DX V3.0 Logging Formats

1.0 Standard DX Data File Structure (& Software Parsing Guidelines)

[I think maybe this should be an appendix in the user manual. The channel set, calibration and logging/realtime sections could refer to this appendix. The idea is to provide guidelines for DX datafile users. --Chris].

The basic structure used by DX data files are common between all the data files imported or exported (e.g. channel sets, receiver calibration, realtime logging and log dump files). Any parsing software (e.g Excel macros, scripts, C programs, etc.) may wish to use the following guidelines for parsing any of these files. By following these rules any software (scripts, macros, program, etc.) will be easier to maintain as data file formats evolve to add new features.

Of course it is not necessary to follow all of these guidelines, it is up to the data file user to decide if it is appropriate to their specific application. For example, it might be safe to assume in your particular environment that a log file will contain no comment lines -- so if you do not plan to proliferate your parsing scheme to other users who may use comments you could simplify the parsing slightly by not checking for comment lines.

1.1 Overview

Here is a quick overview of the standard file format used by the DX -- full details are given below. Basically all DX files are ASCII text which consist of 3 types of lines:

- **Comment lines** (begin with #). Comments are sometimes inserted by the DX itself (to help users interpret a file) or a user can optionally use these lines to make notes.
- **Control lines** (begin with @). Control lines are used to indicate the start and end of data in a file (i.e. @START... and @END). “@ lines” are also reserved for future use such as for keywords.
- **Message (data) lines**. Comma-delimited lines of data.

1.2 General Syntax Guidelines

1.2.1 Ignore Extra Whitespace

Any blank lines or other extra white space (e.g. tabs, spaces, new lines, nulls) should be ignored. Also ignore ASCII NUL (Hex code = 0x00) characters.

1.2.2 End of Lines

There is a carriage return at the end of each message (ASCII Hex code = 0x0D).

1.2.3 Comments

If the first non-whitespace character of a line is '#' then the line should be ignored by the parsing software. The entire line should be considered a comment and ignored. Comments are supported anywhere in a file, e.g. at the beginning before the @START line and between "data" lines.

1.3 Start, End and Control lines

“Control lines” are lines which begin with an “@” character. All data files use @START and @END lines to indicate the start and end of data.

1.3.1 Start Line (@START...)

The start of data is indicated by a line beginning (first non-whitespace characters) with "@START". Parsing software should ignore any lines before the "@START" line. This line uses white-space delimited fields.

Here is an example SAM-ALL realtime output @START line: (model=DX836, SAM-ALL messages version 3.0, firmware version 9.9A)

```
@START  ZK-SAM/DX836  SAM-ALL  09/30/1997  14:51:49  3.0  9.9A
```

Here is an example SAM-ALL “dump to pc” output @START line:

```
@START  ZK-SAM/DX836  LOG  09/30/1997  16:32:13  3.0  9.9A
```

The format of the @START line is as follows:

TABLE 6. @START line format

	Field Names							
	@START	**Model**	**File Type**	**Date**	**Time**	**File Version**	**Software Version**	**Reserved**
"Dump To PC" example:	@START	ZK-SAM/ DX836	LOG	9/30/97	14:51:49	3.0	9.9A	
SAM-ALL Realtime Example:	@START	ZK-SAM/ DX836	SAM-ALL	9/30/97	14:51:49	3.0	9.9A	
Comments:				Month/ Day/ Year	Hours: Minutes: Seonds	Format revision for File-Type	Note: V9.9A is example only.	Any other data at end of line should be ignored.

1.3.2 End of Data (@END)

The end of a data file is indicated by a line beginning with "@END". Parsing software should ignore any data following an @END. Parsing software should ignore data after the @END line until the next @START line. Also parsing software should treat end-of-file as an @END. ***Note: when transferring any data file [e.g. calibration and channel set data] to a DX the @END line is required.***

1.3.3 Other Control (@) Lines

Other @ lines may be used by specific file types (e.g. Channel Set). Other @ lines may be used in the future, the best idea for parsing software is to explicity ignore non-specified @ lines.

Essentially software should treat these lines like comment lines - i.e. skip them. For example, in a LOG data file the only valid "@ lines" are @START and @END any other line beginning with "@" should be ignored.

1.4 Message (Data) Lines

1.4.1 File Type Specific formats

The data format is different for each file type (e.g. SAM-ALL, Channel Set, etc), refer to the appropriate documentation for specific data format information.

1.4.2 Comma-Delimitted Syntax

An ASCII comma-delimitted field syntax for message lines.

1.4.3 Extra Fields are Reserved

It is possible that formats may change in the future by adding new fields to the end of the existing line formats. Ideally therefore, parsing software should ignore any fields at the end of a line.

1.4.4 End of Lines

There is a carriage return at the end of each message line.

2.0 DX V3.0 Realtime and Log Message Formats

This section describes the specific messages produced by the SAM-ALL & Select Channel modes. The log data conforms to the standard DX data file format -- please refer to *appendix [TBD]* for a description of the standard data file structure.

To simplify the documentation of SAM-ALL/Select Channel messages are divided into two types:

- **Non-GPS messages:** These messages do not contain GPS information. For example the Date message.
- **GPS marked messages:** These messages all begin with several fields which indicate the message type, time and GPS information.

2.1 About Message Format Tables

Below each message is described using a table. The columns of the table are correspond to a single field of the message. The rows of the table give detailed information about the fields. The rows of the table are:

- Example -- shows the data from the example message given above the table.
- Units -- if applicable gives the units of the message field, e.g. “meters” or “dBm”.
- Min/Max -- these to fields (if applicable) give the minimum and maximum values to be expected in the associated message field.
- Blank -- “Yes” indicates that the field may be blank under certain conditions. “No” indicates that the field will never be blank.
- Comments -- miscellaneous notes about the message field.

2.2 Non-GPS Messages

2.2.1 Date (DATE) Message

This message applies to both SAM-ALL and Select Channel modes.

This log is produced at the time SAM-ALL or Select Channel modes are first started.

Synopsis:

```
DATE, month/day/year
```

Examples (September 30, 1997 & August 23, 2001):

```
DATE,9/30/1997

DATE,8/23/2001
```

TABLE 7. Date (DATE) Messages Format

	Field Names	
	message type	**date**
Example (1997)	DATE	9/30/1997
Example (2001)	DATE	8/23/2001
Units	-	MM/DD/YYYY
Min	-	-
Max	-	-
Blank	No	No
Comments:	-	MM=2 digit month DD=2 digit day YYYY=4 digit year

2.2.2 System Settings Message

This message applies to SAM-ALL mode only.

This message is generated at the beginning of a SAM-ALL session. It indicates the scanning mode selected by the user during that SAM-ALL session. Does not apply to Select Channel mode.

Synopsis:

```
SS, hour:minute:second, control channel logging selection, voice channel set
logging selection
```

Example:

```
SS,14:51:52,CAB,VAB
```

TABLE 8. System Settings(SS) Messages Format

	Field Names			
	message type	time	control channel scanning mode	voice channel scanning mode
Example	SS	14:51:52	CAB	VAB
Min	-	-	-	-
Max	-	-	-	-
Blank	No	No	No	No
Comments:	-	HH = 2 digit hour MM=2 digiti minute SS=2 digit secnod	possible values: CAB = control A & B CA = control A only CB = control B only CNONE = no control scanning	possible values: VAB = voice A & B VA = voice A scanning VB = voice B scanning VNONE = no voice scanning

2.2.3 GPS Indicator (GP) Message

This message applies to SAM-ALL and Select Channel modes.

This log is generated at the beginning of a SAM-ALL or Select Channel session to indicate if GPS was enabled. If the unit is non-GPS then this message will always indicate disabled. If the unit does have the GPS option then the user can optionally disable/enable GPS via the GLOBAL SETUP menu (this might be useful for in-building measurements for example).

Synopsis:

```
GP, hour:minutes:seconds , flag
```

Example:

```
GP,14:51:52,1
```

TABLE 9. GPS Indicator Message (GP) Message Format

	Field Names		
	message type	time	GPS enabled flag
Example	SS	14:51:52	1
Min	-	-	0
Max	-	-	1
Blank	No	No	No
Comments:	-	HH = 2 digit hour MM=2 digiti minute SS=2 digit secnod	Where flag=1, the user has set GPS enabled. Where flag=0, the user has set GPS disabled, or unit does not have GPS option.

2.3 GPS Marked Messages

The remaining message types all begin with the same fields which give the associated message type, time and GPS information.

2.3.1 Prefix for GPS Marked Messages

The “Prefix for GPS Marked Message” is not a message in itself, but is part of all GPS marked messages.

Refer to this section for a description of the time and GPS informtion fields associated with GPS marked logs. The same format is used for Select Channel and SAM-ALL modes.

Synopsis:

```
Message type, hour:minute:second, latitude, longitude, # of sattelites, HDOP,
heading, speed (km/h), altitude (m), ....message-type specific data...
```

Example (GPS Enabled):

```
xx,14:51:52,37.3800,-121.9409,4,3.9,344,59.3,100.6,...
```

Example (GPS Disabled)[1]:

```
xx,,,,,,,,,,,,...
```

TABLE 10. GPS Prefix Format

	Field Names								
	message type	**time**	**latitude**	**longitude**	**satellites**	**HDOP**	**heading**	**speed**	**altitude**
Example	xx	14:51:52	37.3800	-121.9409	4	3.9	344	59.3	100.6
Units	2 or more chars	-	degrees	degrees	-		degrees	km/hr	meters
Min	-	-	-90	-180	1	0	0	0	0
Max	-	No	90	180	-	-	360	-	-
Blank	No	HH = 2 digit hour MM=2 digiti minute SS=2 digit secnod	Yes[1]	Yes[1]	Yes[1]	Yes[1]	Yes[1]	Yes[1]	Yes[1]
Comments:	message types are defined below.					Horizontal Dilution of Precision			

Notes:

[1] The GPS fields are always generated even if the GPS option is not enabled (or installed). There are three reasons that the GPS fields will be blank: (1) GPS is disabled (*GPS enabled flag*

field of the GP message will be 0) or (2) GPS is enabled (GP message *GPS enabled flag* = 1) but has not been able to get a fix on enough satellites, or (3) the GPS option is not installed.

2.3.2 Marker (MK) Message

This message applies to SAM-ALL and Select Channel modes.

Synopsis:

MK, hour:minute:second, latitude, longitude, number of satellites, HDOP, heading, speed (km/h), altitude (m), marker number

Example: (marker number 11)

MK,14:51:52,37.3800,-121.9409,4,3.9,344,59.3,100.6**,11**

TABLE 11. Marker (MK) Message Format

	Field Names		
	message type	**gps prefix (see sec 2.3.1)**	**marker number**
Example	MK	*	11
Min	-	*	0
Max	-	*	99
Blank	No	*	No
Comments:	-	*	Marker number increments each time user inserts marker (with ENTER key in SAM-ALL). Marker wraps to 0 after reaching 99. Marker number returns to 0 when log memory cleared.

2.3.3 Strongest Voice Channel Sets Messages (VA & VB):

This message applies to SAM-ALL mode only.

The voice channel sets message is a variable length message, which gives the RSSI average, RSSI standard deviation and number of channels for the strongest voice channel sets. The number of voice channel sets logged depends on user selected preferences.

Synopsis:

V[AB], hour:minute:second, latitude, longitude, # of satellites, HDOP, heading, speed (km/h), altitude (m), strongest set #, strongest set, SAT, Average RSSI, RSSI Standard Deviation, # of channels, ...repeated for up to 21 strongest voice sets...

Example: (2 strongest voice sets logged in system A, sets D1 & D3)

VA,14:51:53,37.3800,-121.9409,4,3.9,344,59.3,100.6,**4,D1,3,-74,3,8,18,D3,3,-79,2,13**

TABLE 12. Voice Channel Sets Messages (VA & VB) Format

	Field Names							
			Repeated for 1st, 2nd... (up to 21) strongest sets.					
	message type	gps prefix (see sec 2.3.1)	strongest set #	strongest set abbr.	sat	avg. RSSI	RSSI std dev	# of channels
A Band example	VA	*	4	D1	3	-74	3	8
Units	-	*		1 or 2 chars		dBm	dBm	-
Min	-	*	1	-	0	-255	0	0
Max	-	*	21	-	3	0	255	255
Blank	No	*	No	No	Yes	No	No	No
Comments:	-	* See sec 2.3.1	-	-	Blank or 3 means no SAT detected	-	-	Set's voice channels above *XX* dBm

2.3.4 Strongest Control Channels Messages (CA & CB)

This message applies to SAM-ALL mode only.

Synopsis:

C[AB], hour:minute:second, latitude, longitude, # of satellites, HDOP, heading, speed (km/h), altitude (m), strongest control channel, RSSI, DCC, second strongest control channel, RSSI, DCC, . . .(repeated for up to 21 control channels)

Example: (2 strongest control channels for system A (CA) and system B (CB))

CA,16:27:10,37.3808,-121.9412,6,1.1,344,0.0,17**,330,-76,0,316,-84,0**

CB,16:27:14,37.3808,-121.9412,6,1.1,344,0.0,17**,347,-79,0,349,-88,1**

TABLE 13. Strongest Control Channels Messages (CA & CB) Format

	Field Names				
			Repeated for 1st, 2nd... (up to 21) strongest control channels.		
	message type	gps prefix (see sec 2.3.1)	strongest control channel	RSSI	DCC
A Band example	CA	*	330	-76	0
B Band example	CB	*	347	-79	0
Units	-	*		dBm	
Min	-	*	1	-255	0
Max	-	*	1023	0	4
Blank	No	*	No	No	Yes
Comments:	-	* See sec 2.3.1	-	-	Blank or 4 means no DCC detected

2.3.5 System ID message (ID)

This message applies to SAM-ALL mode only.

This message provides network type, system ID, private system ID and residential system ID information. available on the serving digital control channel.

Synopsis:

ID, hour:minute:second, latitude, longitude, # of satellites, HDOP, heading, speed (km/h), altitude (m), public network type indicator, private network type indicator, residential network type indicator, SID, PSID1, PSID2, PSID3, PSID4, RSID

Example: (SID=31, public network type, no PSID, no RSID)

ID,14:53:08,37.3800,-121.9409,4,3.9,344,59.3,100.6**,1,0,0,31,,,,,**

TABLE 14. System ID Message (ID) Format

	Field Names										
	message type	gps prefix (see sec 2.3.1)	Network Type Indicators			(public) system ID (SID)	private system ID (PSID1)	private system ID (PSID2)	private system ID (PSID3)	private system ID (PSID4)	residential system ID (RSID)
			public	private	resid-ential						
Example	ID	*	1	0	0	31					
Min	-	*	0	0	0	0	0	0	0	0	0
Max	-	*	1	1	1	65535	65535	65535	65535	65535	65535
Blank	No	*	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Com-ments:	-	* See sec 2.3.1	0 : ID not available, the associated ID field(s) will be blank. 1 : ID available, the ID value will be indicated by the associated ID field.			Blank indicates ID not available, associated indicator field will be 0. 16-bit values.					

2.3.6 Phone (PH) Message

This message applies to SAM-ALL mode only.

This message provides the key information coming from the phone with the exception of the neighbors.

Synopsis:

PH, hour:minute:second, latitude, longitude, #sats, PDOP, heading, speed (km/h), altitude (m), phone type (N6=Nokia2160), control (C) or voice (V) channel, channel number, time slot, set #, set abbr., color code type (DVCC, SAT or DCC), color code value, RSSI, power level, BER, time alignment (TA)

Example (IS136 control channel 996A, DVCC=153, RSSI=-83dBm...):

PH,14:53:19,37.3800,-
121.9409,4,3.9,344,59.3,100.6**,N6,C,996,A,4,D1,DVCC,153,-83,2,0,,**

TABLE 15. Phone (PH) Message Format

	Field Names													
	msg. type	GPS prefix (sec 2.3.1)	phone type	channel type	channel #	time slot	set#	set abbr.	color code type	color code value	RSSI	power level	BER	timing alignment
Example	PH	*	N6	C	996	A	4	D1	DVCC	153	-83	2	0	
Units	-	*	1 or more chars	1 char	-	-	-	1 or 2 chars	1 or more chars	-	dBm	see note 1	%	-
Min	-	*	1	-	1	A	1	-	-	0	-255	0	0	0
Max	-	*	21	-	1023	C	21	-	-	DVCC=255 DCC=4 SAT=3	0	10	100	31
Blank	No	*	No	Yes [2]	Yes [2]	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Comments:	-	* See sec 2.3.1	N6=2160	possible: C=control V=voice	-	blank = not TDMA	-	-	possible: DVCC, SAT or DCC	Blank or DCC=4, SAT=3 indicates color code not available.	-	see note 1		-

Notes:

[1] Power level value is equal to Mobile Station Power Level (PL) as defined by the IS136 specification. PL can be converted to dBW (PdBW) with the following equation:

$$PdBW = 6dBW - (PL * 4dBW) \quad \text{[e.g. PL=1 is 2dbW]}$$

[2] If channel # is blank it implicates a power-off event of the phone.

2.3.7 Neighbor List (NB) Message

This message applies to SAM-ALL mode only.

This message logs the neighbor list data as measured by the phone. The neighbors are ordered from strongest to weakest.

Synopsis:

NB, hour:minute:second, latitude, longitude, # of satellites, PDOP, heading, speed (km/h), altitude (m), serving channel number, serving time slot, serving set #, serving set abbr., serving DVCC, serving RSSI, strongest neighbor channel, strongest neighbor RSSI, strongest neighbor DVCC, . . . (neighbors repeated to max provided by system, sorted strongest RSSI to weakest)

Example: (serving channel=996A, strongest neighbor=715, 2nd strongest neighbor=708 ...)

NB,14:53:19,37.3800,-121.9409,4,3.9,344,59.3,100.6**,996,A,4,D1,153,-83,715,-85,153,708,-93,153,695,-103,111,711,-104,162,693,-105,43,992,-105,162,1002,-106,43**

TABLE 16. Neighbor List (NB) Message Format

	Field Names										
	message type	gps prefix (see sec 2.3.1)	Serving Channel Information						Neighbor Channel Information Repeated for all neighbors provided by system (up to 24 max). Order is sorted by RSSI, strongest RSSI first, weakest last..		
			channel	time slot	set #	set abbr.	DVCC	RSSI	channel	RSSI	DVCC
Example	NB	*	996	A	4	D1	153	-83	715	-85	153
Units	-	*	-	-	-	1 or 2 chars	-	dBm	-	dBm	-
Min	-	*	1	A	1	-	0	-255	1	-255	0
Max	-	*	1023	C	21	-	255	0	1023	0	255
Blank	No	*	No	Yes	No	No	Yes	Yes	No	Yes	Yes
Comments:	-	* See sec 2.3.1	-	-	-	-	-	-	-	-	-

2.3.8 Interference (IA & IB) Messages

This message applies to SAM-ALL mode only.

When an adjacent channel interference event occurs the data is logged in this message.

Synopsis:

I[AB], hour:minute:second, latitude, longitude, #sats, PDOP, heading, speed (km/h), altitude (m), upper (U) or lower (L) adjacent, C/I, serving channel set #, serving channel set abbr., serving channel #, serving time slot, serving RSSI, serving color code type, serving color code value, power level, BER, time alignment (TA), adjacent set #, adjacent set abbr., adjacent channel #, adjacent RSSI

Examples: (system A, serving channel=996, lower adjacent channel=995...)

IA,14:54:55,37.3800,-121.9409,4,3.9,344,59.3,100.6**,L,22,4,D1,996,C,-68,DVCC,153,4,0,0, 5,E1,995,-90**

TABLE 17. Interference (IA & IB) Messages Format

	Field Names																	
					Serving Channel Information										Adjacent Channel Info			
	message type	gps prefix (see sec 2.3.1)	interference type	C/I	set #	set abbr.	chan #	time slot	RSSI	color code type	color code value	power level (PL)	BER	timing alignment	set #	set abbr.	chan #	RSSI
A band Example	IA	*	L	22	4	D1	996	C	-68	DVCC	153	4	0	0	5	E1	995	-90
Units	-	*	1 char	dBm		1 or 2 chars	-	1 char	dBm	1 or more chars	0	see note 1	%	-	-	1 or 2 chars	-	dBm
Min	-	*	-	-128	1	-	1	A	-255	-	0	0	0	0	1		1	-255
Max	-	*	-	127	21	-	1023	C	0	-	DVCC=255 DCC=4 SAT=3	10	100	31	1023		1023	0
Blank	No	*	No		No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No
Comments:	-	* See sec 2.3.1	possible: L: lower-adjacent. U: upper-adjacent	carrier to interference	-	-	-	-	-	possible: DVCC, SAT or DCC	Blank or DCC=4, SAT=3 indicates color code not available.	see note 1		-	-	-	-	-

[1] Power level value is equal to Mobile Station Power Level (PL) as defined by the IS136 specification. PL can be converted to dBW (PdBW) with the following equation:

PdBW = 6dBW - (PL * 4dBW) [e.g. PL=1 is 2dbW]

2.3.9 Individual Voice Channel RSSI (RA & RB) Messages

This message applies to SAM-ALL mode only.

If the user selects a scanning mode that includes voice channel scanning and selects more than zero individual voice channels to store then these messages will log the top XX voice channels and their signal strength where XX ranges from 0 to 40 and is settable by the user in the MORE SAM-ALL SETUP SCREEN.

Synopsis:

```
R[AB], hour:minute:second, latitude, longitude, #sats, PDOP, heading, speed
(km/h), altitude (m), channel1, channel1 RSSI, channel2, channel2 RSSI, . . .
```

Examples: (system A, channels 78,99, 996,246 . System B channels 486, 463, 722, 591)

```
RA,19:01:25,37.3800,-121.9409,4,3.9,344,59.3,100.6,78,-71,99,-72,996,-
75,246,-75
```

```
RB,19:01:31,37.3800,-121.9409,4,3.9,344,59.3,100.6,486,-51,463,-52,722,-
61,591,-62
```

TABLE 18. Individual Voice Channel RSSI (RA & RB) Messages Format

	Field Names			
	message type	gps prefix (see sec 2.3.1)	Channel Information Repeated for the number of channels configured by the user. Sorted by RSSI, strongest to weakest.	
			channel number	RSSI
A band Example	RA	*	78	-71
B band Example	RB	*	486	-51
Units	-	*	-	dBm
Min	-	*	1	-255
Max	-	*	1023	0
Blank	No	*	No	No
Comments:	-	* See sec 2.3.1	-	-

2.3.10 Select Channel (CN) Log:

This message applies to Select Channel mode only.

....description goes here....

Synopsis:

CN, hour:minute:second, latitude, longitude, # of satellites, PDOP, heading, speed (km/h), altitude (m), channel1, channel1 RSSI, channel1 SAT, channel1 DCC, ...

Example: (channel 255, RSSI=-56dBm, SAT=1, channel 779, RSSI=-56dBm, no color code, ...)

CN,13:41:26,42.0613,-87.7518,7,1.2,115,5.9,200**,255,-56,1,,779,-56,,,993,-104,,,1022,-106,,,629,-105,,,1,-97,1,**

TABLE 19. Select Channel (CN) Message Format

	Field Names					
	message type	gps prefix (see sec 2.3.1)	Channel Information Repeated for the number of channels configured by the user.			
			channel number	RSSI	SAT	DCC
A band Example	CN	*	255	-56	1	
Units	-	*	-	dBm	-	-
Min	-	*	1	-255	0	0
Max	-	*	1023	0	3	4
Blank	No	*	No	No	Yes	Yes
Comments:	-	* See sec 2.3.1	-	-	Blank or SAT=3 indicates no SAT available.	Blank or DCC=4 indicates no DCC available.