The ASCII Coded Character Set

					6	0	0	0	0	1	1	1	1
Bit					5	0	0	1	1	0	0	1	1
Number					4	0	1	0	1	0	1	0	1
				Hex	1st	0	1	2	3	4	5	6	7
3	2	1	0	2nd									
0	0	0	0	0		NUL	DLE	SP	0	@	P	`	p
0	0	0	1	1		SOH	DC1	!	1	A	Q	a	q
0	0	1	0	2		STX	DC2	“	2	B	R	b	r
0	0	1	1	3		ETX	DC3	#	3	C	S	c	s
0	1	0	0	4		EOT	DC4	$	4	D	T	d	t
0	1	0	1	5		ENQ	NAK	%	5	E	U	e	u
0	1	1	0	6		ACK	SYN	&	6	F	V	f	v
0	1	1	1	7		BEL	ETB	′	7	G	W	g	w
1	0	0	0	8		BS	CAN	(	8	H	X	h	x
1	0	0	1	9		HT	EM	)	9	I	Y	i	y
1	0	1	0	A		LF	SUB	*	:	J	Z	j	z
1	0	1	1	B		VT	ESC	+	;	K	[	k	{
1	1	0	0	C		FF	FS	,	<	L	\	l	|
1	1	0	1	D		CR	GS	-	=	M	]	m	}
1	1	1	0	E		SO	RS	.	>	N	^	n	~
1	1	1	1	F		SI	US	/	?	O	—	o	DEL

ACK	acknowledge	FF	form feed
BEL	bell	FS	file separator
BS	backspace	GS	group separator
CAN	cancel	HT	horizontal tab
CR	carriage return	LF	line feed
DC1	device control 1	NAK	negative acknowledge
DC2	device control 2	NUL	null
DC3	device control 3	RS	record separator
DC4	device control 4	SI	shift in
DEL	(delete)	SO	shift out
DLE	data link escape	SOH	start of heading
ENQ	enquiry	SP	space
EM	end of medium	STX	start of text
EOT	end of transmission	SUB	substitute
ESC	escape	SYN	synchronous idle
ETB	end of block	US	unit separator
ETX	end of text	VT	vertical tab

Notes

1. “1” = mark, “0” = space.
2. Bit 6 is the most-significant bit (MSB). Bit 0 is the least-significant bit (LSB).

Digital Emissions - Lowest Permitted Amateur Frequency - Developed by Ed Neustrom KF5RYL (2017 Edition)
Source: *FLDIGI* Users Manual, version 3.23
Lowest Allowable Frequency is the lowest amateur frequency at which this emission may be used
See FCC Part 97.307 limits on symbol rate and bandwidth

PSK

Mode	Baud	Lowest Allowable Band	WPM	Duty Cycle	BW (Hz)	Modulation	S/N	ITU	RSID-1	RSID-2
PSK31	31.25	160-12m	50	80.00%	31	1-PSK		31HG1B	1	
PSK63	62.5	160-12m	100	80.00%	63	1-PSK		63HG1B	2	
PSK125	125	160-12m	200	80.00%	125	1-PSK		125HG1B	4	
PSK250	250	160-12m	400	80.00%	250	1-PSK		250HG1B	126	
PSK250C6	250	160-12m	2400	80.00%	2000	6-PSK		2000HG1B	263	63
PSK500	500	10m	800	80.00%	500	1-PSK		500HG1B	173	
PSK500C2	500	10m	1600	80.00%	1200	2-PSK		1200HG1B	263	27
PSK500C4	500	10m	3200	80.00%	2600	4-PSK		2600HG1B	263	28
PSK800C2	800	10m	2300	80.00%	1400	2-PSK		2300HGB1	263	57
PSK1000	1000	10m	1600	80.00%	1800	1-PSK		1800HG1B	263	50
PSK1000C2	1000	10m	3200	80.00%	3600	2-PSK		3600HG1BC	263	52

PSKR / PSK-FEC

Mode	Baud	Lowest Allowable Band	WPM	Duty Cycle	BW (Hz)	Modulation	S/N	ITU	RSID-1	RSID-2
PSK63FEC	62.5	160-12m	55	80.00%	63	1-PSK		63HG1B	22	
PSK63RC4	63	160-12m	220	80.00%	330	4-PSKR		330HG1BC	263	1
PSK63RC5	63	160-12m	275	80.00%	416	5-PSKR		416HG1BC	263	2
PSK63RC10	63	160-12m	550	80.00%	850	10-PSKR		850HG1BC	263	3
PSK63RC20	63	160-12m	1100	80.00%	1725	20-PSKR		1725HG1BC	263	4
PSK63RC32	63	160-12m	1760	80.00%	2775	32-PSKR		2775HG1BC	263	5

Mode	Baud	Lowest Allowable Band	WPM	Duty Cycle	BW (Hz)	Modulation	S/N	ITU	RSID-1	RSID-2
PSK125R	125	160-12m	110	80.00%	125	1-PSKR		125HG1B	183	
PSK125RC4	125	160-12m	352	80.00%	650	3-PSKR		650HG1B	10	
PSK125RC5	125	160-12m	440	80.00%	825	4-PSKR		700HG1BC	11	
PSK125RC10	125	160-12m	1100	80.00%	1700	10-PSKR		1700HG1BC	12	
PSK125RC16	125	160-12m	1760	80.00%	2750	16-PSKR		2750HG1BC	13	

Mode	Baud	Lowest Allowable Band	WPM	Duty Cycle	BW (Hz)	Modulation	S/N	ITU	RSID-1	RSID-2
PSK250R	250	160-12m	220	80.00%	250	1-PSKR		250HG1B	186	
PSK250RC2	250	160-12m	440	80.00%	600	2-PSKR		600HG1BC	263	20

PSK250RC3	250	160-12m	660	80.00%	950	3-PSKR		950HG1BC	263	21
PSK250RC5	250	160-12m	1100	80.00%	1650	5-PSKR		1760HG1BC	263	22
PSK250RC6	250	160-12m	1320	80.00%	2000	6-PSKR		2000HG1BC	263	65
PSK250RC7	250	160-12m	1540	80.00%	2350	7-PSKR		2350HG1BC	263	23

Mode	Baud	Lowest Allowable Band	WPM	Duty Cycle	BW (Hz)	Modulation	S/N	ITU	RSID-1	RSID-2
PSK500R	500	10m	440	80.00%	500	1-PSKR		500-HG1BC	187	
PSK500RC2	500	10m	880	80.00%	1400	2-PSKR		1400HG1BC	263	24
PSK500RC3	500	10m	1320	80.00%	1900	3-PSKR		1900HG1BC	263	25
PSK500RC4	500	10m	1760	80.00%	2600	4-PSKR		2600HG1BC	263	26

Mode	Baud	Lowest Allowable Band	WPM	Duty Cycle	BW (Hz)	Modulation	S/N	ITU	RSID-1	RSID-2
PSK800RC2	800	10m	1280	80.00%	1400	2-PSKR		800HGB1C	263	54

Mode	Baud	Lowest Allowable Band	WPM	Duty Cycle	BW (Hz)	Modulation	S/N	ITU	RSID-1	RSID-2
PSK1000R	1000	10m	880	80.00%	1800	1-PSKR		1800HG1B	263	51
PSK1000RC2	1000	10m	1760	80.00%	3600	2-PSKR		3600HG1BC	263	53

QPSK

Mode	Baud	Lowest Allowable Band	WPM	Duty Cycle	BW (Hz)	Modulation	S/N	ITU	RSID-1	RSID-2
QPSK31	31.25	160-12m	50	80.00%	31	1-QPSK		31H0G1B	110	
QPSK63	62.5	160-12m	100	80.00%	63	1-QPSK		63HG1B	3	
QPSK125	125	160-12m	200	80.00%	125	1-QPSK		125HG1B	5	
QPSK250	250	160-12m	400	80.00%	250	1-QPSK		250HG1B	127	
QPSK500	500	10m	800	80.00%	500	1-QPSK		500HG1B		

8PSK

Mode	Baud	Lowest Allowable Band	WPM	Duty Cycle	BW (Hz)	Modulation	S/N	ITU	RSID-1	RSID-2
8PSK125	125	160-12m	620	80.00%	125	1-8PSK		250HG1B	56	1066
8PSK250	250	160-12m	620	80.00%	250	1-8PSK		250HG1B	56	1071
8PSK500	500	10m	1650	80.00%	500	1-8PSK		500HG1B	56	1076
8PSK1000	1000	10m	3300	80.00%	1000	1-8PSK		1000HG1B	56	1047
8PSK125F	125	160-12m	620	80.00%	125	1-8PSK		250HG1B	56	1037
8PSK250F	250	160-12m	620	80.00%	250	1-8PSK		250HG1B	56	1038
8PSK500F	500	10m	1650	80.00%	500	1-8PSK		500HG1B	56	1043

8PSK1000F	1000	10m	3300	80.00%	1000	1-8PSK		1000HG1B	56	1078
8PSK1200F	1200	10m	4200	80.00%	1200	1-8PSK		1200HG1B	56	1058

Contestia

Mode	Baud	Lowest Allowable Band	WPM	Duty Cycle	BW (Hz)	Modulation	S/N	ITU	RSID-1	RSID-2
CONTESTIA-4-250	62.5	160-12m	40	100.00%	250	4-FSK	-10 dB	250HF1B	55	
CONTSTIA-8-250	31.25	160-12m	30	100.00%	250	8-FSK	-13 dB	250HF1B	49	
CONTESTIA-4-500	125	160-12m	78	100.00%	500	4-FSK	-8 dB	500HF1B	54	
CONTESTIA-8-500	62.5	160-12m	60	100.00%	500	8-FSK	-10 dB	500HF1B	52	
CONTESTIA-16-500	31.25	160-12m	30	100.00%	500	16-FSK	-12 dB	500HF1B	50	
CONTESTIA-8-1000	125	160-12m	117	100.00%	1000	8-FSK	-5 dB	1K00F1B	117	
CONTESTIA-16-1000	62.5	160-12m	78	100.00%	1000	16-FSK	-9 dB	1K00F1B	53	
CONTESTIA-32-1000	31.25	160-12m	48	100.00%	1000	32-FSK	-12 dB	1K00F1B	51	

DominoEX

Mode	Baud	Lowest Allowable Band	WPM	Duty Cycle	BW (Hz)	Modulation	S/N	ITU	RSID-1	RSID-2
DominoEX4	3.9	160-12m	29	100.00%	173			173HF1B	84	
DominoEX5	5.4	160-12m	44	100.00%	244			244HF1B	85	
DominoEX8	7.8	160-12m	58	100.00%	346			346HF1B	86	
DominoEX11	10.8	160-12m	80	100.00%	262			262HF1B	87	
DominoEX16	15.6	160-12m	115	100.00%	355			355HF1B	88	
DominoEX22	21.5	160-12m	160	100.00%	524			524HF1B	90	
DominoEX44	43	160-12m	312	100.00%	1600			1600HF1B	263	45
DominoEX88	86	160-12m	614	100.00%	1600			1600HF1B	263	46

MFSK

Mode	Baud	Lowest Allowable Band	WPM	Duty Cycle	BW (Hz)	Modulation	S/N	ITU	RSID-1	RSID-2
MFSK4	3.9	160-12m	18	100.00%	154	32-FSK		154HF1B		
MFSK8	7.8	160-12m	36	100.00%	316	32-FSK		316HF1B	60	
MFSK11	10.8	160-12m	40	100.00%	218	16-FSK		218HF1B	148	
MFSK16	15.6	160-12m	58	100.00%	316	16-FSK		316HF1B	57	
MFSK22	21.5	160-12m	80	100.00%	435	16-FSK		435HF1B	152	
MFSK31	31.3	160-12m	55	100.00%	330	8-FSK		330HF1B		
MFSK32	31.3	160-12m	120	100.00%	630	16-FSK		630HF1B	147	
MFSK64	63	160-12m	240	100.00%	1260	16-FSK		1260HF1B	263	30

MFSK128	125	160-12m	480	100.00%	1920			1920HF1B	263	31
MFSK64L	63	160-12m	240	100.00%	1260	16-FSK		1260HF1B	263	30
MFSK128L	125	160-12m	480	100.00%	1920			1920HF1B	263	31

MT-63

Mode	Baud	Lowest Allowable Band	WPM	Duty Cycle	BW (Hz)	Modulation	S/N	ITU	RSID-1	RSID-2
MT63-500	5	160-12m	50	80.00%	500	64 x 2-PSK		500HJ2DEN	9	
MT63-1000	10	160-12m	100	80.00%	1000	64 x 2-PSK		1K00J2DEN	12	
MT63-2000	20	160-12m	200	80.00%	2000	64 x 2-PSK		2K00J2DEN	15	

Olivia

Mode	Baud	Lowest Allowable Band	WPM	Duty Cycle	BW (Hz)	Modulation	S/N	ITU	RSID-1	RSID-2
OLIVIA-4-250	63	160-12m	20	100.00%	250	4-FSK	-12 dB	250HF1B	75	
OLIVIA-8-250	31	160-12m	15	100.00%	250	8-FSK	-14 dB	250HF1B	69	
OLIVIA-4-500	125	160-12m	40	100.00%	500	4-FSK	-10 dB	500HF1B	74	
OLIVIA-8-500	63	160-12m	30	100.00%	500	8-FSK	-11 dB	500HF1B	72	
OLIVIA-16-500	31	160-12m	20	100.00%	500	16-FSK	-13 dB	500HF1B	70	
OLIVIA-8-1000	125	160-12m	58	100.00%	1000	8-FSK	- 7 dB	1K00F1B	116	
OLIVIA-16-1000	63	160-12m	40	100.00%	1000	16-FSK	-10 dB	1K00F1B	73	
OLIVIA-32-1000	31	160-12m	24	100.00%	1000	32-FSK	-12 dB	1K00F1B	71	

RTTY

Mode	Baud	Lowest Allowable Band	WPM	Duty Cycle	BW (Hz)	Modulation	S/N	ITU	RSID-1	RSID-2
RTTY 45	45	160-12m	60	100.00%	270			270HF1B	39	
RTTY 50	50	160-12m	66	100.00%	270			270HF1B	40	
RTTY 75N	75	160-12m	100	100.00%	370			370HF1B	41	
RTTY 75W	75	160-12m	100	100.00%	870			870HF1B		

THOR

Mode	Baud	Lowest Allowable Band	WPM	Duty Cycle	BW (Hz)	Modulation	S/N	ITU	RSID-1	RSID-2
THOR4	3.9	160-12m	14	100.00%	173			173HF1B	136	
THOR5	5.4	160-12m	22	100.00%	244			244HF1B	139	
THOR8	7.8	160-12m	28	100.00%	346			346HF1B	137	
THOR11	10.8	160-12m	40	100.00%	262			262HF1B	143	
THOR16	15.6	160-12m	58	100.00%	355			355HF1B	138	

THOR22	21.5	160-12m	78	100.00%	524			524HF1B	145	
THOR25X4	24.3	160-12m	88	100.00%	1800	4x tone spacing, 2 sec interleave		1800HF1B	263	40
THOR50X1	48.6	160-12m	176	100.00%	900	1 sec interleave		900HF1B	263	41
THOR50X2	48.5	160-12m	176	100.00%	1800	2x tone spacing, 1 sec interleave		1800HF1B	263	42
THOR100	97	160-12m	352	100.00%	1800	0.5 sec interleave		1800HF1B	263	43

THROB

Mode	Baud	Lowest Allowable Band	WPM	Duty Cycle	BW (Hz)	Modulation	S/N	ITU	RSID-1	RSID-2
THROB1	1	160-12m	10	80.00%	72	1/2 of 9-FSK		72H0F1B	43	
THROB2	2	160-12m	20	80.00%	72	1/2 of 9-FSK		72H0F1B	44	
THROB4	4	160-12m	30	80.00%	144	1/2 of 9-FSK		144HF1B	45	
THROBX1	1	160-12m	10	80.00%	94	2 of 11-FSK		94H0F1B	46	
THROBX2	2	160-12m	20	80.00%	94	2 of 11-FSK		94H0F1B	47	
THROBX4	4	160-12m	40	80.00%	188	2 of 11-FSK		188HF1B	146	

ITA2 (Baudot) and AMTOR Codes

Combination No.	ITA2[1] Code Bit No. 43210	Hex	CCIR 476[2] Code Bit No. 6543210	Hex	Character Set Letters Case	Figures Case ITA2	Figures Case U.S. TTYs[3]
1	00011	03	1000111	47	A	—	—
2	11001	19	1110010	72	B	?	?
3	01110	0E	0011101	1D	C	:	:
4	01001	09	1010011	53	D	[5]	$
5	00001	01	1010110	56	E	3	3
6	01101	0D	0011011	1B	F	[4]	!
7	11010	1A	0110101	35	G	[4]	&
8	10100	14	1101001	69	H	[4]	# or motor stop
9	00110	06	1001101	4D	I	8	8
10	01011	0B	0010111	17	J	BELL	´
11	01111	0F	0011110	1E	K	(	(
12	10010	12	1100101	65	L	)	)
13	11100	1C	0111001	39	M	.	.
14	01100	0C	1011001	59	N	,	,
15	11000	18	1110001	71	0	9	9
16	10110	16	0101101	2D	P	0	0
17	10111	17	0101110	2E	Q	1	1
18	01010	0A	1010101	55	R	4	4
19	00101	05	1001011	4B	S	'	BELL
20	10000	10	1110100	74	T	5	5
21	00111	07	1001110	4E	U	7	7
22	11110	1E	0111100	3C	V	=	;
23	10011	13	0100111	27	W	2	2
24	11101	1D	0111010	3A	X	/	/
25	10101	15	0101011	2B	Y	6	6
26	10001	11	1100011	63	Z	+	"
27	01000	08	1111000	78	← CR (Carriage return)		
28	00010	02	1101100	6C	≡ LF (Line feed)		
29	11111	1F	1011010	5A	↓ LTRS (Letter shift)		
30	11011	1B	0110110	36	↑ FIGS (Figure shift)		
31	00100	04	1011100	5C	SP (Space)		
32	00000	00	1101010	6A	BLK (Blank)		

Notes

[1] 1 represents the mark condition (shown as Z in ITU recommendations) which is the higher emitted radio frequency for FSK, the lower audio frequency for AFSK. 0 represents the space condition (shown as A in ITU documents). Bits are numbered 0 (least-significant bit) through 4 (most-significant bit). The order of bit transmission is LSB first, MSB last. Symbols A and Z are defined in CCIR Rec. R.140.

[2] 1 represents the mark condition (shown as B in CCIR recommendations), which is the higher emitted radio frequency for FSK, the lower audio frequency for AFSK. 0 represents the space condition (shown as Y in CCIR recommendations). Bits are numbered 0 (LSB) through 6 (MSB). The order of bit transmission is LSB first, MSB last.

[3] Many U.S. teletypewriters have these figures case characters.

[4] At present unassigned. Reception of these signals, however, should not initiate a request for repetition.

[5] The pictorial representations of ☒ or ✠ indicate WRU (Who are you?), which is used for an answer-back function in telex networks.

Operating Tips for Digital Voice Using *FreeDV*

By Mel Whitten, KØPFX

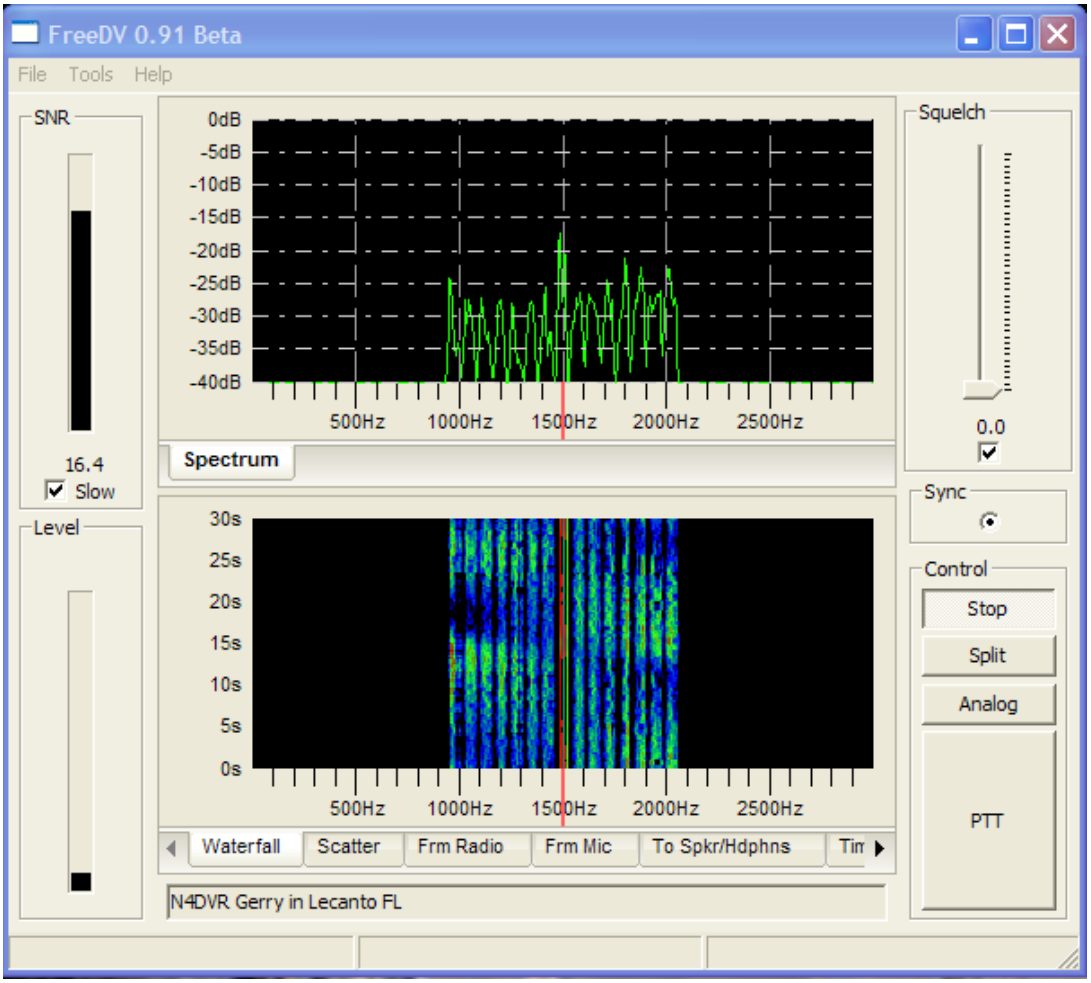
The following are guidelines for configuring and using *FreeDV* on the HF bands. Written and video setup guides are available at **http://freedv.org**. Log in to the *FreeDV* QSO Finder at **http://qso.k7ve.org**.

Configuration:

- Use the internal/motherboard sound card for the radio in/out data (same as PSK31).
- Use a USB headset for microphone/speaker or USB audio adapter/dongle with "PC" mic and powered speakers. Adapters should use the "C-Media" codec.
- Start by adjusting sound card/USB audio dongles/headset mixer levels to ¼ scale using the mixer associated with each sound device. In Windows OS, select the Playback (Volume/Wave slider) and then Playback (Record slider) for each sound device.
- Keep the "Set Call Sign" text box short as possible. Add only your call, name and location.

Receive adjustments:

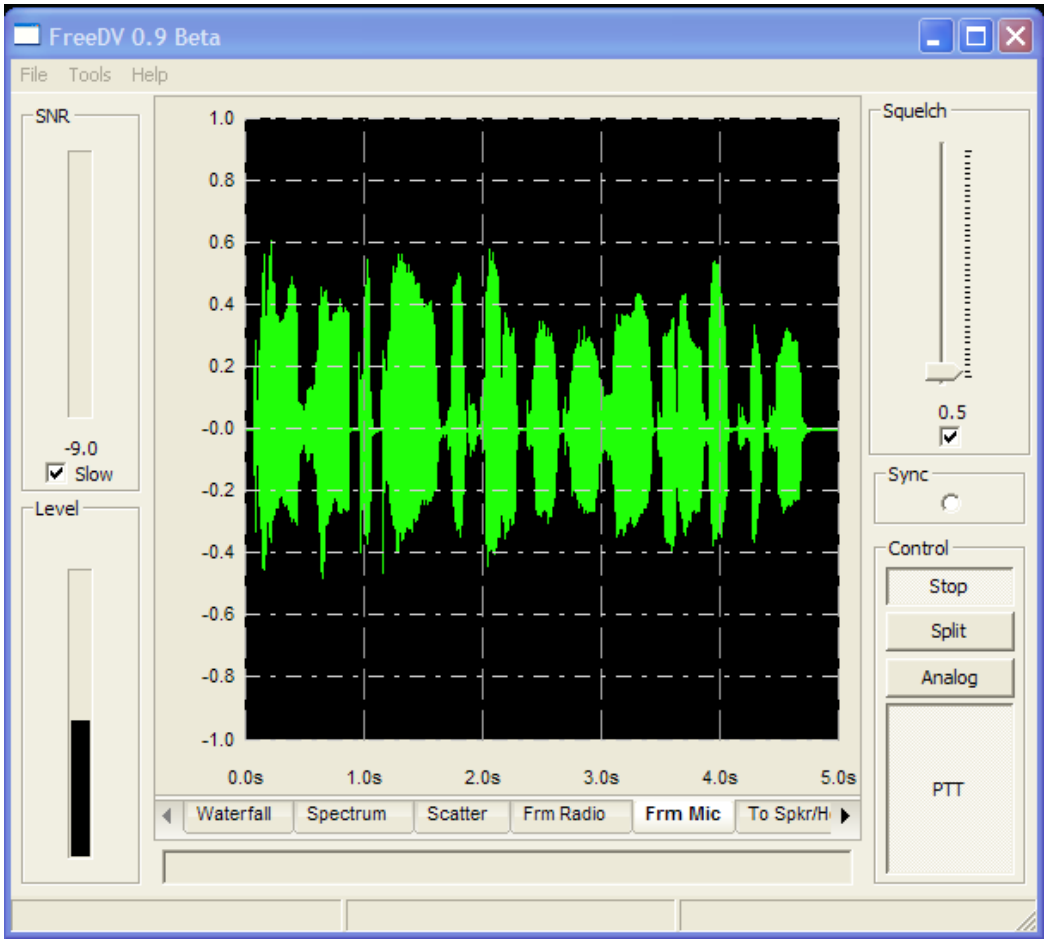
- Using the Squelch slider, adjust to 0.0. Squelch will still function but with highest sensitivity and allow decoding during fast fading of the signal.
- Adjust the Waterfall audio level to display a "blue" color with no *FreeDV* signal present. Normally, the RF/AGC gain will be backed off approximately 30%. Then adjust the RF/AF gain to obtain the highest SNR with a *FreeDV* signal present. The sound card mixer Record level slider also affects the audio level to the *FreeDV* decoder. Excessive drive will trigger a red warning indicator. When using the Spectrum display, adjust level of carriers so they do not exceed 80% of full scale.



The *FreeDV* interface showing typical waterfall (with some fading) decoding a digital voice signal.

Transmit adjustments:

- Adjust a typical 100 watt transceiver output to approximately 25 watts out (no ALC action).
- Adjust microphone level to show maximum peak deflection of ±0.6 with average around 0.4.
- Close-talk the microphone while making the final level adjustment. Any non-speech input (such as fan noise or RFI) will be decoded as "noise." No deflection should be observed on the baseline of the transmit display with no speech input.
- Make a transmit/receive sound card loop-around connection (From Microphone to Speaker/Headphone) and listen to the DV decoded audio while speaking into the mic. Adjust for best voice quality using *FreeDV*'s mic equalizer found under "Tools."



The *FreeDV* interface in transmit mode showing the analog modulation peaks from the microphone prior to encoding for DV.

What to expect:

- Expect good voice decoding with the SNR readings above 6 dB. Due to fading over an HF channel caused by multipath signals arriving at the antenna, the SNR can rapidly fluctuate over a wide range. S9 signals with low distortion will peak to 19 dB or better providing a good cushion for deep fades (shown as black areas or "notches" in the waterfall).
- Once receive signal is in sync with the transmitting station (black dot in radio bullet indicator), no additional tuning is required. The BPSK (looks like a PSK31 signal in the waterfall) will sync within ±200 Hz of the transmitter signal. Left click on the display at 1500 Hz to center the signal within the display.
- Decoding may improve with fast or no AGC. Turn off any transmitter equalization, DSP, noise limiter/noise reduction that normally may be on in SSB mode.
- Ensure the transceiver's SSB microphone is not "live" when in transmit.

Modulation formats used in Amateur Radio

Developed by Alan Bloom, N1AL and edited by Scott Honnaker, N7SS; March 2015

Format name	Developer	Principal uses		Data rate	Bit rate	Symol rate	Modulation	Error handling
		Freq.	Application	(bits/sec)	(bits/sec)	(baud)	("N-" means multi-carrier)	
ALE	MIL-STD-188-141, FED-STD-1	HF	Data	<375	375	125	8FSK	FEC
AMTOR-A	G3PLX	HF	Data	53	114	114	FSK	ARQ
AMTOR-B	G3PLX	HF	Data	57	114	114	FSK	FEC
AOR AMBE	AOR Corporation	HF	Voice, Data	2400	3600	50	36-QPSK	FEC
APCO P25	APCO	VHF	Voice	6800	9600	4,800	4FSK/QPSK/C4FM	FEC
Chip64	IZ8BLY	HF	Keyboarding	21.1/37.5	300	300	DBPSK-DSSS	FEC
CLOVER-II	Hal Communications	HF	Data	< 37.5-750	62.5-750	31.25	4-(2-16)DPSK/(2-4)DASK	FEC/FEC+ARQ
CLOVER-2000	Hal Communications	HF	Data	108-1994	500-3000	62.5	8-(2-16)DPSK/(2-4)DASK	FEC/FEC+ARQ
DMR	Motorola	VHF	Voice		9600	4,800	4FSK/QPSK/C4FM	FEC
Domino	ZL2AFP	HF	Keyboarding	31/44/62?	31/44/62	7.8/11/15.6	16FSK	None
DominoEX	ZL1BPU	HF	Keyboarding	(<15.63)-86.13	15.63-86.13	3.9-21.5	18FSK	None/FEC
D-Star (DV)	JARL	VHF	Voice & data	D:960 V:2400	4800	4800	0.5 GMSK/QPSK/4PSK	FEC
D-Star (DD)	JARL	UHF	Data	72k-124k	128,000	128,000	0.5 GMSK/QPSK/4PSK	FEC
Facsimile		HF	Image			120 lpm	FM, 1500-2300 Hz	None
FDMDV	G3PLX/HB9TLK	HF	Voice	1450	1450	50	15-QPSK	None
FSK441	K1JT	VHF	Meteor scatter	882	882	441	4FSK	None
G-TOR	Kantronics	HF	Data	35/75/115	80/160/240	100/200/300	FSK, 170/200 shift	FEC + ARQ
Hellschreiber (Feld)	Rudolf Hell	HF	Keyboarding	2.5 char/s	122.5	122.5	ASK	None
JT6M	K1JT	50 MHz	Meteor scatter	77.9	116.8	21.53	44FSK	None
JT65	K1JT	V/UHF	Moonbounce	1.54	16.1	2.7	65FSK	FEC
MFSK16	ZL1BPU/IZ8BLY	HF	Keyboarding, Data	31.25	62.5	15.625	16FSK	FEC
MT63	SP9VRC	HF	Keyboarding	35/70/140	320/640/1280	5/10/20	64-DPSK	FEC
Olivia	SP9VRC	HF	Keyboarding	8.75/17.5	78.13/156.25	15.63/31.25	32-FSK	FEC
Packet (Bell202)		VHF	Data	<1200	1,200	1,200	FSK	ARQ
PACTOR-I	DL6MAA/DF4KV	HF	Data, Winlink email	51.2/128	100/200	100/200	FSK, 200 Hz	ARQ
PACTOR-II	Spec. Comm. Systems	HF	Data, Winlink email	100-700	200-800	100	2-DBPSK/PI-4DQPSK/8,16DPSK	FEC + ARQ
PACTOR-III	Spec. Comm. Systems	HF	Data, Winlink email	85-2722	200-3600	100	(2-18)-DBPSK/DQPSK	FEC + ARQ
PSK31	G3PLX	HF	Keyboarding	31.25	31.25	31.25	BPSK	None
QPSK31	G3PLX	HF	Keyboarding	31.25	62.5	31.25	QPSK	FEC
PSK63/125		HF	Keyboarding	62.5/125	62.5/125	62.5/125	BPSK	None
QPSK62/126		HF	Keyboarding	62.5/125	125/250	62.5/125	QPSK	FEC
Q15X25	SP9VRC	HF	Data	300/1200/2400	2,500	83.33	15-QPSK	FEC + ARQ
RTTY (Baudot)		HF	Keyboarding, contests	30.3	45.45	45.45	FSK, 170 Hz	None
SSTV (traditional)	W0ORX	HF	Image	8 s/frame		120-line B/W	FM, 1200-2300 Hz	None
SSTV Martin M1	Martin Emmerson	HF	Image	114 s/frame		240-line RGB	FM, 1200-2300 Hz	None
SSTV Scottie S1	Eddie Murphy	HF	Image	110 s/frame		240-line RGB	FM, 1200-2300 Hz	None
System Fusion	Yaesu	VHF	Voice, data		9600	4,800	4FSK/QPSK/C4FM	FEC
Throb	G3PPT	HF	Keyboarding	10/20/40 wpm		1/2/4	9FSK/2-9FSK	None
WinDRM	HB9TLK	HF	Voice, Data				COFDM (n-QAM)	FEC/FEC+ARQ
WINMOR	KN6KB	HF	Winlink email		62.5-3750	31.25/62.5	(1-15)-QPSK/16QAM/4FSK	FEC + ARQ
WSPR (MEPT-JT)	K1JT	HF-VHF	Weak signal beacon	0.45	2.93	1.46	4FSK	FEC

DominoEX Varicode Table

Standard ASCII

CHAR	ASCII	PRIVAR SECVAR	CHAR	ASCII	PRIVAR SECVAR	CHAR	ASCII	PRIVAR SECVAR	CHAR	ASCII	PRIVAR SECVAR
NUL	0	1,15,9	SPACE	32	0 3,8,8	@	64	0,9,8 5,9,8	`	96	0,9,11 5,9,11
SOH ☺	1	1,15,10	!	33	7,11 4,15,11	A	65	3,9 4,11,9	a	97	4 3,8,12
STX ☻	2	1,15,11	“	34	0,8,14 5,8,14	B	66	4,14 4,12,14	b	98	1,11 4,9,11
ETX ♥	3	1,15,12	#	35	0,10,11 5,10,11	C	67	3,12 4,11,12	c	99	0,12 4,8,12
EOT ♦	4	1,15,13	$	36	0,9,10 5,9,10	D	68	3,14 4,11,14	d	100	0,11 4,8,11
ENQ ♣	5	1,15,14	%	37	0,9,9 5,9,9	E	69	3,8 4,11,8	e	101	1 3,8,9
ACK ♠	6	1,15,15	&	38	0,8,15 5,8,15	F	70	4,12 4,12,12	f	102	0,15 4,8,15
BEL •	7	2,8,8	‘	39	7,10 4,15,10	G	71	5,8 4,13,8	g	103	1,9 4,9,9
BS ◘	8	2,12	(	40	0,8,12 5,8,12	H	72	5,10 4,13,10	h	104	0,10 4,8,10
TAB ○	9	2,8,9	)	41	0,8,11 5,8,11	I	73	3,10 4,11,10	i	105	5 3,8,13
LF ◙	10	2,8,10	*	42	0,9,13 5,9,13	J	74	7,8 4,15,8	j	106	2,10 4,10,10
VT ♂	11	2,8,11	+	43	0,8,8 5,8,8	K	75	6,10 4,14,10	k	107	1,14 4,9,14
FF ♀	12	2,8,12	,	44	2,11 4,10,11	L	76	4,11 4,12,11	l	108	0,9 4,8,9
CR ♪	13	2,13	-	45	7,14 4,15,14	M	77	4,8 4,12,8	m	109	0,14 4,8,14
SO ♫	14	2,8,13	.	46	7,13 4,15,13	N	78	4,13 4,12,13	n	110	6 3,8,14
SI ☼	15	2,8,14	/	47	0,8,9 5,8,9	O	79	3,11 4,11,11	o	111	3 3,8,11
DLE ►	16	2,8,15	0	48	3,15 4,11,15	P	80	4,9 4,12,9	p	112	1,8 4,9,8
DC1 ◄	17	2,9,8	1	49	4,10 4,12,10	Q	81	6,15 4,14,15	q	113	2,8 4,10,8
DC2 ↕	18	2,9,9	2	50	4,15 4,12,15	R	82	3,13 4,11,13	r	114	7 3,8,15
DC3 ‼	19	2,9,10	3	51	5,9 4,13,9	S	83	2,15 4,10,15	s	115	0,8 4,8,8
DC4 ¶	20	2,9,11	4	52	6,8 4,15,8	T	84	2,14 4,10,14	t	116	2 3,8,10
NAK §	21	2,9,12	5	53	5,12 4,13,12	U	85	5,11 4,13,11	u	117	0,13 4,8,13
SYN ▬	22	2,9,13	6	54	5,14 4,13,14	V	86	6,13 4,14,13	v	118	1,13 4,9,13
ETB ↨	23	2,9,14	7	55	6,12 4,14,12	W	87	5,13 4,13,13	w	119	1,12 4,9,12
CAN ↑	24	2,9,15	8	56	6,11 4,14,11	X	88	5,15 4,13,15	x	120	1,15 4,9,15
EM ↓	25	2,10,8	9	57	6,14 4,14,14	Y	89	6,9 4,14,9	y	121	1,10 4,9,10
SUB →	26	2,10,9	:	58	0,8,10 5,8,10	Z	90	7,9 4,15,9	z	122	2,9 4,10,9
ESC ←	27	2,10,10	;	59	0,8,13 5,8,13	[	91	0,10,14 5,10,14	{	123	0,10,12 5,10,12
FS ∟	28	2,10,11	<	60	0,8,10 5,8,10	\	92	0,10,9 5,10,9	|	124	0,9,14 5,9,14
GS ↔	29	2,10,12	=	61	7,15 4,15,15	]	93	0,10,15 5,10,15	}	125	0,10,13 5,10,13
RS ▲	30	2,10,13	>	62	0,9,15 5,9,15	^	94	0,10,10 5,10,10	~	126	0,11,8 5,11,8
US ▼	31	2,10,14	?	63	7,12 4,15,12	_	95	0,9,12 5,9,12	DEL	127	2,10,15 7,10,15

DominoEX Varicode Table

Extended ASCII

CHAR	ASCII	PRIVAR	SECVAR	CHAR	ASCII	PRIVAR	SECVAR	CHAR	ASCII	PRIVAR	SECVAR	CHAR	ASCII	PRIVAR	SECVAR
Ç	128	2,11,8	7,11,8	á	160	0,11,9	5,11,9	└	192	0,15,9	5,15,9	α	224	1,11,9	6,11,9
ü	129	2,11,9	7,11,9	í	161	0,11,10	5,11,10	┴	193	0,15,10	5,15,10	ß	225	1,11,10	6,11,10
é	130	2,11,10	7,11,10	ó	162	0,11,11	5,11,11	┬	194	0,15,11	5,15,11	γ	226	1,11,11	6,11,11
â	131	2,11,11	7,11,11	ú	163	0,11,12	5,11,12	├	195	0,15,12	5,15,12	π	227	1,11,12	6,11,12
ä	132	2,11,12	7,11,12	ñ	164	0,11,13	5,11,13	─	196	0,15,13	5,15,13	õ	228	1,11,13	6,11,13
à	133	2,11,13	7,11,13	Ñ	165	0,11,14	5,11,14	┼	197	0,15,14	5,15,14	Õ	229	1,11,14	6,11,14
å	134	2,11,14	7,11,14	ª	166	0,11,15	5,11,15	ã	198	0,15,15	5,15,15	µ	230	1,11,15	6,11,15
ç	135	2,11,15	7,11,15	º	167	0,12,8	5,12,8	Ã	199	1,8,8	6,8,8	þ	231	1,12,8	6,12,8
ê	136	2,12,8	7,12,8	¿	168	0,12,9	5,12,9	╚	200	1,8,9	6,8,9	Þ	232	1,12,9	6,12,9
ë	137	2,12,9	7,12,9	®	169	0,12,10	5,12,10	╔	201	1,8,10	6,8,10	Ú	233	1,12,10	6,12,10
è	138	2,12,10	7,12,10	¬	170	0,12,11	5,12,11	╩	202	1,8,11	6,8,11	Û	234	1,12,11	6,12,11
ï	139	2,12,11	7,12,11	½	171	0,12,12	5,12,12	╦	203	1,8,12	6,8,12	Ù	235	1,12,12	6,12,12
î	140	2,12,12	7,12,12	¼	172	0,12,13	5,12,13	╠	204	1,8,13	6,8,13	ý	236	1,12,13	6,12,13
ì	141	2,12,13	7,12,13	¡	173	0,12,14	5,12,14	═	205	1,8,14	6,8,14	Ý	237	1,12,14	6,12,14
Ä	142	2,12,14	7,12,14	«	174	0,12,15	5,12,15	╬	206	1,8,15	6,8,15	¯	238	1,12,15	6,12,15
Å	143	2,12,15	7,12,15	»	175	0,13,8	5,13,8	¤	207	1,9,8	6,9,8	´	239	1,13,8	6,13,8
É	144	2,13,8	7,13,8	░	176	0,13,9	5,13,9	ð	208	1,9,9	6,9,9	-	240	1,13,9	6,13,9
æ	145	2,13,9	7,13,9	▒	177	0,13,10	5,13,10	Ð	209	1,9,10	6,9,10	±	241	1,13,10	6,13,10
Æ	146	2,13,10	7,13,10	▓	178	0,13,11	5,13,11	Ê	210	1,9,11	6,9,11	‗	242	1,13,11	6,13,11
ô	147	2,13,11	7,13,11	│	179	0,13,12	5,13,12	Ë	211	1,9,12	6,9,12	¾	243	1,13,12	6,13,12
ö	148	2,13,12	7,13,12	┤	180	0,13,13	5,13,13	È	212	1,9,13	6,9,13	¶	244	1,13,13	6,13,13
ò	149	2,13,13	7,13,13	Á	181	0,13,14	5,13,14	I	213	1,9,14	6,9,14	§	245	1,13,14	6,13,14
û	150	2,13,14	7,13,14	Â	182	0,13,15	5,13,15	Í	214	1,9,15	6,9,15	÷	246	1,13,15	6,13,15
ù	151	2,13,15	7,13,15	À	183	0,14,8	5,14,8	Î	215	1,10,8	6,10,8	¸	247	1,14,8	6,14,8
ÿ	152	2,14,8	7,14,8	©	184	0,14,9	5,14,9	Ï	216	1,10,9	6,10,9	°	248	1,14,9	6,14,9
Ö	153	2,14,9	7,14,9	╣	185	0,14,10	5,14,10	┘	217	1,10,10	6,10,10	¨	249	1,14,10	6,14,10
Ü	154	2,14,10	7,14,10	║	186	0,14,11	5,14,11	┌	218	1,10,11	6,10,11	·	250	1,14,11	6,14,11
ø	155	2,14,11	7,14,11	╗	187	0,14,12	5,14,12	█	219	1,10,12	6,10,12	¹	251	1,14,12	6,14,12
£	156	2,14,12	7,14,12	╝	188	0,14,13	5,14,13	▄	220	1,10,13	6,10,13	³	252	1,14,13	6,14,13
Ø	157	2,14,13	7,14,13	¢	189	0,14,14	5,14,14	¦	221	1,10,14	6,10,14	²	253	1,14,14	6,14,14
×	158	2,14,14	7,14,14	¥	190	0,14,15	5,14,15	Ì	222	1,10,15	6,10,15	■	254	1,14,15	6,14,15
ƒ	159	2,14,15	7,14,15	┐	191	0,15,8	5,15,8	▀	223	1,11,8	6,11,8	BLANK	255	1,15,8	6,15,8

Notes

1. ASCII means the decimal number 0 – 255 assigned to the code in Extended ASCII representation.
2. PRIVAR means Primary Text (keyboard or file) Varicode alphabet.
3. SECVAR means Secondary Text (ID or beacon) Varicode alphabet.
4. Characters are represented by one, two, or three nibbles each in the Varicode table, with the most commonly used characters having the shortest codes. Varicodes are shown in the form ‘n’, ‘n,n’ or ‘n,n,n’. The numbers represented by ‘n’ are the nibbles (values 0 – 15), and are transmitted in the order shown.
5. The first nibble of a character Varicode (the ‘Initial’ nibble) is ALWAYS <8, i.e. 0 – 7.
6. Following nibbles of a character Varicode, if used (‘Continuation’ nibbles) are ALWAYS >7, i.e. 8 – 15.
7. It is suggested that in tables maintained within the actual software, all Varicodes be regularized to three nibbles (‘n,n,n’) , and unwanted trailing nibbles set to 0, which is an invalid value for 2-nibble and 3-nibble codes. For example Varicode ‘2’ becomes ‘2,0,0’ and ‘3,8’ becomes ‘3,8,0’. This makes tables much easier to handle.
8. Many 3-nibble codes are unassigned. They are not used, but RESERVED for future use. If you feel moved to use one, apply to have it’s use made official, and supply a good reason!
9. No idle character is assigned or permitted. When the transmitter is idle, it must send the next pending character from a fixed message using the Secondary Text alphabet. If nothing else is available, transmit repeated Secondary Text SPACE (‘3,8,8’) or whatever suits.
10. Fonts and code pages vary in their representation, from language to language, especially of Extended ASCII assignments. This table specifies the ASCII to Varicode translation, not the character representation! The characters shown are merely typical.
11. Previous releases of this specification contained minor discrepancies from what was intended. In this corrected version, the changed values are indicated in RED. This is Version 2.0, dated 28 July 2009, and replaces all previous versions. All correspondence relating to this specification should be addressed to Murray Greenman zl1bpu@nzart.org.nz .

Varicode Used by MFSK16

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Value	Bit Sequence	Code or ASCII Character
0	11101011100	<NUL>
1	11101100000	<SOH>
2	11101101000	<STX>
3	11101101100	<ETX>
4	11101110000	<EOT>
5	11101110100	<ENQ>
6	11101111000	<ACK>
7	11101111100	<BEL>
8	10101000	<BS>
9	11110000000	<TAB>
10	11110100000	<LF>
11	11110101000	<VT>
12	11110101100	<FF>
13	10101100	<CR>
14	11110110000	<SO>
15	11110110100	<SI>
16	11110111000	<DLE>
17	11110111100	<DC1>
18	11111000000	<DC2>
19	11111010000	<DC3>
20	11111010100	<DC4>
21	11111011000	<NAK>
22	11111011100	<SYN>
23	11111100000	<ETB>
24	11111101000	<CAN>
25	11111101100	<EM>
26	11111110000	<SUB>
27	11111110100	<ESC>
28	11111111000	<FS>
29	11111111100	<GS>
30	100000000000	<RS>
31	101000000000	<US>
32	100	<SPACE>
33	111000000	!
34	111111100	"
35	1011011000	#
36	1010101000	$
37	1010100000	%
38	1000000000	&
39	110111100	'

40	111110100	(
41	111110000	)
42	1010110100	*
43	111100000	+
44	10100000	,
45	111011000	-
46	111010100	.
47	111101000	/
48	11100000	0
49	11110000	1
50	101000000	2
51	101010100	3
52	101110100	4
53	101100000	5
54	101101100	6
55	110100000	7
56	110000000	8
57	110101100	9
58	111101100	:
59	111111000	;
60	1011000000	<
61	111011100	=
62	1010111100	>
63	111010000	?
64	1010000000	@
65	10111100	A
66	100000000	B
67	11010100	C
68	11011100	D
69	10111000	E
70	11111000	F
71	101010000	G
72	101011000	H
73	11000000	I
74	110110100	J
75	101111100	K
76	11110100	L
77	11101000	M
78	11111100	N
79	11010000	O
80	11101100	P
81	110110000	Q
82	11011000	R
83	10110100	S
84	10110000	T
85	101011100	U

86	110101000	V
87	101101000	W
88	101110000	X
89	101111000	Y
90	110111000	Z
91	1011101000	[
92	1011010000	\
93	1011101100	]
94	1011010100	^
95	1010110000	_
96	1010101100	`
97	10100	a
98	1100000	b
99	111000	c
100	110100	d
101	1000	e
102	1010000	f
103	1011000	g
104	110000	h
105	11000	i
106	10000000	j
107	1110000	k
108	101100	l
109	1000000	m
110	11100	n
111	10000	o
112	1010100	p
113	1111000	q
114	100000	r
115	101000	s
116	1100	t
117	111100	u
118	1101100	v
119	1101000	w
120	1110100	x
121	1011100	y
122	1111100	z
123	1011011100	{
124	1010111000	|
125	1011100000	}
126	1011110000	~
127	101010000000	<DEL>
128	101010100000	?
129	101010101000	,
130	101010101100	,
131	101010110000	*f*

132	101010110100	„
133	101010111000	…
134	101010111100	†
135	101011000000	‡
136	101011010000	ˆ
137	101011010100	‰
138	101011011000	Š
139	101011011100	‹
140	101011100000	Œ
141	101011101000	
142	101011101100	Ž
143	101011110000	
144	101011110100	
145	101011111000	‘
146	101011111100	’
147	101100000000	“
148	101101000000	”
149	101101010000	•
150	101101010100	–
151	101101011000	—
152	101101011100	˜
153	101101100000	™
154	101101101000	š
155	101101101100	›
156	101101110000	œ
157	101101110100	
158	101101111000	ž
159	101101111100	Ÿ
160	1011110100	
161	1011111000	¡
162	1011111100	¢
163	1100000000	£
164	1101000000	¤
165	1101010000	¥
166	1101010100	¦
167	1101011000	§
168	1101011100	¨
169	1101100000	©
170	1101101000	ª
171	1101101100	«
172	1101110000	¬
173	1101110100	-
174	1101111000	®
175	1101111100	¯
176	1110000000	°
177	1110100000	±

178	1110101000	²
179	1110101100	³
180	1110110000	´
181	1110110100	µ
182	1110111000	¶
183	1110111100	·
184	1111000000	¸
185	1111010000	¹
186	1111010100	º
187	1111011000	»
188	1111011100	¼
189	1111100000	½
190	1111101000	¾
191	1111101100	¿
192	1111110000	À
193	1111110100	Á
194	1111111000	Â
195	1111111100	Ã
196	10000000000	Ä
197	10100000000	Å
198	10101000000	Æ
199	10101010000	Ç
200	10101010100	È
201	10101011000	É
202	10101011100	Ê
203	10101100000	Ë
204	10101101000	Ì
205	10101101100	Í
206	10101110000	Î
207	10101110100	Ï
208	10101111000	Ð
209	10101111100	Ñ
210	10110000000	Ò
211	10110100000	Ó
212	10110101000	Ô
213	10110101100	Õ
214	10110110000	Ö
215	10110110100	×
216	10110111000	Ø
217	10110111100	Ù
218	10111000000	Ú
219	10111010000	Û
220	10111010100	Ü
221	10111011000	Ý
222	10111011100	Þ
223	10111100000	ß

224	10111101000	à
225	10111101100	á
226	10111110000	â
227	10111110100	ã
228	10111111000	ä
229	10111111100	å
230	11000000000	æ
231	11010000000	ç
232	11010100000	è
233	11010101000	é
234	11010101100	ê
235	11010110000	ë
236	11010110100	ì
237	11010111000	í
238	11010111100	î
239	11011000000	ï
240	11011010000	ð
241	11011010100	ñ
242	11011011000	ò
243	11011011100	ó
244	11011100000	ô
245	11011101000	õ
246	11011101100	ö
247	11011110000	÷
248	11011110100	ø
249	11011111000	ù
250	11011111100	ú
251	11100000000	û
252	11101000000	n
253	11101010000	ý
254	11101010100	þ
255	11101011000	ÿ

Varicode Used by PSK31

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Numeric codes (non-printing characters)				
Code	Bit Sequence		Code	Bit Sequence
0	1010101011		1	1011011011
2	1011101101		3	1101110111
4	1011101011		5	1101011111
6	1011101111		7	1011111101
8	1011111111		9	11101111
line feed (LF)	11101		11	1101101111
12	1011011101		return (CR)	11111
14	1101110101		15	1110101011
16	1011110111		17	1011110101
18	1110101101		19	1110101111
20	1101011011		21	1101101011
22	1101101101		23	1101010111
24	1101111011		25	1101111101
26	1110110111		27	1101010101
28	1101011101		29	1110111011
30	1011111011		31	1101111111
127	1110110101			
Printable characters (ASCII)				
Character	Bit Sequence		Character	Bit Sequence
space	1		!	111111111
"	101011111		#	111110101
$	111011011		%	1011010101
&	1010111011		'	101111111
(	11111011		)	11110111
*	101101111		+	111011111
,	1110101		-	110101
.	1010111		/	110101111
0	10110111		1	10111101
2	11101101		3	11111111
4	101110111		5	101011011
6	101101011		7	110101101
8	110101011		9	110110111
:	11110101		;	110111101

<	111101101		=	1010101
>	111010111		?	1010101111
@	1010111101		A	1111101
B	11101011		C	10101101
D	10110101		E	1110111
F	11011011		G	11111101
H	101010101		I	1111111
J	111111101		K	101111101
L	11010111		M	10111011
N	11011101		O	10101011
P	11010101		Q	111011101
R	10101111		S	1101111
T	1101101		U	101010111
V	110110101		W	101011101
X	101110101		Y	101111011
Z	1010101101		[	111110111
\	111101111		]	111111011
^	1010111111		_	101101101
`	1011011111		a	1011
b	1011111		c	101111
d	101101		e	11
f	111101		g	1011011
h	101011		i	1101
j	111101011		k	10111111
l	11011		m	111011
n	1111		o	111
p	111111		q	110111111
r	10101		s	10111
t	101		u	110111
v	1111011		w	1101011
x	11011111		y	1011101
z	111010101		{	1010110111
|	110111011		}	1010110101
~	1011010111			