

Technical Manual of Itranslator 99

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1. Structure and Character Set of ITX File
2. Fundamentals of ITX Encoding Scheme
3. Structure of Devanagari Font Sanskrit 99
4. Conversion of Transliterated Texts to ITX
5. Miscellaneous Details on Various Topics

Please read Chapter 2 first, as it may serve as a tutorial

This documentation refers to Itranslator 99, available since October 2002. Itranslator 99 has been developed by Omkarananda Ashram Himalayas.

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1. Structure and Character Set of ITX File

The **ITX file** is a special ANSI file consisting of portions treated as ITX encoding, which will be converted to Devanagari or to Transliteration, and portions treated as English etc. insertions (comments, translations, etc.), which will remain as is. Example:

candraH	##moon##	>— Itranslator conversion —<	चन्द्रः	moon
ITX	English		Sanskrit	English

1.1. Character Set of ITX Encoding

1.1.1. Control Characters (0-31)

All characters in the range 0–31 are forbidden with the exception of **CR + LF** (= 13 + 10), treated as the end of a paragraph, whereby a paragraph can be of any length and hence is not restricted to a line of text as seen on the screen when word-wrapping is turned on.

CR + LF (Carriage Return + Linefeed) should always be used as a pair in this sequence. Therefore CR alone without LF or LF + CR (wrong sequence) will not work.

Usage of any other control characters except CR + LF provokes unpredictable results.

1.1.2. ASCII Characters (32–127)

Of the characters in the range 32–127, only those marked **pink and green** on the following chart will be evaluated for the conversion to Devanagari or Transliteration:

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
032		!	"	#	\$	%	&	'	()	*	+	,	-	.	/
048	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
064	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
080	P	Q	R	S	T	U	V	W	X	Y	Z	[\]	^	_
096	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
112	p	q	r	s	t	u	v	w	x	y	z	{		}	~	DEL

Pink = letters and figures, **Green** = delimiters and modifiers, **Yellow** = unused, forbidden

The usage of the 31 **yellow** characters `!"#$%&()* ,/ ;<=>?@BEFPQVWXY[\]` DEL` is forbidden and has unpredictable results. In addition, **all** characters in the 8-bit ANSI range 128-255 are strictly forbidden in ITX encoded portions, which are clean 7-bit ASCII texts.

1.2. Character Set of English etc. Insertions

There are two types of insertions, and hence there are two different character sets.

1.2.1. Insertion of Single Punctuation Marks

In this case, the escape character "\" is prefixed, and **one each** of these marks may follow:

`\! \" \$ \% \& \' (\) * \+ \, \- \. \/ \: \; \< \= \> \? \@ \[\] \^ _ \| \~`

which will be converted to the respective punctuation marks with "\" being stripped off:

`! " $ % & () * + , - . / : ; < = > ? @ [] ^ _ ` | ~`

The following escape character sequences are **forbidden**: `\' \" _ \# \% \\ \{ \}`.

Note: `\'` (1 apostrophe), `\"` (2 apostrophes) – **But:** `\"` (quotation mark). See section 2.2.6.

1.2.2. Insertion of English etc. Passages

In this case, the English etc. passage has to be encapsulated by a pair of `## ... ##`, whereby `##` serves as a simple toggle switch, so you should take care to use `## ... ##` always in pairs, because the insertion mode is not terminated by CR + LF and thus may be of any length.

The character set of an insertion may comprise – besides the two control codes CR + LF – **all** characters in the range 32-255 **except** these six: `# % \ DEL-Code 127 { }`.

These forbidden codes have been marked by "x" (x underlined) in following test file:

ITX file with Insertions	Itranslator Result
<pre> saMskR^itam ## !"<u>x</u>\$<u>x</u>&'()*+,-./ 0123456789:;<=>? @ABCDEFGHIJKLMNO PQRSTUVWXYZ [<u>x</u>] ^ _ `abcdefghijklmno pqrstuvwxyz<u>x</u> <u>x</u>~<u>x</u> €□, f „... † ‡ ^ % Š < € □ Ž □ □ ' ' ' ' ' • — ~™š >œ□žŸ ; ç £ ¤ ¥ ¦ § ¨ © ª « ¬ ® ¯ ° ± ² ³ ´ µ ¶ · ¸ ¹ º » ¼ ½ ¾ ¿ À Á Â Ã Ä Å Æ Ç È É Ê Ë Ì Í Î Ï Ð Ñ Ò Ó Ô Õ Ö × Ø Ù Ú Û Ü Ý Þ ß à á â ã ä å æ ç è é ê ë ì í î ï ð ñ ò ó ô õ ö ÷ ø ù ú û ý þ ÿ ## saMskR^itam </pre>	<pre> संस्कृतम् !"<u>x</u>\$<u>x</u>&'()*+,-./ 0123456789:;<=>? @ABCDEFGHIJKLMNO PQRSTUVWXYZ [<u>x</u>] ^ _ `abcdefghijklmno pqrstuvwxyz<u>x</u> <u>x</u>~<u>x</u> €□, f „... † ‡ ^ % Š < € □ Ž □ □ ' ' ' ' ' • — ~™š >œ□žŸ ; ç £ ¤ ¥ ¦ § ¨ © ª « ¬ ® ¯ ° ± ² ³ ´ µ ¶ · ¸ ¹ º » ¼ ½ ¾ ¿ À Á Â Ã Ä Å Æ Ç È É Ê Ë Ì Í Î Ï Ð Ñ Ò Ó Ô Õ Ö × Ø Ù Ú Û Ü Ý Þ ß à á â ã ä å æ ç è é ê ë ì í î ï ð ñ ò ó ô õ ö ÷ ø ù ú û ý þ ÿ संस्कृतम् </pre>

2.2. Complete Description of the ITX Codes with Examples

(For Pronunciation of the Sanskrit Alphabet see http://home.t-online.de/home/ulrich.stiehl/ipa_sans.pdf)

2.2.1. Sanskrit Punctuation Marks (for English Punctuation Marks see 1.2.1.)

ITX	D.	T.	ITX – Devanagari – Transliteration – English Translation
-	-	-	kuru-kShetram – कुरु-क्षेत्रम् – kuru-kṣetram – <i>Kuru-country</i>
or .			pR^icChAmi ko .aham – पृच्छामि । को ऽहम् ॥
or ..		¹⁾	ṗṛcchāmi ko 'ham – <i>I ask: Who am I?</i>
.a	ऽ	'	Avagraha (apostrophe, i.e. elision of a), as above in को ऽहम्

2.2.2. Sanskrit Vowels

ITX	D.	T.	ITX – Devanagari – Transliteration – English Translation
a	अ	a	arthaH – अर्थः – arthaḥ – <i>money</i>
A, aa	आ	ā	AnandaH or aanandaH – आनन्दः – ānandaḥ – <i>bliss</i>
i	इ	i	iti – इति – iti – <i>thus</i>
I, ii	ई	ī	IkShate or iikShate – ईक्षते – īkṣate – <i>he/she watches (present tense)</i>
u	उ	u	uDupaH – उडुपः – uḍupaḥ – <i>boat</i>
U, uu	ऊ	ū	UcuH or uucuH – ऊचुः – ūcuḥ – <i>they said (perfect tense)</i>
R^i, RRi	ऋ	ṛ	R^itvik or RRitvik – ऋत्विक् – ṛtvik – <i>priest</i>
R^I, RRI	ॠ	ṝ ¹⁾	svasR^INAm or svasRRINAm – स्वसृणाम् – svasṛṇām – <i>of sisters</i>
L^i, LLi	ऌ	ḷ ²⁾	kL^iptam or kLLiptam – क्लृप्तम् – kḷptam – <i>prepared</i>
L^I, LLI	ॡ	ḹ ³⁾	Not used in Sanskrit words
e	ए	e	ekadA – एकदा – ekadā – <i>once upon a time</i>
ai	ऐ	ai	aikShata – ऐक्षत – aikṣata – <i>he/she watched (imperfect tense)</i>
o	ओ	o	odanaH – ओदनः – odanaḥ – <i>boiled rice</i>
au	औ	au	auShadham – औषधम् – auṣadham – <i>herbal medicine</i>
OM, AUM	ॐ	om	This special ligature ॐ is used instead of om ओम् or aum औम्

¹⁾ ṝ never occurs at the beginning of a word. Therefore the full vowel ऋ is never used.

²⁾ ḷ only occurs in some forms of the root kḷp and hence the full vowel ऌ is never used. Itranslator transliterates this extremely rare ऌ to ḷ since the new build of April 2003.

³⁾ ḹ (long version of ḷ) has been invented by ancient Sanskrit grammarians for reasons of symmetry, since the other simple vowels exist as pairs of short and long vowels.

2.2.3. Sanskrit Consonants

The Devanagari consonants in column "D." are depicted without the Virama (◌), as the Itranslator conversion routine evaluates by itself, where to add the Virama and where not.

ITX	D.	T.	ITX – Devanagari – Transliteration – English Translation
k	क	k	kusumam – कुसुमम् – kusumam – <i>flower</i>
kh	ख	kh	khalu – खलु – khalu – <i>indeed</i>
g	ग	g	gadyam – गद्यम् – gadyam – <i>prose</i>
gh	घ	gh	ghoShaH – घोषः – ghoṣaḥ – <i>noise</i>
~N, N^	ङ	ṅ	a~Ngull or aN^gull – अङ्गुली – aṅgulī – <i>finger</i>
c, ch	च	c ¹⁾	cAraH or chAraH – चारः – cāraḥ – <i>spy</i>
Ch, chh	छ	ch ¹⁾	ChAttrah or chhAttrah – छात्रः – chātraḥ – <i>pupil</i>
j	ज	j	jihvA – जिह्वा – jihvā – <i>tongue</i>
jh	झ	jh ²⁾	jhaTiti – झटिति – jhaṭiti – <i>suddenly</i>
~n, JN	ञ	ñ	ra~njayati or raJNjayati – रञ्जयति – rañjayati – <i>he/she dyes in red</i>
T	ट	ṭ	kaTaH – कटः – kaṭaḥ – <i>straw mat</i>
Th	ठ	ṭh	kaNThaH – कण्ठः – kaṅṭhaḥ – <i>neck</i>
D	ड	ḍ	daNDaH – दण्डः – daṇḍaḥ – <i>stick</i>
Dh	ढ	ḍh	leDhum – लेढुम् – leḍhum – <i>to lick (infinitive)</i>
N	ण	ṇ	varNaH – वर्णः – varṇaḥ – <i>color</i>
t	त	t	talam – तलम् – talam – <i>floor</i>
th	थ	th	sthAnam – स्थानम् – sthānam – <i>place</i>
d	द	d	sarvadA – सर्वदा – sarvadā – <i>always</i>
dh	ध	dh	dhanam – धनम् – dhanam – <i>wealth</i>
n	न	n	nArI – नारी – nārī – <i>woman</i>
p	प	p	pashyati – पश्यति – paśyati – <i>he/she sees</i>
ph	फ	ph	phalam – फलम् – phalam – <i>fruit</i>
b	ब	b	bAlaH – बालः – bālaḥ – <i>boy</i>
bh	भ	bh	bhadraM te – भद्रं ते – bhadrām te – <i>good luck!</i>
m	म	m	mitram – मित्रम् – mitram – <i>friend</i>

¹⁾ To achieve compatibility with ITRANS (see 5.3.), encode **ch** for च and **Ch** (or **chh**) for छ.

²⁾ jh, regularly used in Marathi, occurs in Sanskrit only in a few onomatopoeic words.

Sanskrit Consonants Continued

ITX	D.	T.	ITX – Devanagari – Transliteration – English Translation
y	य	y	yogaH – योगः – yogaḥ – <i>Yoga</i>
r	र	r	rAjA – राजा – rājā – <i>king</i>
l	ल	l	likhati – लिखति – likhati – <i>he/she writes</i>
v, w	व	v	vanam or wanam – वनम् – vanam – <i>forest</i>
sh	श	ś	shukaH – शुकः – śukaḥ – <i>parrot</i>
S, Sh, shh, Z	ष	ṣ ¹⁾	SaT or ShaT or shhaT or ZaT – षट् – ṣaṭ – <i>six</i>
s	स	s	svapnaH – स्वप्नः – svapnaḥ – <i>sleep</i>
h	ह	h	hantA – हन्ता – hantā – <i>killer</i>

¹⁾ To achieve compatibility with ITRANS (see 5.3.) encode **Sh** (or **shh**) for ष.

2.2.4. Additional Characters for Classical and Vedic Sanskrit

ITX	D.	T.	ITX – Devanagari – Transliteration – English Translation
H	:	ḥ ¹⁾	ashvaH – अश्वः – aśvaḥ – <i>horse</i>
M, .n, .m	·	m̐ ²⁾	saMshayaH or sa.nsh... or sa.msh... – संशयः – saṁśayaḥ – <i>doubt</i>
.N	ँ	m̐l ³⁾	tA.NllokAn – तँल्लोकान् – tāṁllokān – <i>these people (accusative pl.)</i>
{\m+}	ँ	m̐ ⁴⁾	ida{\m+} or ida.N – इदँ or इदँ – idam̐ (for idam) – <i>this (Vedic)</i>
L	ळ	ḷ ⁵⁾	agnimILe – अग्निमीळे – agnimīḷe – <i>I praise (īḷe) the fire god (agnim)</i>
kS, kSh, x	क्ष	kṣ ⁶⁾	akSi or akShi or axi – अक्षि – akṣi – <i>eye</i> . Do not encode "ksh" !!!
j~n, GY, dny	ज्ञ	jñ ⁶⁾	Aj~nA or AGYA or AdnyA – आज्ञा – ajñā – <i>order</i>

¹⁾ Visarga: Replacement for s or r at the end of a word or syllable as per sandhi rules.

²⁾ Anusvara: Shortcut character for m and other nasals at the end of a word or syllable.

³⁾ Sanskrit Anunasika: m̐l. In Sanskrit texts, it is only used as sandhi, if "l" follows "n".

⁴⁾ Vedic Anunasika: m̐:ँ or ँ. In Vedic texts often used before sibilants, semi-vowels and h. Note: ँ is preferred, if ँ cannot be fitted on top for lack of space. Compare सर्वँ with सर्वँ.

⁵⁾ Vedic Sanskrit: If ḷ is preceded **and** followed by a **vowel**, ḷ may be used instead of ḷ.

⁶⁾ These are the only two ligatures, that – for historical reasons – have **additional** ITX codes (x in addition to usual encoding kS or kSh, GY or dny in addition to usual encoding j~n). All other ligatures are encoded by combining the usual ITX codes for simple characters, which are converted by Itranslator to the respective Devanagari ligatures automatically.

2.2.5. Additional Characters for Modern Indian Languages

ITX	D.	T.	ITX – Devanagari – Transliteration – English Translation
q	ऋ	q ¹⁾	qImata – क्रीमत – qīmata – <i>price</i>
K	ख	kh ¹⁾	KatarA – खतरा – khatarā – <i>danger</i>
G	ग	g ¹⁾	Galata – गलत – galata – <i>wrong</i>
z, J	ज	z ¹⁾	zamIna or JamIna – जमीन – zamīna – <i>earth</i>
f	फ़	f ¹⁾	sirfa – सिर्फ़ – sirfa – <i>only</i>
.D	ड़	ṛ ²⁾	ba.DA – बड़ा – baṛā – <i>big</i> (Same diacritic as for vowel ṛ = ऋ !!!)
.Dh	ढ़	ṛh ²⁾	ba.DhAnA – बढ़ाना – baṛhānā – <i>to increase</i>
.c	ँ	ô ³⁾	jA.cb – जॉब – jôba – <i>job</i> ; kA.cleja – कॉलेज – kôleja – <i>college</i>
L	ळ	l̥ ⁴⁾	kALa – काळ – kāla – <i>time, Death (fig.)</i> Do not encode "ld" !!!
R	ः	ṛ ⁵⁾	taRhA – तऱ्हा – taṛhā – <i>variety</i>

¹⁾ Nukta (underdot): Used in Hindi for words of Persian and Arabic origin as well as for other foreign words to modify the original pronunciation of Devanagari characters.

²⁾ Nukta is here used in Hindi to build diacritical Devanagari characters for retroflex flap (transliteration ṛ) and for aspirated retroflex flap (transliteration ṛh).

³⁾ Ardhaçandra: Anglicising of pronunciation of vowels of English words used in Hindi.

⁴⁾ Retroflex l (transliteration l̥) in Marathi. Compare the letter ळ (l̥) in Vedic Sanskrit. Note: If you encode "ld", you will get लद्, which is used e.g. in word galda (see Rig-Veda 8-1-20).

⁵⁾ This special ṛ-character ः is used in Marathi in combination with the letters y and h.

2.2.6. Vedic Accents

Vedic accents are encoded by ' _ _ – single/double Udatta and Anudatta. Example:

ITX	puru\`Sha e_vedaM sarvaM_ yadbhU_taM yacca_ bhavya\`m
D.	पुरुष एवेदं सर्वं यद्भूतं यच्च भव्यम्
T.	puruṣa evedaṃ sarvaṃ yadbhūtaṃ yacca bhavyaṃ
E.	<i>The primordial being is verily all this that has been and that will be (Rig-Veda, 10-90-2)</i>

Note: ' = \ + apostrophe (ASCII 39), \" = \ + two apostrophes, _ = \ + underscore

2.2.7. Figures

The Arabic figures 0123456789 are converted to the respective Indian figures ०१२३४५६७८९ . Decimal figures are encoded with "\", and "\.", e.g. 1\,500\.99 results in १,५००.९९ (1,500.99).

3. Structure of Devanagari Font Sanskrit 99

3.1. Character Codes of Sanskrit 99 Font versus Latin 1 Fonts (ANSI 1252)

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
032		ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ
032		!	"	#	\$	%	&	'	()	*	+	,	-	.	/
048	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ
048	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
064	ए	अ	इ	उ	ऋ	ॠ	ऌ	ॡ	ऋ	ॠ	ऌ	ॡ	ऋ	ॠ	ऌ	ॡ
064	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
080	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ
080	P	Q	R	S	T	U	V	W	X	Y	Z	[\]	^	_
096	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ
096	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
112	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ
112	p	q	r	s	t	u	v	w	x	y	z	{		}	~	□
128			ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ
128	€	□	,	f	"	..	†	‡	ˆ	%	Š	<	€	□	Ž	□
144		ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ
144	□	`	'	"	"	•	-	-	˜	™	Š	>	œ	□	ž	ÿ
160		ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ
160		ı	ç	£	¤	¥	¦	§	¨	©	ª	«	¬	­	®	¯
176	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ
176	°	±	²	³	´	µ	¶	·	¸	¹	º	»	¼	½	¾	¿
192	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ
192	À	Á	Â	Ã	Ä	Å	Æ	Ç	È	É	Ê	Ë	Ì	Í	Î	Ï
208	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ
208	Ð	Ñ	Ò	Ó	Ô	Õ	Ö	×	Ø	Ù	Ú	Û	Ü	Ý	Þ	ß
224	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ
224	à	á	â	ã	ä	å	æ	ç	è	é	ê	ë	ì	í	î	ï
240	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ
240	õ	ñ	ò	ó	ô	õ	ö	÷	ø	ù	ú	û	ü	ý	þ	ÿ

White rows: Sanskrit 99 font, Green rows: Revised ANSI 1252 (incl. €, Ž, ž): Courier New

3.2. Improvements of New Sanskrit 99 over Old Sanskrit 98

In order to achieve compatibility with all word processing programs and printers, the font has been made compatible with the **original** specifications for TTF and PS Type 1 fonts:

1. The codes 127, 128-129, 141-144, 157-158 (not used in original TTF and PS fonts) have been left empty, because characters in these slots are often skipped by printer drivers.
2. Printer's Specials: Two spaces: hard space (code 32) and no-break space (code 160). Two hyphens: hard hyphen (code 45) and soft hyphen (code 173). Middot (code 183).

3.3. Classification of Glyphs of Sanskrit 99

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
032		ँ	घ	ङ	झ	ञ	ट	ड	ध	फ	य	ॠ	।	-	॥	
048	०	१	२	३	४	५	६	७	८	९	०	१	२	३	४	५
064	ए	अ	इ	उ	ऋ	ॠ	ऌ	ॡ	ॢ	ॣ	।	॥	०	१	२	३
080	८	ठ	ॠ	ॡ	ॢ	ॣ	।	॥	०	१	२	३	४	५	६	७
096	ॐ	।	व	च	द	ॠ	ड	ग	ह	ि	ज	क	ल	म	न	ख
112	प	ट	र	स	त	ॠ	व	थ	ध	य	श	०	१	२	३	४
128			ॠ	ॡ	ॢ	ॣ	।	॥	०	१	२	३	४	५	६	७
144		ॠ	ॡ	ॢ	ॣ	।	॥	०	१	२	३	४	५	६	७	८
160		ॠ	ॡ	ॢ	ॣ	।	॥	०	१	२	३	४	५	६	७	८
176	ॠ	ॡ	ॢ	ॣ	।	॥	०	१	२	३	४	५	६	७	८	९
192	ॠ	ॡ	ॢ	ॣ	।	॥	०	१	२	३	४	५	६	७	८	९
208	ॠ	ॡ	ॢ	ॣ	।	॥	०	१	२	३	४	५	६	७	८	९
224	ॠ	ॡ	ॢ	ॣ	।	॥	०	१	२	३	४	५	६	७	८	९
240	ॠ	ॡ	ॢ	ॣ	।	॥	०	१	२	३	४	५	६	७	८	९

Pink: Complete glyphs (complete simple characters and complete precomposed ligatures)

Green: Half-glyphs (left halves of simple letters and ligatures – *Exception:* च = right half)

Yellow: Zero-width glyphs (matras, accents, virama) inserted **after** the respective glyph, e.g. क + ॠ = कृ – *Exception:* Nukta is inserted **before** the respective glyph, e.g.: ॠ + क = क्र

White: Printer's Specials (spaces, hyphens and centered period = middle dot).

Black: unused, reserved

3.4. Selective List of Ligatures of Sanskrit 99 in Large Print for Beginners

This list of ligatures, drawn from my book "Sanskrit-Kompendium", has been updated to reflect changes made in the font Sanskrit 99 as opposed to Sanskrit 98: Due to lack of 1252 code page space, a few ligatures, e.g. **ṭhṭh** and **phra** used in Hindi and **khna** and **thna** very rarely used in Sanskrit had to be removed. In this way it was possible to re-standardize the code page to achieve compatibility with all word processors and printer drivers.

Not all ligatures listed occur in **Sanskrit**. For detailed information on ligatures that really occur in Vedic and Classical Sanskrit, consult my book "Conjunct Consonants in Sanskrit".

क्क	kka	क्ष्व	kṣva	ङ्क	ṅka ⁺	–	cra
क्ख	kkha	क्स	ksa	ङ्क	ṅkta	च्व	cva
क्क	kca	ख्न	khna	ङ्क्त्य	ṅktya	छ्म	chma
क्ण	kṇa	ख्य	khya ⁺⁺	ङ्क्य	ṅkya	छ्य	chya
क्त	kta ⁺⁺	ख्र	khra	ङ्क्ष	ṅkṣa	छ्र	chra
क्त्य	ktya	ख्व	khva	ङ्क्ष्व	ṅkṣva	छ्व	chva
क्त्र	ktra	ग्द	gda	ङ्क्ख	ṅkha	ज्ज	jjā ⁺
क्त्र्य	ktrya	ग्ध	gdha	ङ्क्ख्य	ṅkhya	ज्ज	jjña
क्त्व	ktva ⁺	ग्ध्व	gdhva	ङ्ङ	ṅga ⁺⁺	ज्ज्व	jjva
क्थ	ktha	ग्न	gna ⁺⁺	ङ्ङ्य	ṅgya	ज्ज	jjha
क्थ्न	kthna	ग्न्य	gnya	ङ्ङ्र	ṅgra	ज्ञ	jña ⁺⁺
क्क	kna	ग्भ	gbha	ङ्ङ्य	ṅgha	ज्ञ्य	jñya
क्न्य	knya	ग्भ्य	gbhya	ङ्ङ्य	ṅghya	ज्म	jma
क्म	kma	ग्म	gma	ङ्ङ्र	ṅghra	ज्य	jya ⁺⁺
क्य	kya ⁺⁺	ग्य	gya	ङ्ङ	ṅna	ज्र	jra
क्क	kra ⁺⁺⁺	ग्र	gra ⁺⁺	ङ्ङ्न	ṅna	ज्व	jva
क्क्य	krya	ग्र्य	grya	ङ्ङ्म	ṅma	ञ्च	ñca ⁺⁺
क्ल	kla	ग्ल	gla	ङ्ङ्य	ṅya	ज्चम	ñcma
क्व	kva	ग्व	gva	ञ्च	cca ⁺⁺	ज्च्य	ñcya
क्व्य	kvya	घ्न	ghna ⁺	ञ्छ	ccha ⁺⁺	ञ्छ	ñcha
क्ष	kṣa ⁺⁺⁺	घ्न्य	ghnya	ञ्छ्र	cchra ⁺	ञ्ज	ñja ⁺⁺
क्षण	kṣṇa	घ्म	ghma	ञ्छ्व	cchva	ज्ज्य	ñjya
क्ष्म	kṣma	घ्य	ghya	ञ्ज	cña	ज्ज	ñña
क्ष्म्य	kṣmya	घ्र	ghra ⁺	चम	cma	ज्श	ñśa ⁺
क्ष्य	kṣya ⁺⁺	घ्ल	ghla	च्य	cya ⁺⁺	ट्क	ṭka

ट्ट	ṭṭa	ण्ड	ṇḍha	थ्व	thva	ध्रय	dhrya
ट्ठ	ṭṭha	ण्ण	ṇṇa	द्र	dga	ध्व	dhva ⁺
ट्प	ṭpa	णन	ṇna	द्रय	dgya	न्क	nka ⁺
ट्म	ṭma	णम	ṇma	द्र	dgra	न्त	nta ⁺⁺⁺
ट्य	ṭya	ण्य	ṇya ⁺⁺	द्ध	dgha	न्त्य	nty ⁺
ट्र	ṭra	ण्व	ṇva	द्घ्र	dghra	न्त्र	ntra ⁺
ट्व	ṭva	त्क	tka ⁺⁺	द्द	dda ⁺	न्त्रय	ntrya
ट्ष	ṭṣa	त्क्र	tkra	द्दय	ddy ^a	न्त्व	ntva
ट्स	ṭsa	त्त	tta ⁺⁺⁺	द्द्र	ddra	न्त्स	ntsa
ठ्ठ	ṭhṭha	त्त्य	ttya	द्द्व	ddva	न्थ	ntha
ठ्म	ṭhma	त्त्र	ttra	द्ध	ddha ⁺⁺⁺	न्द	nda ⁺⁺
ठ्य	ṭhya	त्त्व	ttva ⁺⁺	द्धन	ddhna	न्द्व	nddha
ठ्र	ṭhra	त्थ	ttha ⁺	द्धय	ddhya	न्द्र	ndra ⁺⁺
ड्ग	ḍga	त्त	tta ⁺	द्धव	ddhva	न्ध	ndha ⁺⁺
ड्गय	ḍgya	त्न्य	tnya	द्द	dna	न्ध्य	ndhya
ड्घ	ḍgha	त्प	tpa ⁺⁺	द्द	dba	न्ध्र	ndhra
ड्घ्र	ḍghra	त्प्र	tpra ⁺	द्द्व	dbra	न्न	nna ⁺⁺⁺
ड्द	ḍḍa	त्फ	tpha	द्द	dbha ⁺⁺	न्न्य	nnya
ड्द्व	ḍḍva	त्म	tma ⁺⁺	द्द	dbhra	न्प	npa ⁺⁺
ड्भ	ḍbha	त्म्य	tmya	द्दय	dbhya	न्प्र	npra ⁺
ड्म	ḍma	त्य	tya ⁺⁺⁺	द्द	dma	न्फ	npha
ड्य	ḍya	त्र	tra ⁺⁺⁺	द्य	dya ⁺⁺⁺	न्म	nma ⁺⁺
ड्र	ḍra	त्र्य	trya	द्र	dra ⁺⁺⁺	न्य	nya ⁺⁺⁺
ड्ण	ḍṇa	त्व	tva ⁺⁺⁺	द्रय	drya	न्न	nra ⁺
ड्य	ḍhya	त्स	tsa ⁺⁺	द्द	dva ⁺⁺⁺	न्व	nva ⁺⁺
ड्र	ḍhra	त्स्र	tsna	द्द	dvya	न्स	nsa ⁺⁺
ड्व	ḍhva	त्सन्य	tsnya	द्द्व	dvra	न्ह	nha
ण्ट	ṇṭa	त्सम्य	tsmya	द्घ्र	dhna	प्त	pta ⁺⁺
ण्ठ	ṇṭha	त्स्य	tsya ⁺	ध्न्य	dhnya	प्त्य	ptya
ण्ड	ṇḍa ⁺⁺	त्स्व	tsva	ध्म	dhma	प्त्र	ptr ^a
ण्ड्य	ṇḍya	थ्न	thna	ध्य	dhya ⁺⁺	प्त्रय	ptrya
ण्ड्र	ṇḍra	थ्य	thya	ध्र	dhra	प्न	pna ⁺

प्प	ppa	भ्व	bhva	व्व	vva	स्क	ska ⁺
प्फ	ppha	म्न	mna ⁺	श्क	śka	स्क्र	skra
प्म	pma	म्प	mpa	श्च	śca ⁺⁺⁺	स्ख	skha
प्य	pya ⁺⁺	म्प्र	mpra	श्च्य	ścya	स्ट	ṣṭa
प्र	pra ⁺⁺⁺	म्ब	mba ⁺	श्न	śna	स्त	sta ⁺⁺⁺
प्ल	pla	म्ब्य	mbya	श्म	śma	स्त्य	stya
प्व	pva	म्भ	mbha	श्य	śya ⁺⁺	स्त्र	stra ⁺⁺
प्व्य	pvyā	म्म	mma	श्च	śra ⁺⁺⁺	स्त्व	stva ⁺⁺
प्स	psa ⁺	म्य	mya ⁺⁺	श्च्य	śrya	स्थ	stha ⁺⁺
प्स्व	psva	म्र	mra	श्ल	śla	स्थ्य	sthya
फ्म	phma	म्ल	mla	श्च	śva ⁺⁺	स्त्र	sna
–	phra	म्व	mva	श्च्य	śvya	स्न्य	snyā
फ्य	phyā	म्स	msa	श्श	śśa	स्प	spa ⁺⁺
ब्घ	bgha	म्ह	mha	ष्क	ṣka ⁺	स्फ	spha
ब्ज	bja	य्य	yya	ष्क	ṣkra	स्म	sma ⁺⁺
ब्ट	bṭa	य्व	yva	ष्ट	ṣṭa ⁺⁺	स्म्य	smyā
ब्त	bta	ल्क	lka	ष्ट्य	ṣṭya ⁺⁺	स्य	sya ⁺⁺⁺
ब्द्	bda	ल्ग	lga	ष्ट्र	ṣṭra ⁺⁺	स्त्र	sra ⁺⁺
ब्ध	bdha	ल्द	lda	ष्ट्र्य	ṣṭrya	स्ल	sla
ब्ध्व	bdhva	ल्न	lna	ष्ट्व	ṣṭva ⁺⁺	स्व	sva ⁺⁺
ब्न	bna	ल्प	lpa ⁺	ष्ठ	ṣṭha ⁺⁺	स्स	ssa
ब्ब	bba	ल्म	lma	ष्ठ्य	ṣṭhya	ह	hṇa
ब्भ	bbha	ल्य	lya ⁺⁺	ष्ण	ṣṇa ⁺⁺	ह	hna
ब्भ्य	bbhya	ल्ल	lla ⁺	ष्ण्य	ṣṇya	ह्म	hma ⁺⁺
ब्य	byā	ल्व	lva	ष्प	ṣpa	ह्य	hya ⁺⁺
ब्र	bra ⁺⁺	ल्ह	lha	ष्प्र	ṣpra	ह	hra
ब्व	bva	न्न	vna	ष्म	ṣma ⁺⁺	ह्य	hryā
भ्र	bhna	व्य	vya ⁺⁺⁺	ष्य	ṣya ⁺⁺	ह	hla
भ्य	bhya ⁺⁺	व्र	vra ⁺⁺	ष्व	ṣva ⁺⁺	ह	hva
भ्र	bhra ⁺⁺	व्ल	vla	ष्ष	ṣṣa	ह्य	hvya

+++ p > 5 %; ++ p > 1 %; + p > 0.5 %; others p < 0.5 %. Probability p = 1 % means that the ligature occurs **once** in every 100 lines (=16-syllable half-verses) of the Mahabharata, e.g. ligature **म्म** occurs in 577 lines out of 158,484 lines of the Mahabharata, hence p = 0.364%.

4. Conversion of Transliterated Texts to ITX

The font **URW Palladio IT** (= Itranslator Transliteration) has the following encoding:

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
032		!	"	#	\$	%	&	'	()	*	+	,	-	.	/
048	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
064	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
080	P	Q	R	S	T	U	V	W	X	Y	Z	[\]	^	_
096	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
112	p	q	r	s	t	u	v	w	x	y	z	{		}	~	
128			,	f	„	...	†	‡	^	‰	Š	<	Œ		•	
144		'	'	“	”	•	–	—	~	™	š	>	œ		•	ÿ
160		ı	ç	£	¤	¥	ı	§	¨	©	ª	«	¬	-	®	-
176	°	±	²	³	´	µ	¶	·	¸	¹	º	»	¼	½	¾	¿
192	Ṁ	Á	Â	Ã	Ā	Ṛ	Æ	Ś	Ṛ	Ī	Ê	Ṇ	Ṇ	Í	Î	Ñ
208	Ṃ	Ş	Ḍ	Ó	Ô	Ṛ	Ṭ	Ṭ	Ḷ	Ḥ	Ġ	Ḳh	Ū	Ḷ	Ḷ	Ḷ
224	ṁ	á	â	ã	ā	ṛ	æ	ś	ṛ	ī	ê	ṇ	ṇ	í	î	ñ
240	ṡ	ş	ḍ	ó	ô	ṛ	ṭ	ṭ	ḷ	ḥ	ġ	ḳh	ū	ḷ	ḲH	ḷ

Green = Sanskrit; **Pink** = Vedic accents; **Yellow** = *additional* diacritics for Hindi/Marathi

This font was reworked in April 2003 to include *additional* diacritics for Hindi/Marathi. Note: Itranslator does not use uppercase diacritics. It converts to lowercase only.

This font is used for **output**, if you select "Transliteration" in Itranslator. However, most Western indologists do not use 7-bit ITX encoding for **input**. They enter Sanskrit texts with any of various 8-bit transliteration fonts such as URW Palladio IT. In this case you will need the Code Converter **Koko** converting 8-bit encoded transliterated "clean textfiles" (without English etc. insertions) into ITX encoded textfiles. These ITX files can thereafter be converted by the Itranslator program to Sanskrit 99 files.

Input	Program	Output
Transliterated file	>———— Koko ———>	a) ITX encoded file, or b) Transliterated file (<i>with other encoding</i>)
ITX encoded file	>— Itranslator —>	a) Devanagari file (<i>Sanskrit 99</i>), or b) Transliterated file (<i>URW Palladio IT</i>)

"Koko" is available to programmers only. See <http://home.t-online.de/home/ulrich.stiehl/koko.htm>

5. Miscellaneous Details on Various Topics

This chapter deals with a variety of different additional topics.

5.1. The Ligature Problem

Itranslator allows the user to build (a) ligatures, which really occur in the ancient texts, and (b) fancy ligatures, which may have never been used in old Sanskrit manuscripts. Example: If you encode "mbha", Itranslator generates भ्म, which is a correct conversion of a ligature that *does occur* in Sanskrit texts. However, if you encode "bmha", Itranslator produces भ्ह, a typographically pleasant ligature that is phonetically impossible and hence obviously *does not occur* in extant Sanskrit texts. Itranslator, therefore, can generate many ligatures looking nice from the typographical point of view, but which are phonetically impossible and hence are unlikely to be ever discovered. On the other hand, Itranslator has to generate many typographically unpleasant pseudo-ligatures for very rare ligatures. Example: "ñkhy" (~Nkhya) is built as the pseudo-ligature ङ्ख्य (i.e. ङ् with virama + ख्य), but you should bear in mind, that this ligature occurs *not even once* in the Mahabharata, though – theoretically – it *could* occur, e.g. in प्राङ्ख्याति ("the one looking east is revealing").

Readers who are interested in ligature research may consult my comprehensive book "Conjunct consonants in Sanskrit" documenting almost all conjunct consonants ever used in Vedic and Classical Sanskrit by quotations from a large variety of original texts.

5.2. Ligature Inhibitor "{}" and Virama Enforcer ".h"

Occasionally, it may be necessary to prevent Itranslator from using build-in ligatures by defining alternative glyph combinations. Likewise, it may be necessary to enforce virama.

5.2.1. Ligature Inhibitor "{}"

The ITX code {} is used as "ligature inhibitor", "half-glyph enforcer" and "diphthong-divider"

"Ligature inhibitor" means that Itranslator is guided not to resort to the ordinary ligature building routine, but rather to build the ligature in the way defined by the inserted code {}.

"Half-glyph enforcer" means that Itranslator will generate a half-glyph for the combination "consonant" + "code {}", provided a half-glyph (e.g. ळ) is available for the consonant (e.g. क). If no half-glyph is available in the Sanskrit 99 font (e.g. छ has no half-glyph), Itranslator uses consonant + virama, so that you need not know, whether a half-glyph exists or not.

As there are so many extremely rare ligatures, the ITX encoding is ambiguous in certain circumstances. A good example is the ligature "kṣ" (क्ष). As this ligature belongs to the ten most often used ligatures, there are in use two *contradicting* ITX codes "ksha" (क्शा) and "kSha" (क्ष), which were converted by Itranslator both to the ligature क्ष, unless the other क्शा was enforced by inserting the half-glyph-enforcer: "k{}sha".

When ITX encoding was devised about ten years ago, it was not known, that there exist several rare ligatures beginning with "kś". Therefore for the new build 1.3.0.58 (April 2003) of Itranslator it was decided to no longer permit the ambiguous ITX code "ksh" for "kṣ" (क्ष) to allow for encoding of ligatures beginning with "kś" (क्श) by encoding "ksh" without {}, e.g. "kśm", "kśr", "kśl", and "kśv". So now simply encode "kshM" for क्शम, "kshl" for क्शल, etc.

The ITX code {} is also used as "*diphthong-divider*" for the very rare occurrence of two consecutive vowels in *Sanskrit* (whereas in *Hindi*, two consecutive vowels are required frequently). Here the {} can be used to prevent automatic generation of diphthongs. Example: The ITX codes ai and au always denote the two respective Sanskrit diphthongs, and Itranslator automatically converts "au" to औ., e.g. devau = देवौ (Dual). However, if you need two consecutive vowels for writing one of those extremely rare Sanskrit words such as "titäü" (*sieve*, ä = a-dieresis, a-trema), i.e. "tita" + "u", you may either encode "tita{u}" or "tita{}u", both of which result in तितउ, transliterated by Itranslator as "titau" (without "ä").

5.2.2. Halant = Virama Enforcer ".h"

Itranslator automatically generates Virama (◌), if a consonant as final character of a word is followed by one of these delimiter codes:

Delimiter	Examples
CR + LF	खादति फलम् consonant terminates a line of text – T: "He eats the fruit."
Danda	खादति फलम्। consonant is followed by single/double danda
Space	अखादत् फलम् consonant is followed by space– T: "He ate the fruit."
\	किं खादति फलम्? consonant is followed by "\" + punctuation mark, e.g. \?
-	ऋग्-वेदः ṛg-vedaḥ hyphen in compound as a help for Sanskrit learners

Occasionally it may be necessary to enforce the virama by inserting the code ".h", but Itranslator itself does not require the Halant code ".h", whereas in mixed Hindi-Sanskrit encoding environments, e.g. ITRANS (see 5.3.), it is usually necessary to enforce virama.

Note: In Hindi, "virām" denotes the period or full-stop, while "halant" denotes the sign "◌". In Sanskrit, "virāmaḥ" means sign "◌", while "halantaḥ" is a consonant at the end of word.

5.3. ITRANS Textfiles

ITRANS textfiles encoded for use by the converter ITRANS (current release 5.3, 2001), developed by Avinash Chopde, contain – beside the straightforward ITX encoded texts – a lot of additional **meta-commands** not used by Itranslator. Luckily, these commands are usually only found in the file header preceding the respective Sanskrit text. Example:

```
%@@1
% File name      : akshi.itx
%-----
% Text title     : Akshi Upanishad
% Author        : Vedic tradition
% Language      : Sanskrit
% Subject       : philosophy/hinduism
% Description/comments : # 72 / 108; Krishna Yajurveda - Samanya upanishad
% Latest update  : Mar. 24, 2000
% Send corrections to : sanskrit@cheerful.com
% Special Instructions:
% i|h.hdr,ijag.inc,itrans.sty,multicol.sty,iarticle.sty
% Transliteration scheme: ITRANS 5.2
% Site access   :
% http://sanskrit.gde.to
%-----
% The text is to be used for personal studies and research only.
% Any use for commercial purpose is prohibited as a 'gentleman's'
% agreement.
% @@2
% Please ignore the following commands upto #indian and others with
% \ mark,
% which are needed for devanaagarii output and formatting.
%-----
\documentstyle[11pt,multicol,itrans]{article}
#include=ijag.inc
#endwordvowel=.h
\portraitwide
\parindent=50pt
\let\usedvng=\Largedvng % for 1 column
\pagenumbering{itrans}
\def\engtitle#1{\hrule\medskip\centerline{\large #1}}
\def\itxttitle#1{\medskip\centerline{\LARGE\textsc{#1}}\medskip\hrule}
\def\endtitles{\medskip\obeyspaceslines}
%%
\begin{document}
\engtitle{.. Akshi Upanishad ..}##
\itxttitle{.. akshyupanishhat.h ..}##\endtitles##
```

Header

```
yatsaptabhuumikaavidyaavedyaanandakalevaram.h .
vikalevarakaivalya.n raamachandrapadaM bhaje ..
etc. etc.
```

Sanskrit Text

ITRANS textfiles can be best converted by Itranslator, **if you delete the complete header.** For further details on ITRANS textfiles visit the website <http://www.aczone.com/itrans>

5.4. Flush-Right Hyphenated Typesetting of Prose Sanskrit Texts

Word processors (MS-Word etc.) require conditional hyphens for flush-right composition. For this reason, the **soft hyphen** (code 173) has been implemented into the Sanskrit 99 font to enable hyphenated typesetting of prose Sanskrit texts. After importing an Itranslator-generated RTF file in your word processor, you may refine typesetting by insertion of soft hyphens, if possible also by a word processor "macro". A **hard hyphen** (code 45) is always visible, while a soft hyphen remains invisible, unless it is needed as hyphen at the end of a line. Therefore you will never be annoyed by visible hyphens in the middle of lines of text, when you reformat the text in another point size or make corrections, deletions, insertions.

Prose Text without Soft Hyphens

अस्ति भागीरथीतीरे गृध्रकूटनाम्नि पर्वते महान्पर्कटीवृक्षः। तस्य कोटरे दैवदुर्विपाकाद्गलितनखनयनो जरद्भवो नाम गृध्रः प्रतिवसति। तज्जीवनाय तद्दृक्षवासिनः पक्षिणः स्वाहारात्किञ्चित्किञ्चिद्ददति। तेनासौ जीवति। शावकानां रक्षणं करोति। अथ कदाचिद्दीर्घकर्णो नाम मार्जारः पक्षिशवकान्भक्षयितुमागतः। तत्तमायान्तं दृष्ट्वा शावकैर्भयाकुलैर्महान्कोलाहलः कृतः। तच्छ्रुत्वा जरद्भवेनोक्तम्। कोऽयमायाति। दीर्घकर्णो गृध्रमवलोक्य सभयं हा हतोऽस्मि। अधुनातिसंनिधाने पलायितुमक्षमः। तद्यथा प्राप्तव्यं तद्भवतु। एतत्समीपमुपगच्छामि। इत्यालोच्योपसृत्याब्रवीत्। आर्य त्वामभिवन्दे। गृध्रो ब्रूते। कस्त्वम्। सोऽब्रवीत्। मार्जारोऽहम्। तदपसर। नो चेद्धन्तव्योऽसि मया। मार्जारोऽवदत्। श्रूयतां तावन्मम वचनम्। ततो यद्यहं वध्यस्तदा हन्तव्यः।

Prose Text with Soft Hyphens

अस्ति भागीरथीतीरे गृध्रकूटनाम्नि पर्वते महान्पर्कटीवृक्षः। तस्य कोटरे दैवदुर्विपाकाद्गलितनख-
नयनो जरद्भवो नाम गृध्रः प्रतिवसति। तज्जीवनाय तद्दृक्षवासिनः पक्षिणः स्वाहारात्किञ्चित्किञ्चिद्द-
दति। तेनासौ जीवति। शावकानां रक्षणं करोति। अथ कदाचिद्दीर्घकर्णो नाम मार्जारः पक्षिशव-
कान्भक्षयितुमागतः। तत्तमायान्तं दृष्ट्वा शावकैर्भयाकुलैर्महान्कोलाहलः कृतः। तच्छ्रुत्वा जरद्भ-
वेनोक्तम्। कोऽयमायाति। दीर्घकर्णो गृध्रमवलोक्य सभयं हा हतोऽस्मि। अधुनातिसंनिधाने
पलायितुमक्षमः। तद्यथा प्राप्तव्यं तद्भवतु। एतत्समीपमुपगच्छामि। इत्यालोच्योपसृत्याब्रवीत्।
आर्य त्वामभिवन्दे। गृध्रो ब्रूते। कस्त्वम्। सोऽब्रवीत्। मार्जारोऽहम्। तदपसर। नो चेद्धन्त-
व्योऽसि मया। मार्जारोऽवदत्। श्रूयतां तावन्मम वचनम्। ततो यद्यहं वध्यस्तदा हन्तव्यः।

The text has been drawn from Hitopadeśa, Part I, Fable 3: "Vulture, Cat and Little Birds".

5.5. Variants of Floating Accents or Matras

Occasionally you may wish to refine a Devanagari word according to your personal taste, e.g. Itranslator converts "vartate" to व॒र्त॑ते with very elegantly overlapping floating accents. But Sanskrit beginners might be confused, so that व॒र्त॑ते might be better readable for them. For making such refinements, use following chart of floating accents (zero-width glyphs), where न is used as reference glyph to make visible positional differences among variants:

॑	न् (033)	न् (137)	न् (156)
॑	नं (151)	नं (060)	
॑	र्न (082)	र्न (155)	
॑	नृ (038)	नृ (175)	नृ (171)
॑	नृ (168)	नृ (176)	नृ (169)
॑	नु (117)	नु (130)	नु (133)
॑	नू (085)	नू (131)	नू (170)
॑	न॑ (150) ¹	न॑ (136) ¹	
॑	नँ (126) ²	नँ (163) ²	
॑	र्न (161) ²		
॑	ने (101) ²	नै (069) ²	

¹ Nukta is inserted **before** the respective letter ("nukta" is of Persian origin denoting "dot").

² These matras do not have variants. A matra is a (non-a) vowel sign put above or below a consonant. In a broader sense, the term "matra" includes all other floating accents too.

The floating accents are inserted by pressing the ALT key and by entering the respective ANSI character code, prefixed by 0, on the numerical key pad, for example ALT 0137.

5.6. Sanskrit 99 ps (PostScript Type 1 Font)

In addition to the TrueType font "**Sanskrit 99**" (file name: Sanskrit99.ttf), you may also use the PostScript Type 1 font "**Sanskrit 99 ps**" (file names sans99ps.pfb, sans99ps.pfm), which is recommended for those who own a PostScript printer **or** who want to make PDF files with Acrobat Distiller **or** who have to create imagesetter files for book printing plants. Professional imagesetters and computer-to-plate systems usually prefer PostScript fonts.

5.7. Extracting Sanskrit 99 ps Texts from PDF Files

It is easy to extract the entire Devanagari text from a PDF file created with Sanskrit 99 ps, provided that the text is a "clean" Devanagari text (without English etc. insertions) typeset flush left and with one column per page. However, owing to internal rounding errors relating to zero-width glyphs (in fact not "zero", but with a width of 1 unit per em quad), the clipped file may contain a couple of unwanted spaces, depending on printer driver.

Experiment: 1) In Acrobat Reader: Clip and Copy the following text. 2) In Word Processor: Paste the text and mark it up with Sanskrit 99 ps or with Sanskrit 99 (both is possible).

धृतराष्ट्र उवाच ।

धर्मक्षेत्रे कुरुक्षेत्रे समवेता युयुत्सवः ।

मामकाः पाण्डवाश्चैव किमकुर्वत संजय ॥ १-१ ॥

संजय उवाच ।

दृष्ट्वा तु पाण्डवानीकं व्यूढं दुर्योधनस्तदा ।

आचार्यमुपसंगम्य राजा वचनमब्रवीत् ॥ १-२ ॥

पश्यैतां पाण्डुपुत्राणामाचार्य महतीं चमूम् ।

व्यूढां द्रुपदपुत्रेण तव शिष्येण धीमता ॥ १-३ ॥

अत्र शूरा महेष्वासा भीमार्जुनसमा युधि ।

युयुधानो विराटश्च द्रुपदश्च महारथः ॥ १-४ ॥

धृष्टकेतुश्चेकितानः काशिराजश्च वीर्यवान् ।

पुरुजित्कुन्तिभोजश्च शैब्यश्च नरपुंगवः ॥ १-५ ॥

युधामन्युश्च विक्रान्त उत्तमौजाश्च वीर्यवान् ।

सौभद्रो द्रौपदेयाश्च सर्व एव महारथाः ॥ १-६ ॥

अस्माकं तु विशिष्टा ये तान्निबोध द्विजोत्तम ।

नायका मम सैन्यस्य संज्ञार्थं तान्ब्रवीमि ते ॥ १-७ ॥

भवान्भीष्मश्च कर्णश्च कृपश्च समितिंजयः ।

अश्वत्थामा विकर्णश्च सौमदत्तिस्तथैव च ॥ १-८ ॥

अन्ये च बहवः शूरा मदर्थे त्यक्तजीविताः ।

नानाशस्त्रप्रहरणाः सर्वे युद्धविशारदाः ॥ १-९ ॥