, I did not have the time required to familiarise myself with the Macintosh (I had not directly used any computer until then). On the other hand, I was fortunate to have the help of a good student assistant, Hardeep Khabra, under the 1985 Summer youth employment program of the province of British Columbia. I, therefore, told Hardeep what I needed, and he carried out the changes in Kanchi and Geneva that I suggested. Together we went through about ten revisions of the distribution of Kanchi type fonts on the disk.[3] We also changed the details (curves, knots, etc.) of many fonts to match what I consider to be good Nāgarī print. A number of shapes (conjuncts and letters like ई, औ, etc.) that could be had some other way were dropped and the space made available by their removal was used to introduce new fonts needed in editing and presenting Indic texts critically. Copies of the disk, called UBC Indic, that resulted from this activity were made available from about June1985 to February 1986 to several scholars working with Indian languages. Their response, on the whole, was enthusiastically positive.

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3. While carrying out these revisions and the ones mentioned in 1.7, I began to appreciate how difficult the work of Āpiśali or Pāṇini must have been in an analogous but far more complex situation: rearranging the sounds of the earlier Sanskrit alphabet in the form of the pratyāhāra or Śiva sūtras so as to be able to write economical and efficient rules of grammar.

1.6 Since I found the three-square top or framing line of Kanchi characters too thick, I had Hardeep design a version of our new fonts that had a two- square framing line. However, this version, for some reason unknown to us then, mostly produced a thick top line; only every fourth line generally turned out to be thin, but then usually thinner than we wanted it to be. On the basis of a helpful observation by Professor Edwin Gerow, this shortcoming has been removed in the latest version. We discovered that the Kanchi font and the UBC Nāgarī font derived from it were in fact done in sizes 18 and 36 and that their earlier specification as size 12 and size 24 fonts was causing the problem with respect to the two-square top line.

1.7 In September 1985, I began to use the Macintosh myself. By the end of March 1986 I had used it extensively to input and print a variety of materials in Sanskrit, Marathi, Hindi, and transliteration Roman of the kind Sanskritists use. As I was gaining this experience, I made notes regarding the improvements needed in the UBC Indic disk. Then from April to June, I used the Fontastic and Font Mover programs to introduce these improvements, as well as to make a number of additions which in my view considerably enhanced the capability of UBC Indic as a start-up disk. About eight 'reincarnations' of the disk were required. Some implications of the decision made regarding the presence of Arabic or international number signs in Nāgarī font (see 2.9 below) are yet to be fully worked out. However, the assignment of fonts to keys is now as final as it can be. The new disk (in fact, as will be noticed in 2.10 below, two disks that differ only in the matter of international number signs), I believe, is more than an adequate tool.

FEATURES OF UBC INDIC:

2.1 The disk seeks to meet primarily the requirements of scholars working with materials in languages of India, especially the requirements of Indologists. However, its usefulness is not confined to this group. Even those in whose writings Indian words figure infrequently or at a popular level will find the disk to be more of a convenience than the start-up disk that comes with the Macintosh computer.

2.2 The disk makes it possible to print Roman script as it is used for English, French accented words, German words containing umlaut vowels, the distinctive Roman characters or diacritical marks that figure in the standard Roman transliteratations of Indic language materials, and at least one Indic script (see 2.3 below) other than the Perso-Arabic script used for Urdu (see 2.4 below). Thus, the fonts most commonly needed by Indologists are all present on a single disk.

2.3 The Indic script available at present is Nāgarī, but its place on the disk could easily be taken by any other script of Brāhmī origin; all one will have to do is to rearrange the available fonts for Bengali, Gurmukhi, Tamil, etc. on the pattern of UBC Nāgarī. In fact, one could then very easily substitute one Indic script for another by substituting one type of UBC Indic disk (say, the one containing Nāgarī) by another type of UBC Indic disk (say, the one containing Malayalam) as a start-up disk. These disks would be identical except for the individual Indic fonts. Another possibility is to use a double-sided disk and preserve more than one Indic script on it.

2.4 The UBC Indic disk contains provision for transliteration of Urdu words and also for the printing of nuktā that characterises many Urdu/Perso-Arabic words appearing in languages such as Hindi, although it has not at present been adapted to the printing of the Urdu script which differs from all other current Indian scripts in being written from the right to the left.

2.5 Of the Roman fonts available for Imagewriter printing with the Macintosh, Geneva and New York are the most elegant. Hence they have been modified in sizes 12 and 24 on the UBC Indic disk to suit the needs of an Indologist. Besides, another variety of Geneva, called Geneva N(āgarī), that is identical with Geneva 12 and 24 in the shapes of individual fonts but has more space at the top and the bottom to match the height of Nāgarī letters has been created. This enables one to mix Roman and Nāgarī without making the letters of one script appear out of line with those of the other. (The ideal solution would be to design a new Roman font matching the height and width of Nāgarī letters, but at present I cannot invest the time this requires.) The presence of three types of Roman fonts (Geneva, New York, and Geneva N) in two sizes each, in addition to Chicago 12 and Monaco 9 that are required for system use and hence cannot be removed, reduces the free memory space on the disk. In practice, this has not presented any serious disadvantage. In any case, those who prefer greater free space on the start-up disk can remove the New York font and gain an additional 36K. Moreover, the problem of too little free space would not exist even potentially as Macintosh users switch increasingly to upgraded Macintoshes and to the use of double-sided start-up disks.

2.6 In the high quality mode of the Imagewriter, Nāgarī printing in four sizes is at present achieved quite well with the UBC Indic disk (see illustration 2). Font N1 size 18 is fit for use in the case of most text matter; font N1 size 24 can be used for paragraph titles; font N2 size 18 for chapter titles; and font N2 size 24 for book titles. Use of font N2 sizes 12 and 24 produces acceptable results in the standard mode of printing. Font N1 should not be used in that mode. Other sizes (9, 14, etc.) made possible by the style menu would not produce good results in the case of either font.

2.7 Features of UBC Nāgarī and the specific principles on which it is based will be explained below in 4.1, etc. One general position I have taken in its development, however, should be clarified here. Some potential users want the computer to produce every variation, particularly every variation in ligature, that is noticed in the available instances of any one style of Nāgarī printing. This is not only an unrealistic expectation, given the limited number of keys available on a computer, it also ignores the fact that Nāgarī writing had to adapt itself to printing--that, when technology changes, there is nothing wrong in getting rid of the unnecessary variation and irrational features of the earlier period. The major consideration should be to ensure that all distinctions which matter are preserved and that there is greater efficiency in bringing about the desired output; if some compromises are to be made in the case of infrequently occurring combinations then they be made as long as the same information is unambiguously conveyed by the alternative available. There is no point in wasting a key for क्त (kta) simply because one likes that shape or is accustomed to it, when क्त made by hitting the keys for half **k** and **ta**, can

represent the same sound sequence in a manner more in keeping with the 'logic' of the script. Similarly, the infrequently required च्छु (chru) should be replaced by च्छ्रु or च्छ्रू, as there is no loss of information or clarity in the new form. The shapes of or spaces around the relatively thiner letters like र also deserve to be viewed with a similar consideration in mind. If a slight adjustment of those shapes or spaces can eliminate the need to have separate top strokes (◌ॅ, etc.) for them, then such an adjustment should be made.

2.8 Critical editing of texts is an activity that is likely to become more and more frequent in Indology (at least one hopes that it will be more and more frequent). From that point of view, retention of as many devices as are useful in the critical presentation of a text (various kinds of parentheses, etc.) is desirable and has been attempted on UBC Indic.[6] In

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4. See illustrations 3 and 4. For the sake of ease in presentation in the discussion below, I have designated the four Macintosh keyboards as follows: small letters: first, shift or capital letters: second, option: third, shift-option: fourth. The rows of keys in each have been counted from top to bottom and the keys from left to right. Thus, 3.2.4 means 'fourth key from the left in the second row of the option keyboard.' Since keys 3.2.3, 3.2.7, 3.2.8, and 3.4.6 are capable of printing two fonts, mode 'a' (hitting of the specific key in the third keyboard followed by hitting of the same key in the first keyboard) and mode 'b' (hitting of the specific key in the third keyboard followed by hitting of the space bar or another hitting of the same key in the third keyboard) have been specified in their case.

keeping with the same consideration, printing of raised numbers which designate notes or footnotes has been made easy. Having to use the superscript command in the style menu for such numbers is not only time-consuming; it also disturbs the uniformity of spacing between the lines, unless a change of font size is also made, numbers of a smaller size are chosen, and the slower speed of printing which results from a frequent change of fonts and style is accepted. To avoid these problems, UBC Indic has raised numbers (of a smaller size) in the third keyboard in places corresponding to those of unraised numbers in the first keyboard.

2.9 Theoretically, four types of start-up disks that are identical to each other in all details except the numbers in the Nāgarī font file are possible in UBC Indic: (a) Nāgarī numbers in the first keyboard and raised Nāgarī numbers in the third keyboard, (b) Nāgarī numbers in the first keyboard and raised Arabic numbers in the third keyboard, (c) Arabic numbers in the first keyboard and raised Arabic numbers in the third keyboard, and (d) Arabic numbers in the first keyboard and raised Nāgarī numbers in the third keyboard. Of these, the last is not needed, since there is no practice of using only the Nāgarī numbers to indicate notes or footnotes. Disk (c) will be useful to those who prefer the use of international or Arabic numbers throughout. The usefulness of disk (b) will consist mainly in being able to make the numbers of notes appear distinctive in an otherwise Nāgarī text.

2.10 It should be clear from the considerations noted above that disks (a) and (c) are more useful and hence should be prepared first. This is what has been done under the names "UBC Indic" and "UBC Indic International."

Those who wish to have the advantage of disk (b) can use the numbers in the third keyboard of Geneva or New York fonts, if the notes to be numbered in a Nāgarī text are few, or create their own start-up disk by duplicating the numbers in the third keyboard of Geneva or New York into their Nāgarī font file. Those Indologists who mark different types of notes (e. g. notes giving variant readings and notes giving sources of citations in an edited text) with the use of raised Nāgarī and Arabic numbers can use either the UBC Indic or the UBC Indic International disk and use the font change or superscript command to indicate those notes which are fewer.

Features of UBC Geneva, Geneva N(āgarī), and UBC New York:

3.1 No change has been made in the first two keyboards, except for keys 2.1.1 and 2.1.7. These keys are tied to keys 3.4.6b and 3.2.8b respectively and reproduce whatever font is assigned to the latter keys. In all other respects, the first two keyboards match exactly what is displayed on the Macintosh keyboard.

3.2 The characters with diacritical marks which Indologists need have been arranged on the third and fourth keyboards in a manner that is consistent and easy to remember. An attempt has been made to ensure that most such special characters can be produced by pressing just one key. Where this could not or need not (because of the infrequency of the character) be achieved, the diacritical marks given separately are to be used.

3.3 The diacritical marks that go with small letters are on the third keyboard; the ones that go with capital letters are on the fourth keyboard in corresponding places as far as possible. Of the marks that are used at the bottom of letters, no separation according to 'small' or 'capital' is needed. These are given together on keys 4.1.3-5.

3.4 The three accent marks (` , ´ , ˆ) that are most commonly needed in the printing of accented words (French, Vedic, etc.) are placed, for easy finding, at the extremities in the third and fourth keyboards.

3.5 The typing of diacritical marks has been made natural; they are to be typed after the letter concerned, as in writing.

3.6 Provision for the representation of umlaut vowels and cédille has been made in the small as well as capital letter category. For use in the Romanization of Urdu or Perso-Arabic words "s̈," "S̈," "g̱," "G̱," "ẓ," "Ẓ," "kh" and "KH " have been added. To be able to indicate light and heavy syllables in prosodial analysis, "⏑" has been introduced, and "—" (which also serves as dash and the subtraction sign) has been retained. Furthermore, "←," "→," "↑," "↓," "√" (to indicate roots), and " ° " (used before and after that part of an expression which is distinctive, that is, to indicate that, except for the flanked part, the reading is the same as the other reading given) have been added as devices useful in the critical or convenient presentation of a text.

3.7 "æ" and "Æ," and "œ" and "Œ" have been placed respectively near "a"

and "o"; "¢" and "©" in corresponding places; "Ṝ," "ṝ," and "ṛ" near each other; so also "ṭ" and "t̤," "ṁ" and "ṃ," and the nasals "ṅ," "ṇ," and "ñ."

3.8 The association of "ṣ" with "z" and the dissociation of "ẓ," "z̤," and "z̲" with "z" may seem to be an anomaly. However, it should be noted (a) that any attempt to put "ẓ," "z̤," and "z̲" together would disrupt several other 'logical' arrangements, (b) that the place of "ṣ" corresponds to the place of ष/ष् in Nāgarī, and (c) that "ẓ," "z̤," and "z̲" are not as frequently needed as "ṣ" is.

3.9 As many mathematical and currency indicating ($, £, ¢, etc.) symbols of the original Geneva and New York as could be retained have been retained.

3.10 If additional fonts are needed or some other fonts are preferred, they could be accommodated in the place of " ˘ " (3.4.6a), " ˇ " (4.1.2), ".." (4.1.4), "↑" (4.1.9), and "↓" (4.1.10). Indologists are not likely to need these fonts very much. I use the last two to indicate important sections of a document.

Principles behind the arrangement of UBC Nāgarī:

4.1 A general correlation has been maintained between the Nāgarī letters and the Roman letters used in the standard Sanskrit transliteration system (र in the place of "r," त in the place of "t," etc.).

4.2 Consonant forms inclusive of अ / "a" are placed in the first two

keyboards except for the rarely required ङ (in the case of which, see 4.8 below).

4.3 Aspiration and long vowels are represented by capitalization (use of the shift key); thus, non-aspirates are placed in the first keyboard. Their corresponding aspirates are placed at the corresponding places in the second keyboard: ट ठ, त थ, प फ, ड ढ, द ध, ग घ, ज झ, क ख, च छ, and ब भ.

4.4 Actually needed half or deviant forms (a) of consonants in the first keyboard are placed at the corresponding places in the third keyboard and (b) of consonants in the second keyboard are placed at the corresponding places in the fourth keyboard; thus, र ॅ ्र ‸ , त थ त् थ्, य य़ य्, प फ प् फ्, स स्, द ध द् ध्, ग घ ग् घ्, ज झ ज् झ्, क ख क् ख्, ल ळ ल् ळ्, ष ष्, श श्, ञ ञ्, च छ च्, व व्, ब भ ब् भ्, न ण न् ण्, म म्.

4.5 Marks of vowels that unite with consonants (i. e., the non-initial forms of vowels) are placed in the first two keyboards: Phonetically lighter/short (े, ु, ि, ो, ृ) in the first, and heavy/long forms of the same (ै, ू, ी, ौ, ॄ) at the corresponding places in the second.

4.6 Consonant-vowel combinations having a peculiar form (ह्, दृ, हृ, रु, रू) are placed in the second keyboard. The pairs among them appear on neighbouring keys, with lighter syllable to the left.

4.7 Lighter initial forms of vowels (ए, उ, इ, ऋ) are in the third keyboard. Their heavy forms (ऊ, ॠ) are in corresponding places in the fourth keyboard. ऐ, ई, ओ, औ, and आ can be created by combining ए, इ, and अ with other appropriate keys.

4.8 Conjuncts are relegated to the third and fourth keyboards. Those of which half forms are needed (त्त त्र , क्ष क्ष , त्र त्र , ज्ञ ज्ञ) are placed in the third keyboard (exception: ष्ट्व, which can be replaced by ष्ट्व) and the rest in the fourth keyboard. Conjuncts involving ङ् and ह् are placed in a series arranged according to the alphabetical order of the following or second consonant. Conjuncts involving द्, ष् and व् are placed near each other, as far as possible, in an alphabetical order in the same row of keys.

4.9 Avagraha (ऽ), as similar in appearance to Roman "s," and स्र are associated with स; visarga with colon; anusvāra with म; ह्न with ह; ळ्ळ with ल; ॐ with ो /"o" (see 4.7 above); । (daṇḍa) with period; exclamation mark with the question mark; ॅ (needed in Marathi for "a " in English "bat," "ball," etc.) and ॆ with अ; the repha variation ◌ (needed in Marathi खऱ्या, तऱ्हा, etc.) with ◌ , ◌ , and ◌ (see 4.10 below); and ←, →, √, and ° with the same signs on the Geneva-New York keyboards.

4.10 Because the point at which Nāgarī letters क् and फ् join the top or framing line differs from the point at which the rest of the letters join, an additional set of top marks (◌ , ◌ , ◌ , ◌), bottom marks (◌

(virāma), ◌ु, ◌ू, ◌ृ, ◌ॄ), and middle mark ◌़ (ऱ after a consonant) is needed. Members of this additional set are placed, as far as possible, near the corresponding mark needed for letters other than क and फ, in the same keyboard. Exceptions: anusvāra needed over and virāma needed under क and फ; for the former, note its association with म and for the latter, 4.14 below and the fact that the key is almost the same, although the keyboard differs.

4.11 Full advantage has been taken of the ability of keys 3.2.3, 3.2.7, 3.2.8, and 3.4.6 to produce two fonts (see note 4 above). The accent marks most commonly needed in presenting Vedic texts have been accommodated in mode 'a' of three of these keys.

4.12 The nuktā mark required in the writing of many words of Perso-Arabic origin that have entered Indian languages has been added and placed on the very last key (4.4.10), partly because, unlike most other markers of its type (see 5.3 below), it needs to be typed before the character to which it belongs.[7]

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5. I spent considerable time in making the nuktā conform to the principle expressed in 5.3. However, adherence to that principle would have necessitated creation of at least three (possibly, four) nuktā keys, for no single nuktā dot fits well under the letters क, ख, ग, ड, ज, and फ and half-forms of some of them. In a sense, it befits a marker coming from the tradition of right-to-left writing that it go against the general principle accepted for scripts that are written left-to-right!

4.13 Numbers, punctuation marks, and other marks commonly needed in presenting a text (-, =, [ ], ', /, ( ), +, ", ?) are placed where they are commonly found in Roman keyboards.

4.14 Double occurrence of ् (virāma), र्, and ङ् cannot be avoided. It is caused by peculiarities of Macintosh programming.

Some other relevant observations:

5.1 As consonant-vowel combinations are more common than syllables consisting only of a vowel, the availability of non-initial vowel forms and of अ-inclusive consonant forms in the first two keyboards contributes toward increased speed of typing.

5.2 Some other fonts being used for Macintosh printing of Nāgarī seem to have been arranged, at least originally, according to the order of letters found on Nāgarī typewriters. Since the use of such typewriters is extremely limited, especially outside India, there is really not much gain in following their order.

5.3 The typewriters use the device of 'dead keys' to effect consonant-vowel combinations. In most instances, one has to type the non-initial vowel form first with a dead key and then the consonant shape that goes with it. This method is against the natural way and practice of Nāgarī writing. In the UBC Nāgarī keyboard, the sequence that is found in actual writing is preserved. Except for र्‍, the ‍ part of which is written

before the consonant in traditional writing, no non-initial vowel sign needs to be typed before the consonant form making a syllable with it.

5.4 The consonant-vowel and consonant-consonant combinations which have assumed peculiar conventional forms and are widely employed (despite the use of a simpler, more consistent, revised Nāgarī in many Indian periodicals) are retained on individual keys; thus रु, रू, ह्म, क्ष, ज्ञ, ट्ट, ष्ट्व, त्त, etc. are preserved. ॐ too is preserved as a very common stylization. The space made available by the elimination of non-essential combinations has been used to include as many other marks as are useful in presenting a text (e. g., [ ], ( ), ✓, °, ← →) and covering the full range of current Nāgarī (e. g., ळ, ◌ॅ, ◌ॆ). Printing of such combinations as अि, अी, अु, अू, अृ, अॄ, अे, and अै which 'reformed' Nāgarī employs for इ, etc. is also possible with UBC Nāgarī.

5.5 Fonts have been so designed as to make clear the difference between those letters which can possibly be confused; thus, य थ, ध घ, रव ख, etc.

5.6 If space is needed for additional signs, it could be had by dropping ॐ, ष्ट्व, ऋ, ॠ, and ऽ (replaceable, respectively, by ओम्, ष्ट्व, ञ्ज, ञ्च, and ३).

Tips on getting better results:

6.1 As ि meets the top or framing line of Nāgarī letters at a point near that of their own perpendicular line and as the top marks like ◌ं , ◌ँ , and ◌ः claim just about the same space, the width of the letter or letters following ि (compare, e. g., टि, रि, जि, खि) frequently makes a difference in how natural the placing of the top mark looks. In the case of wider letters following ि , occasionally use of top marks intended to go with क and फ may lead to better results; e. g. किं seems more natural than किं, but हिं is not better than हिं. In the case of conjuncts formed by combining two or more consonant signs (as against most stylised or 'ready-made' conjuncts like क्ष and द्व), the procedure should occasionally be to type in this sequence: ि , first or half-consonant, top mark, the second or full consonant; e. g. मूर्च्छित is better than मूर्च्छित and निस्त्रिंश is better than निस्त्रिंश, but the same procedure would lead to an unattractive result like द्विं in the case of "rdvi" in the place of द्विं.

6.2 In the case of non-initial forms of vowels coming to the right of the consonant (i. e., in the case of ा , ी , ु , ू , ृ , ॄ , ॅ , े , ै , ॉ, and ॊ), the top marks ◌ं , ◌ँ , and ◌ः should be introduced after the vowel form, as in writing, although in the case of ु , ू , ृ , and ॄ the difference would be negligible.

6.3 As there can be many claimants for space on top of a Nāgarī syllable, introduction of the svarita accent mark is not straightforward. The one on 3.2.7a should be used in the case of syllables not having top marks or having

right-leaning top marks at the right end (e. g. ओषधयः, वीर्यम्). On the other hand, the svarita mark on 3.2.8a should be used in the case of syllables having at least one left-leaning top mark (e. g., मन्ये) and syllables having a right-leaning top mark placed in the middle as in र्क and र्फ.

6.4 As bottom marks are attached to Nāgarī letters, underlining that does not touch any part of the text is difficult to achieve. In a font that seeks to provide raised or superscript numbers (see 2.8 above), the attempt to put the underline clearly away from a syllable like भू cuts off a part of the numbers. It seems preferable to use the command "underline" from the style menu. Happily, the underline produced with this command stops short of an intervening a bottom mark and does not cut through it.

6.5 The difficulty experienced in the case of the underline is experienced also in the case of the anudātta accent mark (3.2.3a). However, a quick glance through Vedic texts reveals that instances in which anudātta marking is needed under a syllable having bottom marks like ु are not as many as instances in which such marking goes under syllables without bottom marks. Hence the anudātta sign should be useful in most instances. Combining it with the underline command one should be able to indicate all anudātta syllables, although not with equal clarity when the latter device is used. Note, e. g., अर्जुन, अङ्गुष्ठ.

6.6 To get ग्र्य, as in सामग्र्य, first type ग and र्य, and then the repha (,) that goes with क्र (key 3.3.3).

Changes which the users 1985 UBC Indic should note:

7.1 The 1986 UBC Indic disk is a much more powerful and convenient tool when compared with the 1985 disk. Rearrangement and strengthening of Geneva and New York fonts, the possibility of which I had seen in 1985 but which I was not able to carry out then for want of time, is the major improvement. On the Nāgarī side, addition of ः (for Marathi **खऱ्या,** etc.), Vedic accent marks, ॒ (needed in **सम्राॅज्ञ्या,** etc.), ॅ (needed in Marathi **माॅज्ञ्या,** etc.), √ (for indicating roots), ° (for indicating reading variance), ऽ (half ऽ, for **अश्व,** etc. for those who prefer it to **अश्व,** etc.), and nuktā constitute a change for the better. To accomplish it, the underline sign, * or asterisk, § or section sign, **ष्ट, ष्ठ,** and **ज्ज** had to be removed. However, this was a relatively small price to pay, since the first three are available in the Geneva and New York fonts (the first is available also in the style menu) and the last three, when made by combining two signs as in the preceding sentence, are not inelegant.

7.2 Users of the 1985 disk switching to the 1986 disk should check the documents typed with the earlier disk from the point of view of the Roman as well as Nāgarī signs and letters mentioned in the preceding paragraph. They should also note that the places of the following are different in the Nāgarī part of the 1986 disk: ÷, **ङ्ख,** **ज्ञ,** <, >, **ॲ,** and **ॳ.** Any use of keys 3.2.3, 3.2.7, 3.2.8, and 3.4.6 they might have made should also be checked, since each of these keys produces two different results in the 1986 disk (see note 4 above).

7.3 On the 1985 disk, the names given to the two Nāgarī fonts and to the Geneva font intended to match their height were respectively "UBC Nāgarī," "UBC Thick Nāgarī," and "Wide Line Geneva." The names for the same on the 1986 disk are: "N1 H18,24," "N2 H18,24 S12,24," and "Geneva N" (see 2.6 for the rationale behind the new names, 1.6 for the elimination of "thick" Nāgarī, and 2.9-10 for the raising of Arabic numbers). Consequently, when the 1986 disk is used as a start-up disk for the first time, the computer will display the documents in the earlier fonts in a strange kind of Roman; they must be reassigned (preferably in instalments of 5-7 pages, for the free memory space on a single-sided UBC Indic disk is not much) to the new fonts by using the font menu.

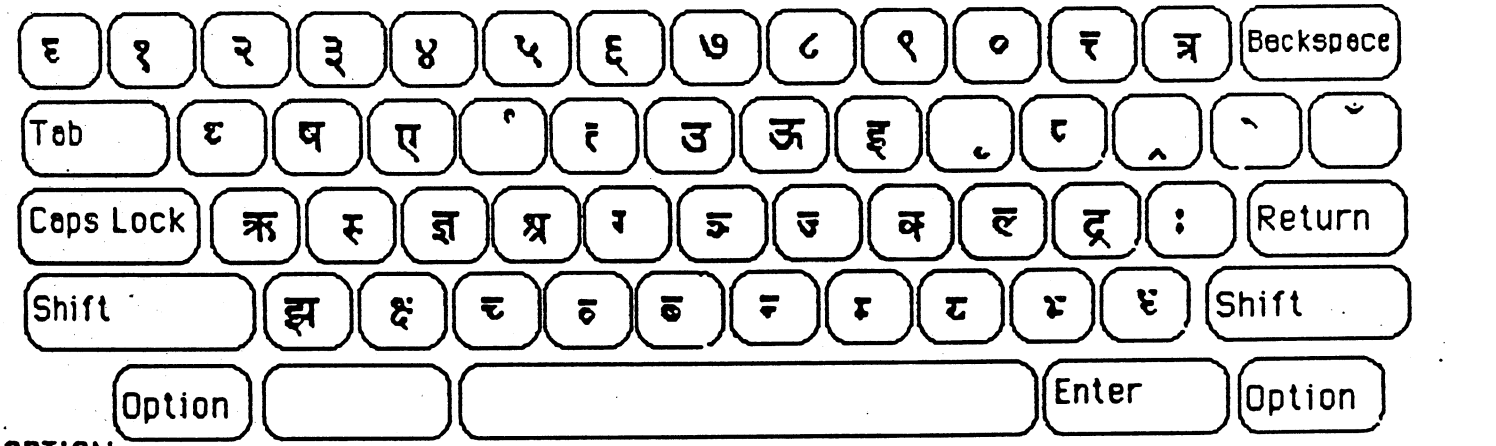
7.4 Some minor problems of the 1985 disk (e. g., the 'crowded' appearance of ◌ु and ◌ू in a word like बभूवुः) have been corrected.

Distribution of UBC Indic:

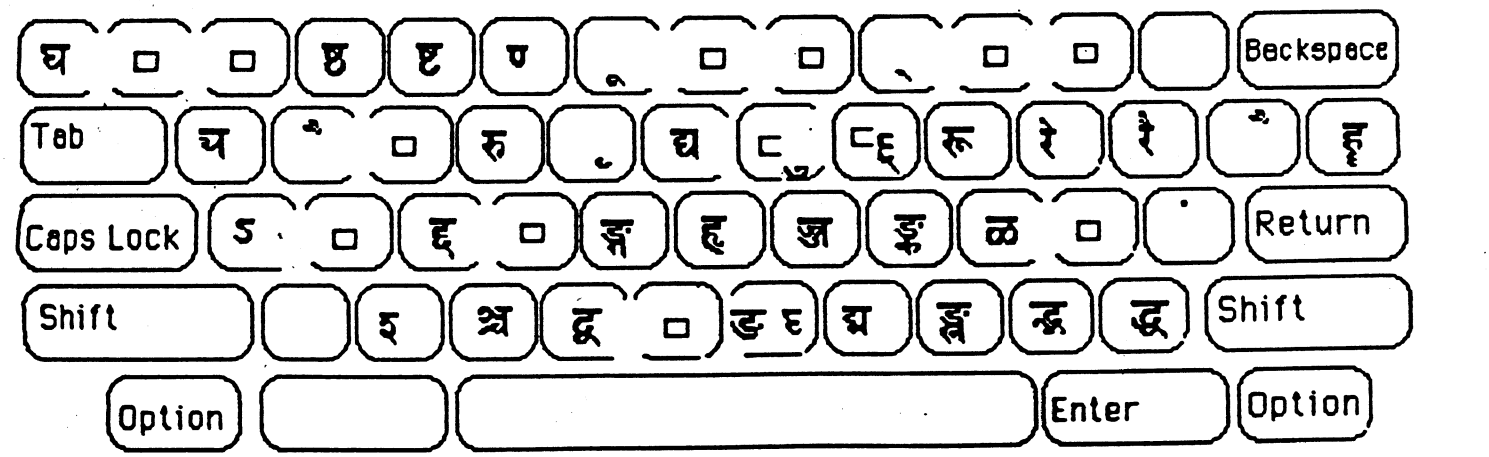
8.1 Those who wish to acquire copies of UBC Indic or UBC Indic International should send to me at the Department of Asian Studies, University of British Columbia, Vancouver, B. C., Canada V6T 1W5, U. S. $30.00 or its Canadian equivalent for each disk copy to be supplied. The address to which the disks are to be mailed and the type of disk desired should be clearly specified. Cheques should be made payable to the University of British Columbia. All net proceeds will be deposited in the Community Endowment for South Asian Studies and will be used for the benefit of students.

ILLUSTRATION 1: KANCHI AS RECEIVED IN MAY 1985

SHIFT



OPTION



SHIFT+OPTION

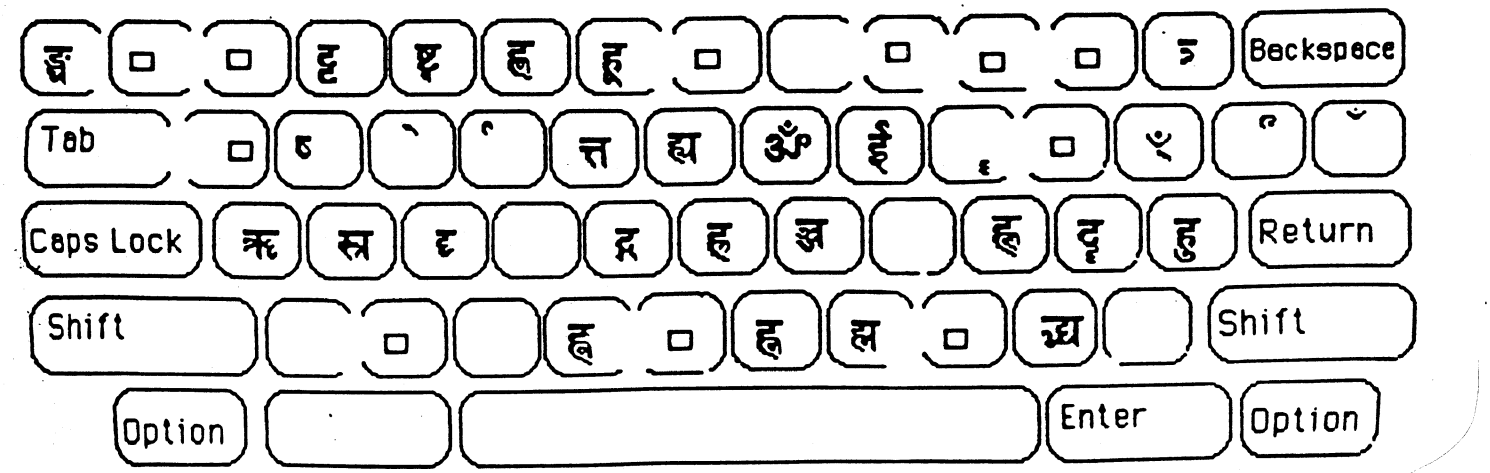


ILLUSTRATION 2 : नागरी, नागरी, नागरी, and नागरी

Acceptable sizes in standard quality printing:

केकैपेपैपोपौ कोणत्या आकारात मुद्रण 2.12 क़ख़ग़ज़फ़

केकैपेपैपोपौ कोणत्या आकारात मुद्रण 2.24. क़ख़ग़ज़फ़

Acceptable sizes in high quality printing:

केकैपेपैपोपौ कोणत्या आकारात मुद्रण 1.18. क़ख़ग़ज़फ़

केकैपेपैपोपौ कोणत्या आकारात मुद्रण 1.24

क़ख़ग़ज़फ़

केकैपेपैपोपौ कोणत्या आकारात मुद्रण 2.18.

क़ख़ग़ज़फ़

केकैपेपैपोपौ कोणत्या आकारात मुद्रण 2.24. क़ख़ग़ज़फ़

१२३४५६७८९१० 1.18

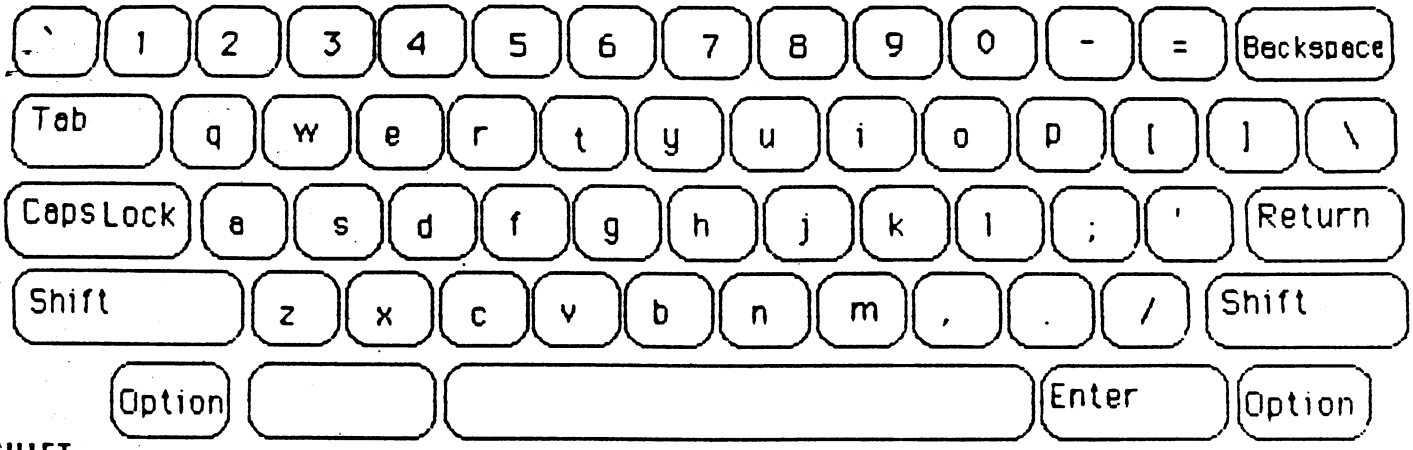
१२३४५६७८९१० 2.12

१२३४५६७८९१० 1.24

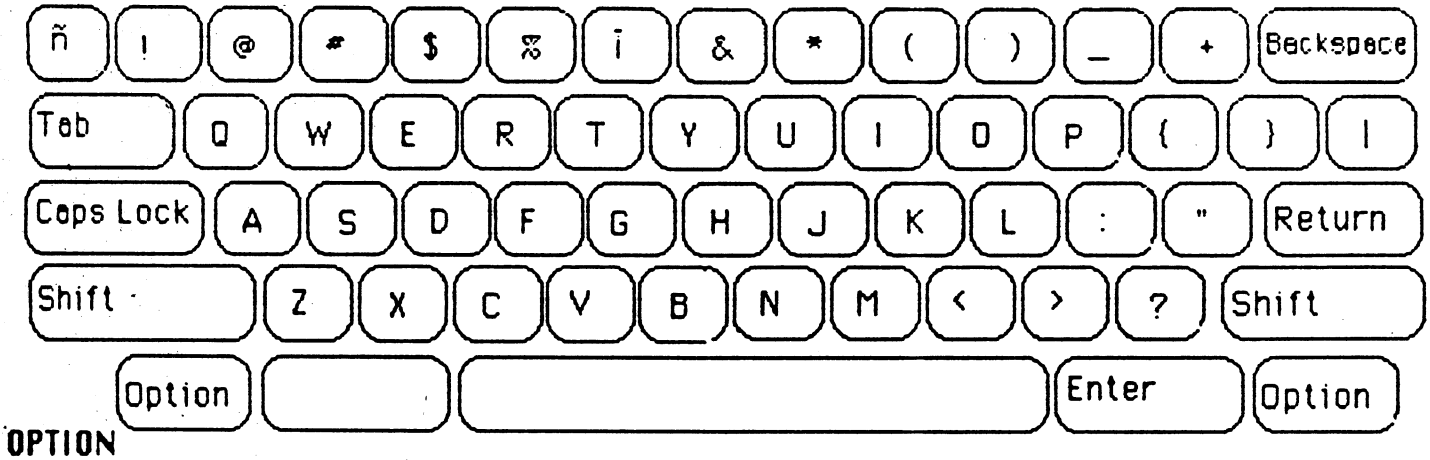
१२३४५६७८९१० 2.18

१२३४५६७८९१० 2.24

ILLUSTRATION 3: GENEVA NEW YORK, 1 JULY 1986



SHIFT



OPTION

SHIFT+OPTION

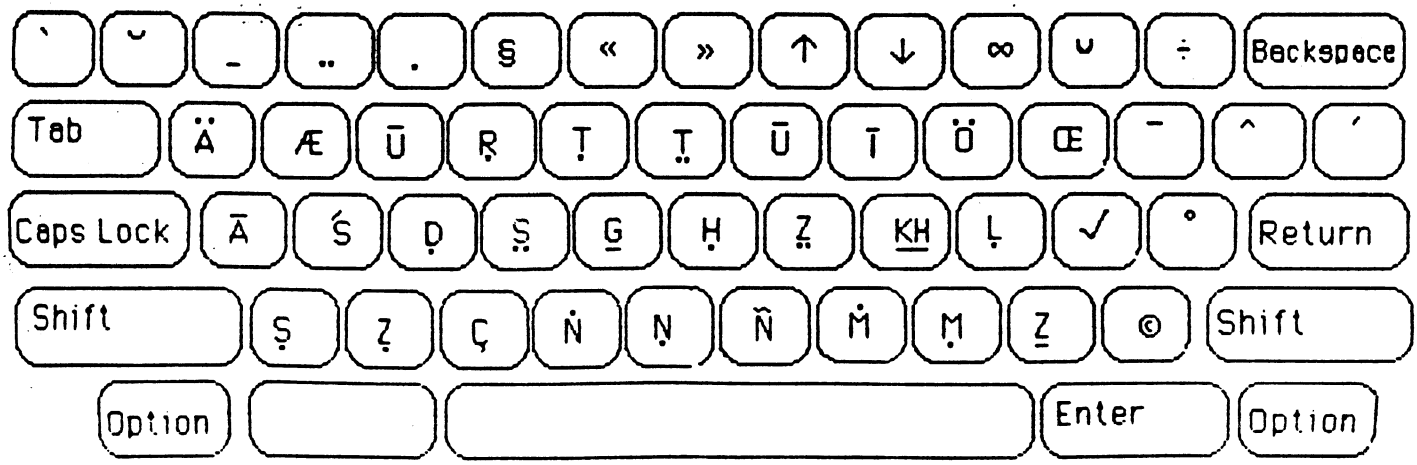


ILLUSTRATION 4: NĀGARĪ, 27 MAY 1986

SHIFT

OPTION

SHIFT+OPTION