

ENIGMA 2000 Active Stations and N&O ident list

Incorporating the ENIGMA Control List archive

[v1.3 September 2017]

NUMBER STATION KNOWN FAMILIES

Direct equivalents (Morse & Voice) are separated by /.

Other TX's operated by the same agency, but not direct equivalents, are separated by //.

All equivalents use broadly similar formats, and often, similar schedules and frequencies

Family	"Owner?"	Members
I	KGB/GRU/FSB	IA- E06/E17?/E20?/G06/S06/V06/M14/M24//F01//F06//F06a//S25 (No digits repeated in first 8 numbers) IB- E07/G07/G17?/G19?/S07/V07/M12//XP IC- M18, M21, M42, MX, S13, S14, S28, X6
II	CIA/NSA?	E05/G05/V05//E14/E21/V14
III	"STRICH" Family	E11/G11/S11/S12/M03//G10/S26//M20//F11
IV	NNN Family	E12/G12?/V12/V18//M0
V	Five Dashes	E13/G13
VI	BND/FRG	G14//G15//G16/E16//M15
VII	AIDA Family	S01//S02//E01#/M17#//X1
VIII	BVT/YT Family	S08/M27//?M40/M53?
IX	CZECH Family	IXA- G18?/S10/M10//M07 #M11/S10d IXB- S05/M06A//S15//S16/M6 IXC- S18//S17/S19//M39?
X	MI6	E03/E03a (Formerly E4)
XI	SWEDISH RHAPSODY	G02/M04//E23
XII	?	E09/V08
XIII	3 NOTE ODDITY	G04/M29
XIV	M01 Family	S21/M45//M01/M01b//M01a//M50//S27
XV	EDNA SEDNITZER	E18/G22/S04/M13
XVI	ROMANIAN	V01//M48//V17?//M63?
XVII	DDR	G03//G08/M49 G01? M41?
XVIII	CUBAN	V02/V02a/V02b/M08//V19?//V20?//HM01
XIX	FRENCH	M51//M51a//M83?

AIDA Family:-

E01 & M17 may not be part of the family, only indication is frequency usage.

IX(A) Family

M11 & S10d possibly not of this family, although using the same formats.

O

INDIVIDUALS

Show no obvious signs of a "family" relationship.

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INTRODUCTION

This Active Station list which includes the N&O ident list updates ENIGMA Control List 25 that remained in use for five years.

The style of the ECL initially was good and easy to use; with the closure of many stations as the political ideology and needs of countries changed the mass of information became unwieldy. The outnumbered active stations were difficult to find within the list for the newcomer.

With this in mind the style of the ECL has been changed, this new order reflecting the need to consult active stations easily whilst leaving the 'non-active' stations in the standard ECL format.

The sections are

Active Stations

Voice stations:	English, German, Slavic and Other Languages.
Morse stations:	Additional info as required
Beacons	Single Letter HF Beacons applicable to Russian/E. Europe networks
Previously Withdrawn Morse :	Allow identification/comparisons of these still active stations
Active Polytone stations:	Additional info as required
Hybrid Modes	
Digital Modes	Includes FSK
Temporary Holding Assignments:	900 series idents
N&O Current Ident List	

Logging Abbreviations Explained Moved from Newsletter

International Number Systems Moved from Newsletter

Inactive Stations which reflects the above listing as per ECL25

Noise Stations (or unidentified mode) as per ECL25

Log of Previous Changes made to ENIGMA 2000 Active Stations & N&O Ident List

LATEST CHANGES - September 2017

In the continuation of this document the following changes were made:

Front Cover

From ongoing study of the stations it has become clear that the transmissions designated as M42c & M42d have a number of similarities to stations in Family Ia. These stations have therefore been added to this family group. The designations have also been changed from the M42 group to the Priyom designators of F01 & F06. (See under **Digital Mode Section Changes** for more detail).

I	KGB/GRU/FSB IA-	E06/E17?/E20?/G06/S06/V06/M14/M24//F01//F06//F06a//S25	Stations added to Family I
III	"STRICH" Family	E11/G11/S11/S12/M03//G10/S26//M20//F11	Use of F11 replaces FSK POL
XIV	M01 Family	S21/M45//M01/M01b//M01a//M50//S27	Previously omitted in error

Contents

Page 3; New Section Added: Log of Changes made to ENIGMA 2000 Active Stations & N&O Ident List

Ident Rationale

Page 5 Added: HM - Hybrid Modes P - Some M42 FSK (Using Priyom designators)

Speech Station Changes

Page 10 Changed to:

O **V26 YL** Strange Chinese / English mixture. Poss Mil **M95**
Callsigns XSA, XSE23 (Eks-Es-Ee Lian San) or 3SG ((San-Es-Gee)
Preamble unid., TX is **AM, LSB or USB** (2010), unid sked, 3f grps
Heard at 06.30z & 15.33/15.53z
Update –**Aug 2010**.07.30, 09.00 – 10.00 & 13.00 – 14.00z
Simultrans on multiple freqs.
Freqs heard **4283, 4650, 5922, 6446, 6460, 7553, 8619, 8621, 9101, 9054, 9153, 13030, 16665kHz**
...
[Remainder of definition remains unchanged]

Page 35 Changed to:

O V27 YL ^ **WITHDRAWN - Chinese YL Call 3SG - Identified as V26**

Morse Section Changes

Page 11 New format definition added:

XIV M01 or 194 R4, 381/30 381/30, msg 30 x 5F, ending 381/30 000 (Alternative format frequently used 2017)

Page 17 Original

IC **M41** Russian Government & Intelligence Uses short zero **M42**

General Morse activity associated with Russian Government & Intelligence not covered by any of the other designations.

This is part of a large network using numerous different modes including many FSK variation, CROWD-36 etc. all of which have been assigned their own suffix under the FSK M42 group of stations. (See under the **FSK 42** for details)

Changed to:

IC **M42** Russian Government & Intelligence Uses short zero **FSK 42**

General Morse activity associated with Russian Government & Intelligence not covered by any of the other designations.

This is part of a large network using numerous different modes including many FSK variation, CROWD-36 etc. all of which have been assigned their own **designations under the Digital Modes Section on page 23/24.**

Digital Mode Section Changes

In February 2017, Ary Boender of Numbers & Oddities announced he was switching to the use of three of the Priyom designations for some transmissions designated under the historic M42 category. This group of stations uses many different modes & the use of a Morse designator is no longer accurate for the FSK modes being used. ENIGMA 2000, while still maintaining the M42 designator, which is still active, is also changing to the following Fxx designators which will allow for expansion & flexibility for the increasing use of this mode, which has become impractical under M42.

(Thanks to Ary Boender (N&O), Daniel (Danix) Priyom & ENIGMA 2000) & Pierre Ynard (Priyom), for their expertise on these digital signals).

Page 23 / 24

FSK M42c - Assigned 01 Feb 2015 Changed to: **F01 - (Formerly FSK M42c)**

FSK M42d - Assigned 01 Feb 2015 Changed to: **F06 - (Formerly FSK 42d)**

FSK POL - Assigned 01 Feb 2015 Changed to: **F11 - (Formerly FSK POL)**

Definitions added for F01, F06, F06a & F11

N&O and Priyom designators

Page 27

Added: **UM03 - X2M Temporary designator**

IDENT RATIONALE [refers to historical and current additions]

Voice stations are classified strictly according to the language used in their transmission. E.G.:- Station NNN in German, French, English & Hungarian would have four distinct reference numbers.

In order to eliminate confusion over unknown or obscure/ambiguous languages and dialects the total number of languages has been grouped under four headings :-

E - English, G - German, S - Slavic, V - All other languages

(As a group the Slavic languages are easy to aurally identify, but to the untrained ear are not easy to identify specifically. Slavic words for numbers are closely linguistically related and a listing of those used by the currently operating Slavic stations can be found in the European Languages document on the ENIGMA 2000 Website, and elsewhere)

Non-voice stations have the classifications:-

M - Morse & RTTY P - Some M42 FSK (Using Priyom designators) HM - Hybrid Modes X - Other modes

Alphabetical suffixes (**always written in lower case**) refer to variant forms of the SAME STATION, occasionally or regularly operating within the same period as the more usual format.

Earlier formats, later superseded, of a station, retain their original designation.

Those operative over markedly different periods are assigned as separate stations.

The term variant for our assignment purposes **applies only to format**, not to schedule, or different voice, or musical ID's or tuning signals. The variants have many forms, some being minor and others radically different in preamble or message type.

Numerical/Alphabetical suffixes, currently only used for the M01/M45 CW stations and XPA, were introduced from 2004 to meet specific logging requirements.

M45 was given numerical suffixes in 2010.

XPA was given alphabetical suffixes in 2011

Activity Indicators

With the current rate of change in the activity status of stations these indicators should not be regarded as definitive, only a guide.

* Denotes station/format no longer active

^ Denotes station/format possibly inactive

 Omitted reference numbers have been deleted from the ENIGMA Control List

CW Stations

Figures/Letters shown in the Morse Station profiles are for illustration only.

The actual currently used content may vary considerably, but those shown have all been used in past transmissions.

Times

All times are quoted in GMT/UTC/Zulu, all information posted to ENIGMA2000 should use this structure.

The known families are shown on the front cover; those active are emboldened.

ACTIVE VOICE

LISTING BY LANGUAGE / MODE

YL = female voice OM = male voice

ENGLISH

<u>Family</u>	<u>Ref. No.</u>	<u>Comments/"nickname"</u>	<u>Non-Voice Counterpart (Other links in brackets)</u>
IA	E06 OM	AM (English Man) Usually H+0, H+30 Stays on UTC Times/freqs vary seasonally, up to date charts given in Newsletters High pitched start tone. Null message format:- “ nnn x3 00000 ” for 4 mins. Message format:- 3f call for 4mins preamble – 3f DK x2, 2/3f GC x 2. Msg 5F grps, Ends – DK x 2, GC x 2, 00000 (fast/slow zeros) Note that the first 8 figs of TX has NO repeat figs. (returned to the original voice early 2001, with distinctive pronunciation of 3 & 8) (additional voice from Sept 03, with no perceived distinctive pronunciations)	M14 / M24
	E06a OM E06b OM	AM, 2 group commencing with 11111 stutter group AM, 3F ID with 5F group <i>in call</i> , 2 messages	
IB	E07 OM	AM, (English Man) H+0 or H+10, Changes time 1 st Apl/Nov. Null msg format : - “nnn nnn nnn 000”, R2 Repeats 20 mins later, no third sending. Msg format : - Call, 3f x 3, Number of messages, R2 Preamble 3/4f ID, 2/3f GC all x 2 Msg 5f grps, repeats 20 & 40 mins later Ends with 000 000. New voice early 2001. In Dec 2003 it was noted that the ID was no longer always directly TX frequency related, and that no separate repeats were logged. Ongoing study (2004 – 2005) now show that some of the ID's are again freq related and can be the 2 nd , 3 rd or 4 th fig of a 4fig freq or the 3 rd , 4 th or 5 th fig of a 5 fig freq, or again not related at all. Some TX's noted using the E06 voice in 2010	M12// XP
	E07a	First logged 01 Jan 2009 ID assigned 26 Feb 09. Effective 01 Mar 09 Null msg format:- Nnn nnn nnn 000 R2 Repeats 20 mins later. Msg Format :- 3f call x3, number of messages(1), single 5f group all R2 Pause then preamble 3f ID, 2f GC, all x2 Msg 5f grps, repeats 20 & 40 mins later Ends with 000 000	
III	E11 YL	AM/USB, Daily, all/any 05.00, 06.05, 06.45, 07.15, 07.55, 08.15, 08.45, 09.15, 10.30, 11.00, 12.30, 13.00, 13.30, 14.15, 16.30 Wed 21.00z (noted Feb 06 5082kHz) Freqs vary regularly, up to date info given in Newsletters. YL speaks quickly. Null format : - " nnn Oblique 00" (nnn / 00) no intro, 5 min TX, ending “OUT”	M03, F11 (Formerly FSK POL)
III	E11a	With msg(s) nnn Oblique nn (nnn/nn)R5. 5Fmssg, 5f Rpt, ending “OUT” (originally END)	

III	E11c	<p>Assigned 08 Sept 2010 First logged 22 July 2010, 00.45z, 6804kHz, last log 05 Aug. Null format:- nnn Oblique nnn Oblique 00 (754/555/00) Rc3, ends "OUT" Msg format:- nnn Oblique nnn Oblique nn, Attention, 5f groups ending "OUT"</p>
IA	E17z YL	<p>AM, call "674" variant, Thurs 08.00/08.10z +-(ex Ukraine?) Call-up for 4 Min, New msg monthly. 674, nnn(ID)x2, n (GC)x2, 5f msg ends ID, GC, 0 0 0 0 0 (spaced) Has used/current freqs (7635) / 9820 / 10240 /10320 /11170 /12850/12930/14260/16780 usually very short messages. Heard in Europe mainly during Nov – Feb inc</p>
O	E22 OM/YL	<p><u>Claimed</u> to be engineering test TX's of All India Radio network. See Issue 32 ENIGMA 2000 Newsletter and investigation document on group site. (Original write-up from 1997) AM, Arabic Man, (Heavily accented English) 2L+ f , (ie FD7, FD9) . YL voice also logged. Re-logged July 05, many calls heard XN2, PN8, PS5 etc. 15040 / 17387kHz / 11620kHz, 09.00z –15.00z at H+25, H+55 variable Strong carrier in Europe, but mod sometimes difficult to understand.</p>
O	E25 OM/YL	<p>AM(suppressed LSB) /USB, music intro (sometimes), songs by the Egyptian singer Umm Kultum & others. 3f-2f call, 4f msg repeat repeat repeat msg rpt ends 'end of message' Daily, currently only on 9450kHz. **** see later. Operates to a "local" time, not UTC From late 2004 TX's have been heard between 11.00z – 15.00z (12.00-14.00z in winter) From Apr 05 times noted varying +- 20min 3f-2f call, R5 = null msg. Poor reception in Northern Europe, BC QRM. From May 2006 being affected by VoR DRM service. Noted with musical endings to some TX's from April 04 There are 5 voices used for the English transmission 1 YL & 3 OM (July 2005) + [another heard during May 06] During Jan 2007 a further schedule at 07.45 / 08.00z +- was identified. See major article in E2k Newsletter 39, Mar 2007.</p> <p>**** On Sat 26 May 07 a new sked found **** 07.00z 6140kHz, (6170 also reported.) This is still current. Testing on new Freqs heard December 2015: 9400 kHz 1015z , 9600 kHz 1035z, 1105z with Tone, carrier and song with audio breaks: 'An Execution Of A Dead Man' by Omar Khairat See Newsletter 92 for detail.</p>
O	E25a OM/YL	<p>AM/USB, As E25, but 3f 3f 2f 2f 2f call. (re-appeared Feb 05 after a couple of years unlogged) Believed to be "Control" messages of some sort, remains unheard for very long periods.</p>
	E25b OM	<p>Arabic language message variant, but call-up is in English. From 01 July 07.</p>

O **E27 OM** First heard 23 Nov 06
 16270 // 10915kHz USB, 15.30z/ 20.40z, 5f grps
 6840kHz used from Jan 07 at 20.45z.
 9061 & 9269 also reported but unconfirmed.
 Format :-
 Carrier up c5 mins prior
 Long 1k tuning tone followed by 5 long dashes.
 Only 20 grp msgs heard.
 Message, group nn, message
 Into msg, with c3 sec pause after 10 grps
 Message End

Suspected 'special event' station, now presumed closed down, but occasional listening watches are still carried out.

GERMAN

Family	Ref.No.	Comments/"nickname"	Non-Voice Counterpart (other links in brackets)
IA	G06 YL	(see E06 for format details) AM, German Lady, ends "00000" Only five schedules known, seasonal frequency changes. Sends messages infrequently. See Newsletters for current activity.	M14
IA	G06a YL	AM, Dual message variant	

SLAVIC

Family	Ref.No.	Comments/"nickname"	Non-Voice Counterpart (other links in brackets)
IA	S06 OM/YL	(see E06 for format details) AM, Russian Man, ends "00000" read fast or slow YL voice started Apr / May 2004. YL voice changed 27 Jul 05.	M14
	S06a OM ^	AM, 55555-00000 "idler" format	
	S06b OM	AM, 2 group msg commencing 11111, stutter gp. Ends "00000" (rare, once a year ?? in Oct)	
	S06c OM	AM, single 5f group, R4, no call, no ending. Sometimes a repeat TX at +10, +20 on another freq. Each 5f call starts with '11', and appear to be frequency specific. First noted during 2010.	
	S06d OM ^	AM, ID + 111	
	S06e OM	AM, 2 message variant, ends "00000"	M14a
	S06f OM	AM, 3 group msg, ends "00000"	
	S06(S)	Is assigned. Effective 14 Jan 2010.	

This assignment is to clarify a confusion with S06 postings that have arisen since the introduction of the YL voice in 2004 and the perceived use of fast & slow zero endings.
 The way the station itself has evolved since then to its current operating style requires us to make this change.

The existing S06 ID will apply to, the current, 'OM + fast zeros ending' TX's
 The existing a – f variants are unchanged.
 The new S06(S) ID will be used for, the current, 'YL' + slow zeros ending' TX's

It will be useful, for clarity, to comment on the Fast & Slow endings.
 It does NOT relate to the speed with which the ending zeros themselves are spoken, or even to whether it's a male or female voice.
 It relates to the RELATIVE spoken speed of the zeros compared to the spacing between the numbers in the body of the message itself.

S06 male, at the moment, voice message can be spoken either slowly or more quickly but the zeros are always spoken at the SAME speed.

S06(S) female, at the moment, voice message is spoken at only ONE speed and the zeros are always spoken at a SLOWER speed.

III	S11a YL AM/USB, (Cherta)	Mon/Tue/Wed/Thu Null msg "nnn/00" Call nnn(ID) nn (GC) V 5f Ends 'FINIT/KONEC' Freqs (mid 2010) 5815, 5855, 6280, 6877, 7840, 9371, 10210, 13908, 16388 Times 07.00, 07.30, 09.00, 09.50, 10.00, 12.30, 13.00z	M03, F11
IC	S28 OM	Buzzer /UVB-76, 4625kHz, (Formerly XB) AM/USB TX, Also reported on 3824/3842. Additionally from mid 2010 +-4585, 4625, 4666, 4705, 4745, 6995 logged Believed Russ Mil. Emergency Mobilisation Ch marker/Nuclear warning similar to UK HANDEL system With additional voice & data. The traditional 'top of the hour' warble ceased mid 2010 after the 'maintenance' off air period.	
	S30 OM	"The Pip" with messages. (was XT) 3757 night / 5448kHz day, changing over at c18.00z/06.00z +- ?hrs, seasonal dependant. Freqs sometimes run // for a short time.	
	S32 YL	Formerly XSW,(Squeaky Wheel) voice traffic noted during Mar 05 / Dec 05 Short Russian phrases, ie "For 544: 384 388 290" TX last about 1 min. Current freqs : -3829, 5474, 6991kHz, slight variations. Noted on 15010/15040kHz Nov 05 Russ Mil. Ch marker with voice & data.	

OTHER LANGUAGES

Family	Ref.No.	Comments/"nickname"	Non-Voice Counterpart (other links in brackets)
XVIII	V02a YL	AM, 3 msgs of 150 grps each, diff addr , single grps Usually rptd 1hr later, first and last 2 grps usually the same, but during late 2010 msgs with a different last group were noted and is under investigation. Initial notes in Newsletter 62. Occasionally heard; voice used on HM01	M08a, HM01
IB	V07 OM/YL^	(see E07 for call details) AM, Spanish Man, ends "000 000" (fem voice started early 2001)	M12, XP
O	V13 YL	AM, New Star / Star Star Radio, Taiwan, in live Mandarin Musical intro (flute) + voice preamble H-3 TX's 23.00z – 16.00z In Europe best 12.00/15.00z 8300kHz. In CONUS best on 10522kHz, 06.00/12.00/13.00z Freqs used : - 8300, 9725, 9275 ?, 10522, 11430, 13750, 15388	
O	V15 OM/YL	AM, North Korean, given via Radio Pyongyang, martial music.	
O	V21 OM/YL	The Babbler, Spanish. USB Quick delivery, erratic TX's around 13.50 – 14.40z 5637, 5688 and main freq: 6529kHz See Newsletter 62, page 40 for an analysis	
O	V22 YL	Chinese II, 8375kHz AM, Mon-Fri, 13.00/13.30/14.00/14.30z 4f grps. Only the QRU (null msg) format heard in Europe. Heard in Japan, misc times, on 8375/10200/10520/16520kHz with the announcement [All listening stations in the country x 3, This is Beijing x 2]. Repeated 5 mins. Ending "Thanks"	

ACTIVE MORSE

Common abbreviations used for reporting : - (full abbreviation list available on our group site)

R4=repeated for 4 mins 5f=5 figure single groups 5F=5 figure paired groups
 5Ff=5 figure triple groups Short =short zero (sent as "t") Long = long zero (- - - - -)
 nnn x 3= repeated 3 times // = parallel freq Hand = hand sent
 Cut = numbers sent in abbreviated form (numerous systems used).

Family	Ref No	Comments	Non-Morse Counterpart (Other links in Brackets)
XIV	M01	MCW "Two Tone", hand sent, ends "000",short 0. 194 R4, 381 381 30 30 = =, msg 30 x 5F, ending 381 381 30 30 000 or 194 R4, 381/30 381/30, msg 30 x 5F, ending 381/30 000 (Alternative format in frequent use 2017)	

This station has a regular annual sked structure & from July 2004 the designators are amended to :-

- M01/1** ID 197 Jan, Feb, Nov, Dec
- M01/2** ID 463 Mar, Apr, Sept, Oct
- M01/3** ID 025 May, June, July, Aug

(See newsletters for frequencies & times)

Usually contains errors, believed introduced deliberately as part of a training net.
 Speed can vary from slow to very fast.

It was thought that M01 never repeated msgs until Christmas 2012 saw two msgs repeated. Since then there have been a small number of repeated msgs recorded, & the use of sections of old M01 or M01b msgs is common.

M01a Hand sent Short zero Normally ending 000 or 111 000.

Formerly end of month variants, day/time/freq varies. .changed to random skeds in 2005. 197 197 197 58003 58003 58003 111 000 repeated several times, no message

There are many different formats in use. No strict protocol - Endings may vary.
 May send short sequences of 5f grps repeated often preceded or followed by 111.

May move to different nearby frequency or consist of a msg followed minutes later by repeats of some grps.

Believed 2-way link, but no frequencies for the other end of link have been found.

Example of typical transmissions:

463 463 463 50481 50481	(Repeated up to 6 times)	45830 BT
111 51962 51962	(Repeated up to 6 times)	
333 51028 51028		76059 10143 33461 54986 63140 89188 54026 41933 75574 66069
020 18 23		28103 46291 64537 92340 38315 47976 45107 25939 12087 28741
111 999		63216 89631 77048 01987 35555 96795 27418 26728 BT
558 37 = 37x5f = 558 37		45830
111 51179 53065 (Repeat of groups 15 and 25)		111 01987 35555 96795 27418 26728
111 000		111 000

M01b Format as M01 but using other frequencies & times (often odd times such as T+04 or T+10) The same messages can be repeated over several weeks, even multiple repeats within same day. Uses parallel freqs, hand sent.

III M03 ICW/CW slow Auto Sent CW. Short 0 **E11, S11a, F11**
 Can appear any time, but always on a 5 min slot (i.e. H+15, H+20, H=25 etc.)
 Each msg is sent firstly with 5 fig paired grps, then 'call x5' & msg repeated with single 5 fig grps. Call is always 3 fig.

Null format: Call / 00 sent for 3 mins ending = = 000

Msg format: Call / GC sent for 3 mins, msg 5 fig paired grps.
 Call / GC repeated for 1 min. Rpt of msg single 5 fig grps ending = = 000

Uses cut numbers (ANDUWRIGMT)

Call-up: 3 x 5 figure grps repeated for 3 mins,

1st grp sent 5 times, 1st msg 150 single grps, ending AR AR AR

2nd grp sent 5 times, 2nd msg 150 single grps, ending AR AR AR

3rd grp sent 5 times, 3rd msg 150 single grps, ending AR AR AR SK

First and last 2 grps the same

A	N	D	U	W	R	I	G	M	T
1	2	3	4	5	6	7	8	9	0

The only remaining M08 transmissions are of the M08a variant

This family has undergone much change - having experimented with many amateur radio digital modes. Much of the output consists of data bursts & M08a grps sent alternately - See **HM01** for detail.

5f, 3 or 4F DK, ends "000 000" Uses short zero

Very active. Always appears on 10 min slots (i.e. H00, H+10, H+30 etc.), with the two most used time slots being H00 & H+30.

Always uses frequencies in the ITU Fixed Allocation segments using the full short wave spectrum.

Where msg length exceeds the time, the 2nd & 3rd transmissions will be sent approx 2 mins after the previous msg has completed transmission. Where no msg is sent there is no third transmission.

Transmissions up to 1200z the freqs go from low to high, after 1200z they go from high to low, although there are a small number of exceptions to this rule.

The call ID is sent fairly slowly at about 15 WPM for 2 minutes, but DK, GC & msg are usually sent around 30 WPM. (Variable)

Null format: (3 fig ID sent 3 times followed by 000), repeated for 2 mins

Msg format: (3 fig ID sent 3 times followed by 1), repeated for 2mins.
DK GC DK GC, msg 5 fig single grps. Ends 000 000

ID is always 3 fig. DK can be 2 or 3 fig.

Uses regular scheds, but these change over time with new scheds appearing & old ones ceasing. Scheds appear with one transmission or more per week, though a repeat may be sent on another day, usually - but not always on the same freq / time. Scheds also often reappear yearly at the same Month / Day / Time slots.

Most of the early transmissions (0340 - 0600z) have ceased with only a few remaining.

Current comprehensive activity Charts and Predictions published in Newsletters.

5F<3F, ends "00000" long or short

Similar format to M01 - But ends 00000

Call ID always 3 fig. DK always 3fig. Paired groups.

Null Format: DK DK DK 00000 (Repeated for 4 mins).

Msg Format: Call-up ID repeated for 4 mins, DK DK GC GC = =,
msg 5 fig paired grps, ending DK DK GC GC 00000

Note that the 1st/3rd Fri of month 19.00/20.00z TXs will repeat same time on Saturday if message is sent.

Note: See also M24 - Identical format, but high-speed version (25 - 40 wpm)

O	M23	<p>ICW Auto Sent Slow Morse Long Zero Usually 5f call, some as stutter grps (can also be 2 or 3f or random letters) 00000 R3 to 20 = 30 = 33 x5f = IMI IMI =". Can end AR or AR AR or no ending.</p> <p>Very random and infrequent. Can have long periods of no activity.</p> <p>Freq use is many & varied. Usually, though not always a parallel freq is also found. 8030kHz is a commonly used frequency.</p> <p>Calls can take many forms. Strings of continuous I or V, 2, 3 or 5 fig calls have been reported, some of them stutter groups. (e.g. 333).</p> <p>The most common calls recently heard consist of 3 or 5 fig stutter grps, repeated continuously in slow CW for up to 40 mins, usually daily on a regular time slot.</p> <p>If all figs are EVEN a msg MAY be sent, but not always. Msgs are rare. If all the figs are ODD, there will NEVER be a msg sent.</p> <p>Calls can suddenly change to other figs, often more than once - then can change back to the original call just as easily.</p> <p>When a daily sched appears to cease, it has been noted that an hourly 'dit' is still transmitted at the previous sched time - & often at one or more other regular times over the hour. The sched may reappear after a period of days or weeks on these 'active' frequencies.</p> <p>Most commonly used formats;</p> <p>Null Format: Call (Repeated for up to 40mins). Ceases with no formal ending.</p> <p>Msg Format: Call (repeated 3 to 20 mins) = GC GC = msg 5fig single grps = IMI IMI = GC GC AR AR</p>	
IA	M24	<p>ICW / MCW Auto sent Uses short zero 5F<3F,ends "00000" long or short</p> <p>As M14 except the whole transmission is sent at high-speed. (25 - 40 WPM) Call ID always 3 fig. DK always 3fig. Paired groups.</p> <p>Null Format: DK DK DK 0 0 0 0 0 (Repeated for 4 mins).</p> <p>Msg Format; Call-up ID repeated for 4 mins, DK DK GC GC = =, msg 5 fig paired grps, ends DK DK GC GC 0 0 0 0 0</p>	E06, G06, S06
XIX	M51	<p>Sends continuous grps - . Uses fast Morse. Single grps. Long Zero. Mostly 5-ltr, but with some number & punctuation grps. Until mid-2015 sent 100grp msg with headers, but has changed to continuous grps that will often continue for hours, sometimes days.</p> <p>Uses apparently random frequencies across the bands, including designated amateur allocations. Can appear at any time. Uses single or parallel freqs. Frequently uses 3881//6825kHz when not in use by the scheduled FAV22 (M51a) transmissions which will cease suddenly when a scheduled FAV22 broadcast is due</p> <p>Believed to be a French military CW training net, this station has been operating since the 1960s in various forms and has previously been known to use the amateur call sign F9TM, though this has not been reported in recent years. According to HamCall.net, F9TM is licensed to the CSTEI, 'Centre Spécialisé Des Telecommunications Et de l'informatique',</p> <p>Pre-2015 Header example - BT NR 54 J 9 10:42:37 2015 BT</p>	

M51a Assigned. 18 August 2012. Letter variant of M51 Single Grps Long Zero
Regular training scheds on 3881 // 6825kHz. Uses call-sign FAV22.

Believed to be allocated to the French army at Mont-Valerien, Paris FAV22 transmits Morse in several formats, divided into lessons for Morse code instruction and training.

Consists of 4 lessons of 5f grps (with some number grps) & French text alternately, with speeds of 420, 600, 720, 840 & 960 cps. with speed increasing over the week.

Always identifies with call-sign FAV22 both at the start & end of each transmission.

Call-up: VVV VVV VVV DE FAV22 FAV22 FAV22 QLH 3881/6825kHz

Ending: CQ DE FAV22 VA

O

M89 Chinese Mil., 4f. Auto / Hand sent
Uses AU34567DNT cut number format

A	U	3	4	5	6	7	D	N	T
1	2	3	4	5	6	7	8	9	0

Some fixed stations, but many random. Mainly between 3 – 16 kHz.
Sends continuous Round Slip interrupted by msgs.

Call-signs and freqs change periodically. Known to re-use previous freqs/calls
Current call-signs in use 2SLC, 3A7D, ALSK, CV6K, FXM, SLBC, NYZ,. etc. Numerous other call-signs also appear on various freqs during exercises.

Fixed stations normally uses different // day and night frequencies.

Random freqs used for operator 'chat' & 2-way comms mostly error checking grps
Will frequently use 3333, 4444, 5555, 6666kHz etc.

Sample format: V MW3D (x3) DE 2SLC (x2) (Round slip repeated)
MSG NR 697 CK 21 871228 2353 RMKS 3002 TO 6071 K BT BT BT
4DDA 3AUN 63U7 N7T6 TT45 T567 674N 345N TANA TTT7 5U43 AT4D... etc.

Some audible in Europe at times but mostly Far East.

JPL has written an excellent in-depth report on this station entitled 'M89 or the Communication Network of the Second Artillery Corps / Force' which can be downloaded from the 'Articles' section of the ENIGMA 2000 website.

O **M90** Czech Mil CW - Also uses voice (USB)

Net control station & various out stations Simplex net

Freqs: 4133, 4193, 4852, 4861, 5098 kHz (possibly others in use)

Traffic: Voice communication checks, all other traffic in Morse Markers Flash messages
Messages consist of 5 letter groups

Various Formats:

Marker: ITJA ITJA ITJA AR

Flash msg: HRT6 de U4NP XXX NOCLEH 578 NOCLEH 578 K

Message : ITJA (callsign of the addressee 3x) AR
Header = 072 1 10 12 0830 072 = ITJA (callsign of the addressee) = 5LG message =
YPN3 (callsign of the sender) = header = callsign of the addressee = repeats message =
YPN3 (callsign of the sender)

072 - addressee
1 - message nr
10 - group count
12 - day
0830 - UTC+2 (summertime)

(Definition detail courtesy of Ary Boender from Numbers & Oddities)

O **M95** Chinese Mil., 3f. Auto / Hand sent Assigned 08 Sept 2010 **V26**
 CW Sister to V26 Chinese voice station

Uses AU34567DNT cut number format;

A	U	3	4	5	6	7	D	N	T
1	2	3	4	5	6	7	8	9	0

Similar to M89 but uses 3f grps with different format & Tx structure varies

Uses call-signs XSV, XSV70 & XSV85 - possibly others. The call QV5B is also believed to be part of this group.

8030kHz used as main channel for XSV85. Other freqs in use vary.

Sample Format: V V V (x2 – x6) BNEC(x2 – x5) BNEC de XSV70 XSV70

NR 0974 CK 94 35 1116 0654 BT

TA6 3U6 3AN TAU 773 357 373 4T4 NN3 435 3DT TTU 4DT 4D6 TA7
 773 TAD 773 356 4A7 NN3 445 3DU 4DT 4D6 TAN 773 TUT 773 TU3
 773 356 4T7... etc.

Some audible in Europe at times but mostly Far East.

O **M97** Assigned 01 Dec 2011 Single grps Long Zero **V30**

CW sister station to North Vietnamese Voice Station V30
 (aka "The Lighthouse). First heard November 2011.

Irregular sched on 10375kHz, 15.00z (variable)

Sample Format: Call-up varies but a typical example;

AAAAAAAAAAAAAAAAAAAAAAAAAAAA
 SD79 KKK SD79 KKK SD79 KKK
 HT HT HT
 SN60 SN60 SN60
 (msg sent in 5f grps)
 KKKKKKKKKKKKKKKKKKKKKKK

Sometimes send two msgs. If so Second message starts with AAAAA sequence

SD is msg No. (sequential) & SN is the GC - Often sent in full as So Dien & So Nhom
 The msg including the call-up is sent three times

Sometimes audible in Europe / UK but mostly Far East.

Last heard on 06 & 07 May 2015 sending SD84 msg in use since Aug 2013 - May have ceased

Beacons

IC **MX** SLHFB's (Single Letter HF Beacons) Solitary
MXI SLHFB clusters (group of beacons v.close in freq, c 0.1kHz apart)
MXP With message, probably Russ. Naval
MXV Irregular "V"

The above MX designators apply only to Russ/E.European networks, others should use the generic "SLB" term.

Previously Withdrawn ENIGMA Designations & Other Morse Stations

The stations listed in the section below are active Morse stations whose designations have in the past been withdrawn as not of interest to ENIGMA. Although these are not 'Number Stations' in the true sense, most of them do, however send groups of numbers in some form, & are mainly believed to be military or diplomatic stations.

There are three reasons for their inclusion here. Firstly, these are often reported to ENIGMA 2000 as possible number stations, so including the details & format of these stations helps newcomers identify & eliminate these from logs. Secondly, we acknowledge that much information has previously been lost when a station is deleted from the list, & thirdly, because there is still a good deal of interest in these stations.

In particular, Ary Boender has not only kept these designations current, but has added a good deal of knowledge & detail - in the case of M32, adding sub-classifications to indicate from which service these signals belong.

O **M21** Russian Air Defence - Plotting station. Uses short zero.

Continuous 14 fig msg - sent approximately every 50 secs. Various Freqs.

Sends coordinates with a time string.
If no coordinates are sent then the spaces are replaced with question marks

e.g. BT 990914nn8nnnn (where n = coordinates) or T990914??0?????

(0914 represents example time stamp usually Moscow time UTC+4)

O **M22** Uses call sign 4XZ Israeli Navy Single Groups Long Zero

Much of this Morse network was replaced by a "data modem" in early 2005 on 7160//8780kHz

Freqs: 2680, 2860, 4331 & 6607kHz. Sends Round Slip or Msgs 24 hrs
Mainly heard in Europe on; 4331kHz & 6607kHz

Also heard on 10341kHz in late 2015. Other freqs may be in use.

Round Slip Format: VVV DE 4XZ 4XZ = =

Msg Format: Sends 5 ltr single grps Recognisable by characteristic msg headers:

Sample Msg: NR81 3 SH V CU9W 014111 NJ3R GR02 = =

NLNLN YNUNB YLAWN BQCEH OUWSQ
UGFTO GBUHU LMHQY VBCRQ AGJZM
RKFDA HWTJ YHJCEP RUTQG BDGBS
SAQAU PNRWE ZASOQ GGHAC YNWN I = =

NR81 3 SH V CU9W 014111 NJ3R GR02 = =

Group count should be read from right to left. (e.g. GR02 is a 20 grp msg), as should the date in the msg headers.

O **M32** Russian / CIS Ukrainian Military Nets Various & many freqs used.

FAPSI (Federal Agency for Government Communications & Information)

Uses various call sign formats consisting of 4 characters.
Often sends list of calls with pauses between.

e.g. WGGR DE 9JOL K
D2T8 DE 9JOL K
RK
LPLK DE J6SU K

Acknowledgements

Designations M32a, M32b & M32c are sub-classifications that have been assigned by Ary Boender & use of these designations is courtesy of Ary Boender & the Numbers & Oddities Newsletter (N&O).

We acknowledge the help, support & cooperation of Ary Boender in compiling the above entries, who is responsible for much of the information contained particularly within the M32, M41 & M42 entries.

Ary Boender's Numbers & Oddities - <http://www.numbersoddities.nl>

ACTIVE POLYTONE STATIONS

[Including X06 et al]

(XP Family)

See the Inactive stations listings in this Document and discussions in Newsletter 10, May 2001 and articles in Newsletter 16, May 2003 & Newsletter 23, July 2004 for further info.

The Polytone transmissions are of Russian origin and are associated with the more conventional Voice & Morse stations.

XPA	[Russian Intel Multitone System MFSK-20]	M12
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Major Article published in E2K Newsletter 23, July 2004, giving detailed analysis and comment.
Skeds Tue/Fri 07.00/20/40z & 21.00/20/40z (see update info)
Changes freqs monthly, new freqs are posted via E2k group list.
High probability of this signal being involved with an “auto receive” capable system, hence XPA.
It consists of 25 tones (then amended to 20 tones Jan 06)
Station first noted on 3rd Dec 2003, by 8th Dec 2003 analysis had started.
Tones / value relationships used given below (nominal values as per update published Mar 2006 following prolonged analysis, after some anomalies were found in the original assessments)

Owing to the number of new schedules and time variations continually being discovered the current well established and robust transmission pairs are being alphabetically identified (from Jan 2011).

This enables immediate identification between the monitoring team without resorting to a full schedule description – and automatically highlights any new, out of sked, transmissions.

Of these listed only XPA c and XPA e are active:

XPA/a	Wed/Fri	04.00/05.00z	(currently inactive)
XPA/b	Mon/Wed	04.40/05.40z	(currently inactive)
XPA/c	Tue/Fri	06.00/07.00z	
XPA/d	Sun/Tue	08.00z Sun / 14.00z Tue	(currently inactive)
XPA/e	Tue/Thur	17.30/19.00z	

Update info : 2010

Until recently XPA operated in two modes using either USB[10bd] or MCW[20bd]. The MCW [20bd] sendings are heard only during the 20.00/21.00z skeds on Tuesdays and Fridays.

The MCW sendings mode and baud rate changed on 1st Dec 2009 to USB [10bd], putting those skeds in line with all others, and oddly gave increased signal strengths.

However those previous MCW skeds then ceased after Tue 25th May 2010.

Historically the USB mode became operational for the morning sendings on 22 Sept 2006, the evening sending remaining as AM.

On 3 Oct 2006 the numerals and some administration tones of the USB mode changed to double length duration, leading to:-

Two distinctly different schedule types with both sending a train of 60 pulses at 0.5 baud prior to entering the message mode, via the complicated ‘administration’ tone sequence.

The first schedule type, so far only heard in the morning (UK), uses Upper Sideband as its transmission mode and sends the message section at 10 baud.

The second schedule type, previously heard in the evening (UK), used MCW (modulated carrier wave/AM) as its transmission mode and sent the message section at 20 baud. (Now ceased, as remarked in update above, Ed)

At least one XPA split-schedule has been discovered, transmitting the same message on two separate days at differing times and using six differing frequencies..

Transmission Structure , XPA and now discontinued XP [used as a reference for tone measurement].

Lead-in pulse train, administration tones, ident, message count, administration tones, serial number, GC, DK, message/s, ending admin tones.

Message Structure

The message/s are sent in 64 group ‘blocks’ with a 7segment single tone separator between each ‘block’.

The total number of groups sent is always 3 more than given in the GC as the SN/GC/DK are exclusive of the GC.

XPA and M12 have been noted to have interchanged some of their skeds, particularly the Tue/Fri 21.00z AM skeds, as from 16 Feb 07.

The XPA Polytone system uses a total of twenty tones. Five of which have definite machine ‘administration’ functions.

Twelve are concerned as numerals [0 to 9], the space function, and character repeat.

Four of the numerals are known to have other additional functions.

Three tones remain “unallocated” as yet.

<u>Tone [Hz]</u>	<u>Function</u>	<u>Secondary Function</u>	<u>Remark</u>
520	Start Low		Transmission starts on low tone Used with 1280 Start High
600	Synch Low [starts]		Used with 1120 – fig 9
680	Space between groups		Separates Groups or other functions; lengths vary.
720	End Tones		Used with 1200 Repeat tone
760	Fig	0 *	*
800	Fig	1 *	*
840	Fig	2 Separator Low	Seven segment: 626262
880	Fig	3	
920	Fig	4 *	*
960	Fig	5	
1000	Fig	6 Separator High	Seven segment: 626262
1040	Fig	7	
1080	Fig	8	
1120	Fig	9 Synch High	[Follows 600]
1160	Message start pulse Only seen at beginning of message BUT led in by 1200 repeat pulse.		
1200	Repeat		Follows character to be repeated
1280	Start High		Used with 520

Null Message ending seen as 10140 at null message end

XPA2

XPA2 is a variant of the XPA typified by the inverted lead in pulse train Tones depicting numerals are separated by 15kHz instead of 40kHz prev seen. Like the earlier XPA transmissions a secondary schedule indicating letter is used to depict the known three active schedules.

XPA2/m	Sun/Tue	Various time slots
XPA2/p	Jan - Mar	Mon/Wed
	Apr-May	Sun/Fri
	Jun-Aug	Tue/Thu
	Sept-Oct	Sun/Fri
	Nov-Dec	Mon/Wed
XPA2/r	Fri/Sat	Various time slots

See current newsletter for schedule detail

First heard 3 May 2006, ceased 2 June 2006 then re-appeared

Dec 06

See NL 35 July 2006 for full initial report.[P36 to 39]

Narrow bandwidth, 15Hz tonal separation.

Operates at 3 differing speeds and can be mistaken for another system, it is essential to confirm tonal values.

UNID Russ MFSK 15 tone system.

The construction of the tonal sequences clearly indicate this is another system designed for automated reception however the limited samples preclude, for the time being, the establishment of possible tonal secondary functions.

However the nature of the transmissions together with the wide range of frequencies used lead us to believe that this is probably of a “diplomatic” nature

Tone/value relationships initially established :-

1005 = space, 1035 = sync, 1050 = end, 1080 = repeat, 1235 = start
 1100 = 0; 1115 =1; 1130 = 2; 1145 = 3; 1160 = 4;
 1175 = 5; 1190 = 6; 1205 = 7; 1220 = 8; 1235 = 9

(These tones still used and lately measured in AM transmissions,
 09.00z intercepted October 2007 – See NL issue 43 for log)

Tones suddenly changed on 30 May 2005, becoming:-

965 = space 1025 = sync 1135 = end 1125= repeat 1435 = start
 1115 = 0 1185 = 1 1215 = 2 1245 = 3 1275 = 4
 1305 = 5 1345 = 6 1375 = 7 1405 = 8 1435 = 9

[Note in both tone maps the allotted tone for the figure 9 is dual function].

As a result of the many intercepts performed in October 2007 this station is known to send in both AM and USB without change in the baud rate. The above tones encountered on 30th May 2005 can be understood to be nominal tones only for the receiver on which they were heard.

To date [12/2015] no AM tones have been received, USB now being the preferred mode for interception..

Our recent understanding of the tones utilised illustrates that the individual values depend on the characteristics of the receiver used in sideband mode. Therefore analysis of the tones is simplified by measuring the separator tones which, like XP and XPA, use the values for 2 and 6, and the first tone values of groups 1 and 2 producing that for 0, and the 2nd tone of group 2 which provides the repeat tone value [usually –15/20Hz from the 0 value].

XPA/XPA2 tones

December 2015: Whatever tones values are received for XPA the tones are 40Hz apart say:

Rpt	1200	Ghost	n/a
0	760	5	960
1	800	6	1000
2	840	7	1040
3	880	8	1080
4	920	9	1120

Once you have one tone [zero is very convenient] add/subtract 200 to/from the value and you have the value of its opposite number; see 0 and 5. The Rpt tone is always 80kHz higher than that for ‘9’.

Likewise tone values received for XPA2 the tones are 15Hz apart, say:

Rpt	1100	Ghost	1180
0	1115	5	1195
1	1130	6	1210
2	1145	7	1225
3	1160	8	1240
4	1175	9	1255

As with XPA as soon as one value is ascertained the next follows on.

XPA2 differs in that the repeat value is 15Hz below zero, to accommodate this change the gap between 4 and 5 is 20kHz, giving rise to the ‘Ghost’ value, always 5kHz above the value for 4, that allows the 15kHz shift to be maintained. Interestingly, this value is +80kHz from the repeat value; this function can be seen throughout the above table.

IC	X06	<p>6 tones, repeating sequence. (Mazielka) Russ selcall system for FAPSI* stations, many variants. Uses basic tone mapping, as follows, to produce the figures 1 – 6, giving a possible 720 unique combinations, but far fewer heard. Usual format:- A long single 'lead in' tone, then:- 1 = 840Hz, 2 = 870Hz, 3 = 900Hz, 4 = 930Hz, 5 = 970Hz, 6 = 1015Hz Observed that the X06 stations have a close, but not yet fully defined, association with CROWD36 stations. (* Note that FAPSI, per se, closed in 2002 – confirmed 2003 – but the system is still in use by other "owners") [Data & CW sigs sent after the tone sequence which ceased mid 2003, turned up again on 11 May, 2006] Starting in Newsletter 58, page 10 (May 2010) the concept of 'Alert Signals' was introduced for some 'repeated scale' transmissions. Extensive research work by the E2k 'X06' sub group has culminated in a significant 'Commentary' being published in Newsletter 62, page 7, (Jan 2011). Those with a specific interest in the 'tone' stations should consult.</p>
	X06a	Alternating two tones in 'ababab' sequence.
	X06b	Audibly less than 6 tones, where a tone is sequentially repeated 2 or 3 times giving an audible single longer tone.
	X06c	6 tone rising scale, stepping sequentially through the available tones.

Hybrid Mode [HMnn]

HM01	<p>Assigned 18 Nov 2012 Hybrid Mixed-mode variant of Cuban XVII Family. Consists of alternating SK01 & V02a repeating sequences. See SK01 in inactive station listing.</p>
HM02	<p>Assigned 01 May 2015 Hybrid mixed-mode station - possibly variant of Russian Family 1 Consists of FSK transmission followed by a Morse message Uses a single = as separator throughout the message (An unusual feature). Morse Format Auto-sent 5 fig Single Grps Short zero Ends three long dashes See Newsletter 88 for full details (May 2015) Station is currently under investigation - Definition may change.</p>

Digital Modes

DP01	<p>Assigned 12 Apr 2014 Digital Pseudo-polytone: Linked to Russian Family I First heard Apr 2008, with yearly reports since around the same time of year. Recent activity in Apr 2014 around 10250kHz along with other Family I variants. Consists of a two minute, two-tone lead-in & two digital bursts with short tone sequences at the start & finish of each digital burst. See Newsletter 82 for full details (May 2014)</p>
FSK	<p>In response to the need to assign universal identifiers to a number of digital signals, ENIGMA 2000 are pleased to have agreed the following with Ary Boender. This series of designations was developed by Ary from ENIGMA's deleted M42 to cover & classify an increasing number of digital signals emanating from Russia.</p> <p>FSK M42 - Assigned 01 Feb 2015 CROWD 36 (Serdolik) & other Undefined Russian Government/Intelligence Digital Modes</p> <p>FSK M42a - Assigned 01 Feb 2015 GRU (Russian Military Intelligence) CW & Digital traffic</p> <p>FSK 50/500 Msgs with separators every 50 grps (=50= =100= =150= etc.) Russian.</p>

Digital Modes continued:

- F01** Baudot 200Bd / 500Hz (Formerly **FSK M42c**)
Repeats 25-character blocks automatically for 6-8 minutes.
Example: =8251 65380484843868036
=8462 30549583192393891
=7853 29392548929506269
=8554 549410102838013150
=8635 516060140587158102
....
)69729 060840000+++++237
Null messages consist solely of:
)5761 0000+++++++162
- F06** Proprietary FSK 200Bd/1000Hz (Formerly **FSK 42d**)
Repeats 288-bit blocks for 6-8 minutes. Each block encodes 38 digits, compressed. Messages form 5FG's.

A tiny percentage of broadcasts are double messages with one of them using the 11111 000## E06a/S06b Format, an example of which was logged in July 2017.
- F06a** Same modem as F06, except the content is plain ASCII with file names, no compression.
- F11** All Polish Military / Intelligence FSK 100/500, 100/620, 100/740 (Formerly **FSK POL**)
Linked to E11 / M03 Family
Most common usage is 100/620 although 100/740 has recently been used.

Proprietary FSK 100Bd/620Hz.
Repeats a 4-digit ID five times, followed by a 5FG message.
Null messages consist of 00000 repeated ten times.
Traffic is usually preceded and followed by 88888 88888, and additionally followed by the group count as a 5FG, repeated twice.

Acknowledgements: ENIGMA 2000 would like to thank Ary Boender from 'Oddities & Numbers' & Daniel (Danix), (Priyom & ENIGMA 2000) for their assistance & knowledge in assigning & defining these stations.

Temporary Holding Assignments [900 Series]

These assignments were brought in to allow a cautious cataloguing of stations whose traits were altered but had a familiarity during what appeared as a ‘wireless tit-for-tat’ of worthless/meaningless messages transmitted to keep intercept staffers busy.

Readers will note that certain frequencies were ripe with 900 series calls.

Whilst these listed stations have apparently ceased ENIGMA2000 will continue with 900 IDs if and when necessary.

Designation & Description :	Current Status / Conclusion:
<p>M901 -Assigned 29 Jan 2014 (Station under investigation) Temporary holding ID for CW station using the call-sign KLM. Sends extremely fast single 5f grp msgs. Ends QRU QRU SK SK Only known sched on 16720kHz, 0810z.</p>	<p>WITHDRAWN Ceased transmissions 31 May 2014 after changing from a single CW Transmission to a two-way RTTY exchange. Russian diplomatic & Intelligence transmissions. Identified as part of M42 family</p>
<p>E907b -Assigned 06 Mar 2014 (Station under investigation) Temporary holding ID for voice variant belonging to Family I. First heard Wed 05 Mar on 10250kHz. Possibly related to Russia / Ukraine conflict. Format as E07 with additional 3 fig grp in call-up e.g. 123 123 123 1 334 Voice similar -but not the same as E06. Msg uses single 5 fig grps. Ends 000 000</p>	<p>Occasionally Active -No known schedule</p>
<p>M912b -Assigned 13 Mar 2014 -Redefined 01 May 2014 (Station under investigation) Temporary holding ID for Morse variants of M12 on or around 10250kHz. First heard Wed 05 Mar with various variants heard since. Morse equivalent of E907b heard operating on the same freq. Formats: Various, as M12 with changes to call-ups & no known scheds.</p> <p>Type 1 -Additional 3 fig grp in header (e.g. 223 223 223 1 656)</p> <p>Type 2 -Single fig call-up (e.g. 1 1 1)</p> <p>Type 3 -3-fig counting grps as call-up (e.g. 123 123 123 1)</p> <p>Type 4 -Triplet group as call-up (e.g. 333 333 333 1)</p>	<p>Occasionally Active -No known schedule</p>
<p>M912c -Assigned 14 Mar 2014 (Station under investigation)</p> <p>Temporary holding ID for Morse variant of M12.</p> <p>First heard Thu 13 Mar on 10250kHz at 2043z.</p> <p>Format as M12 but uses single figure call-up e.g. 1 (R2m)</p>	<p>WITHDRAWN</p> <p>This variant has been incorporated into the M912b assignment, which has been changed to include all M12 type variants heard on or around 10250kHz</p> <p>Incorporated into M912b</p>
<p>S906g -Assigned 02 Apr 2014 (Station under investigation)</p> <p>Temporary holding ID for voice variant of S06.</p> <p>First heard Sun 02 Mar on 11073kHz.</p> <p>Format as S06 with additional 5 fig grp in header e.g. 352 352 352 63524 719 40</p> <p>Uses S06 voice.</p>	<p>Occasionally Active -No known schedule</p>

N&O and Priyom designators

Active / not active	Code	Description	Counterpart
NA	EV01	EE numbers station. GR35 NO125 message + 5LGs. Sometimes followed by classical music	
A	EV02	US Military voice loops. Transmissions include phrases from Huckleberry Finn, Born to Run, the Bible, etc.	
A	F01	Priyom designator for M42c	
A	F06	Priyom designator for M42d	
A	F11	Priyom designator for POL FSK	
A	M21	Russian Air Defense (morse transmissions) (deleted by Enigma 2000)	RADv
A	M32	Russian Military (morse transmissions) (deleted by Enigma 2000)	RMv
A	M32a	Russian Navy (morse transmissions)	RNv
A	M32b	Russian Naval Air Transport / Naval Aviation (morse transmissions)	RNAv
A	M32c	Russian Air Force (morse transmissions)	RAv
A	M42	Russian Intelligence / diplo / government. Various modes	
A	M42a	GRU HFDF net	
A	M89d	Deleted. Now Q26	
A	M89v	Deleted. Now V26	
NA	MC01	PUQ, FMC1, YCW, QYP, PYM, FUH, BSQ, BMC	
NA	MC02	BX33, BX45, BX53, BX56, BX57, BX72, BX73, BX74, BX75, BX76, BXL107, BON533, BON724, BOZ541, BOZ687, BOZ813, BOZ985, BJO68, BJO60, BUE5	
A	MC03	Chinese Air Defense	VC01
NA	MV09	BCN	
NA	MV22	BKG	
A	MV26	Deleted. Now M95	V26
A	MV27	Morse sister of V27. Sends 3 letter groups	V27
A	MV30	Deleted. Now M97. Morse sister of V30	V30 (VTN)
A	MVC03	Morse sister of VC03	VC03
A	Q26	Digital sister of V26/M95. Mode: 4+4 QPSK 75/3000 LSB	V26, M95
A	RADv	Russian Air Defense (voice transmissions)	M21, M41
A	RAv	Russian Air Force (voice transmissions)	M32c
A	RMv	Russian Military (voice transmissions)	M32
A	RNAv	Russian Naval Air Transport (voice transmissions)	M32b
A	RNv	Russian Navy (voice transmissions)	M32a
A	S3850	Russian Southern Military District network on 3850 and 4970 kHz (Priyom designator)	S28, S30, S32
A	S4525	Russian Military network on 4524 kHz (Priyom designator)	S28, S30, S32
A	S4790	Russian Military network on 4790 kHz (Priyom designator)	S28, S30, S32
A	S5292	Russian Western Military District network on 5292 kHz (Priyom designator)	S28, S30, S32
A	S5330	Russian Military network on 5330 kHz (Priyom designator)	S28, S30, S32
A	S5426	Russian Military network on 5426 kHz (Priyom designator)	S28, S30, S32
A	S6930	Russian Military network on 6930 kHz (Priyom designator)	S28, S30, S32
NA	UM01	CQ-station. Sends messages like: CQ P 1 CQ M 3 etc. Transmits 24/7	
A	UM02	Unid net: YRM, ROZ, KLF, XRJ, etc.	
A	UM03	X2M - Temporary designator	
A	UM10	10-minutes net. Callsigns sent for 10 minutes 2x per hour on 2 parallel frequencies. Seldom messages are sent.	
A	VC01	Chinese Robot (Chinese Air Defense)	MC03
A	VC02	Chinese voice morse stations	
A	VC03	3FG callup and 4FG messages	
A	VC04	Deleted. Same station as VC03	
A	VC05	Chinese time stamp station. Operator calling a 4-figure callsign for four minutes. At the end the actual Beijing time is mentioned.	
A	VTN	Deleted. Now V30. "Son Ca gọi Hải Đăng năm hai năm ba" followed by numbers in Vietnamese	M97 (ex MV30)

Logging Abbreviations explained.

The ENIGMA 2000 Standard logging should take this form without any personalised abbreviations:

E07 10436kHz1740z 07/06[414 1 563 102 92632 ... 09526 0 0 0 0 0 0] 1753z Fair QRM2 QSB2 PLdn SUN

Station: E07 [Traits of stations in ENIGMA Control List]

Freq: kHz [As above 10436kHz]

Time: z [Always 24hour clock, 'z' states GMT/UTC]

Date: day/month [As above 7th June]

Msg detail: Varies with station

ID taken from 100kHz fig in freqs: 414 [freqs used in this schedule were 13468, 12141 and 10436kHz]

Msg count 1

Dk [decode key]: 563

Gc [group count]: 102

First group of msg: 92632

Text between grps: ...

Last group: 09526 [where more than one group is stated the use of LG ahead group indicates 'Last Group']

Ending: 0 0 0 0 0 0

Time msg ends: 1753z

Received signal strength assessment: Fair

Noise QRM2

Fading to signal QSB2

Monitor: PLdn

Day heard: SUN

Unknown: unk

Repeat: R [which can be expanded to mean]:

Repeated : R5m [repeated 5 mins]; R5s[repeated 5seconds], R5x [Repeated 5 times]

Received signal strength assessment.

Some receivers possess 'S' meters that give a derived indication of signal strength caused by changes within that receiver. Calibration may, or may not be accurate and the scale, may or may not, be the same as that on other receivers. Some receivers have no meter yet produce acceptable results.

Therefore we prefer the quality of the signal to be assessed by the particular monitor.

Guidance for this can be sought from the Q code:

QSA What is the strength of my signals (or those of...)?

The strength of your signals (or those of...) is...

1) scarcely perceptible.

2) weak.

3) fairly good.

4) good.

5) very good.

[QSA1 S0 to S1; QSA2 S1 to S3; QSA3 S3 to S6; QSA4 S6 to S9; QSA4 S9 and above]

Sooner than put a numerical value we state: Very Weak, Weak, Fair, Strong or Very Strong.

Noise, Static and Fading.

Again guidance from the Q code:.

Noise:

QRM Are you being interfered with?

I am being interfered with

1) nil

2) slightly

3) moderately

4) severely

5) extremely.

Note: in the sample the monitor has stated QRM2 which means 'slight noise'; had the interference been from a broadcast station you might have read 'BC QRM2' and so on.

Static [Lightning and other atmospheric disturbance]:

QRN Are you troubled by static?

I am troubled by static

- 1) nil
- 2) slightly
- 3) moderately
- 4) severely
- 5) extremely.

Fading [Propagational disturbance]

QSB Are my signals fading?

Your signals are fading

- 1) nil
- 2) slightly
- 3) moderately
- 4) severely
- 5) extremely.

Note: in the sample the monitor has stated QSB2 which means 'slight fading' where the received signal obviously fades but the message is still intelligible.

The use of QRM1, QRN1 and QSB1 is not expected; if there is no such aberration to the signal it need not be stated.

Day Abbreviation

Self explanatory: SUN, MON, TUE, WED, THU, FRI, SAT

Mode used in transmission

Generally the mode of transmission is not stated, being available in the ENIGMA Control List. Should the expected mode change then this can be stated as: CW [Carrier Wave] MCW[Modulated Carrier Wave] ICW [Interrupted Carrier Wave] generally associated with Morse transmission; AM [Amplitude Modulation], LSB [Lower Sideband], USB[Upper Sideband] generally associated with Voice transmission.

Languages used

The ident of a station generally states the language in use, E [English], G[German] S [Slavic], V[All other languages].

Non voice stations

M [Morse and TTY] HM [Hybrid Mode: Voice/Data] SK [Digital modes] X [Other modes]

Ideally we would like to see logs offered in our standard format allowing the editorial staff to process the results quickly rather than having to manually re-format. Anyone submitting logs should refrain from using their own abbreviations or shortening our abbreviations eg. Su Mo Tu etc. See a correct example below which is now self explanatory:

V02a 5883kHz 0700z 06/06[A63752 57781 31521] Fair QRN2 end unk PLdn SAT

And the incorrect version:

V2a 5883k 07:00 06/06/2009 A/63752-57781-31521 S3 PLdn SA

Additional Info:

Own station idents should not be used.

When an unidentifiable station is submitted please supply the obvious details:

Freq, Time start and end, Date, Message content, particularly preamble and message content and ending.

Language details are helpful, particularly any strange pronunciations. Other details about stations can be found in the ENIGMA Control List available from Group files.

NUMBER SYSTEMS

European Numbers systems:

English	zero	one	two	three	four	five	six	seven	eight	nine
Bulgarian	nul	edín	dva	tri	chétiri	pet	shest	sédem	ósem	dévet
French	zero	un	deux	trois	quatre	cinq	six	sept	huit	neuf
German[^]	null	eins	zwei	drei	vier	fünf	sechs	sieben	acht	neun
Spanish	cero	uno	dos	tres	cuatro	cinco	seis	siete	ocho	nueve
Czech	nula	jeden	dva	tr [^] i	chtyr [^] i	pêt	shest	sedm	osm	devêt
Polish	zero	jeden	dwa	trzy	cztery	pie,c'	szes'c'	siedem	osiem	dziewie,c'
Romanian	zero	unu	doi	trei	patru	cinci	s,ase	s,apte	opt	nouâ
Slovak*	nula	jeden	dva	tri	shtyri	pât'	shest'	sedem	osem	devât'
* West	nula	jeden	dva	try	shtyry	pet	shest	sedem	ossem	devat
* East	nula	jeden	dva	trî	shtyri	pejc	shesc	shedzem	osem	dzevec
Serbo-Croat	nula	jèdan	dvâ	trî	chètiri	pêt	shêst	sèdam	ösam	dève:t
Slovene	nula	ena	dva	tri	shtiri	pet	shest	sedem	osem	devet
Russian	null	odín	dva	tri	chety're	pyat'	shest'	sem'	vósem'	dévyat'

[^] Some German numerals have a radio accent and totally in keeping with German armed forces The numbers in question are:

2 ZWEI pronounced as TSWO

5 FUNF pronounced as FUNUF, poss hrd as a fast TUNIS

9 NEUN pronounced by some as NEUGEN

Numeral Systems used on selected Slavic Stations [*those discontinued in italics*]

	Actual Polish[S11]	S11a Cherta
0	<i>zero</i>	nul
1	<i>jedynka</i>	adinka
2	<i>dwójka</i>	dvoyka
3	<i>trójka</i>	troyka
4	<i>cztery</i>	chetyorka
5	<i>pi'tka</i>	petyorka
6	<i>szexææ</i>	shest
7	<i>siedem</i>	syem
8	<i>osiem</i>	vosyem
9	<i>dziewie,c'</i>	dyevyet

Notes on Numeral Systems used on selected Slavic Stations:

- * Nula heard as 'nul'
- [^] Jeden heard as 'Yedinar'
- ' Tri heard as 'she'

Arabic Numerals [E25 and V08]

English	zero	one	two	three	four	five	six	seven	eight	nine
	0	1	2	3	4	5	6	7	8	9
Arabic	sifr	wahid	itmien	talata	arba	khamasa	sitta	saba	tamanya	tissa
	.	١	٢	٣	٤	٥	٦	٧	٨	٩

Chinese Number System:

[Particular attn to Yi/Yao pse].

0	Ling	Zero				
1	Yi/Yao	One	(It appears there is a radio version of Yao. On the telephone it is pronounced Yi; also heard in V16)			
2	Er	Two				
3	San	Three				
4	Si	Four	(The number four in Chinese is always unlucky, because it sounds the same as the word for death which is also pronounced 'Si' but with a different tone).			
5	Wu	Five				
6	Liu	Six				
7	Qi	Seven				
8	Ba	Eight				
9	Jiu	Nine				
Shi	Ten		Ba	One Hundred	Wan	One Thousand

Chinese numeral construction:

For example:

San	Three
San Shi	Thirty. In English they are saying Three and Ten.
San Shi Jiu	Thirty Nine. In English they are saying Three, Ten and Nine.
San Bai	Three Hundred. In English they are saying Three and One Hundred.
San Wan	Three Thousand. In English they are saying Three and One Thousand.

INACTIVE STATIONS

STATION LISTING BY LANGUAGE / MODE

YL = female voice OM = male voice

ENGLISH

Family	Ref.No.	Comments/"nickname"	Non-Voice Counterpart (other links in brackets)
VII	E01 YL *	AM, "Ready Ready" ends "End"	M17
O	E02 OM *	AM, Arabic Man (The Babblers)	
X	E03 YL *	USB, "Lincolnshire Poacher" intro tune, with 'gong' chimes TX = 200 groups of 5F figs, approx 45 mins duration	
X	E03a YL *	USB, "Cherry Ripe" intro tune, with 'gong' chimes TX = 200 groups of 5F figs, approx 45 mins duration	
II	E04	DELETED, should be logged as E03a	
II	E05 YL *	USB, Counting Station (Cynthia). 3-2 grps, "end" Last heard 3 Oct 03	
XII	E09 YL ^	AM, intro music from Magnetic Fields (J-M Jarre) Uses 2 different ID tunes, (possibly a schedule identifier. Ed)	(V08)
O	E10 YL	<u>E10 is probably still the most prolific voice station and always gives surprises.</u> Newsletters contain comprehensive charts of current activity. AM, (more correctly H3e, some J3e (USB) reported) NATO Phonetics call. (any 3 letters eg :-ART, PCD, VLB, TMS,) xxx2 = Null msg , xxx1 = Test, xxx3 = not yet determined	
	E10a YL	All variants / strings to above eg :- SYN7, VLB524X118X0115Z7, HNC-F, HNC-Z etc	
III	E11b	Starts & ends with stutter grps, M03c M03f S11b G11 (77777 77777), as first and last 2 msg grps. Msgs with only "in 30's" grps, Initial msg is 5F, repeat is 5f. distinct pause every 10 grps	
IV	E12 YL *	NNN	M02 sG12 V12 V18
V	E13 YL *	Five Dashes	
II	E14 YL *	4F "control"	
O	E15 YL/OM ^	AM/USB, uses a pre-NATO Phonetic Alphabet (very similar to the 1948 ARRL "Adam Baker Charlie" phonetics) i.e. NAS = Nancy Adam Susan. Does not TX on Fridays. Ends AR AR (as Adam Robert) Difficult copy in Northern Europe, heavily accented. YL voice returned Mar 05 after very long absence. (Under ongoing intensive investigation with numerous variants already found, their significance, if any, is not as yet fully understood. Ceased in 2006, it may return.	
O	E15a	WITHDRAWN, may be part of an expanded E15 section at later date.	
VI	E16 YL *	USB, 2 Letter, (AK, AG, DM, MD)	
IA	E17 YL * AM,	English Lady, ends "00000" Sends msg for first 2 weeks of month Null msg thereafter. Ending Zeros can be fast or slow.	M14
IA	E17a YL *	AM, Dual message variant	M14a
IA	E17y YL *	AM, "398" (ex Cuba)	
XV	E18 YL *	LSB, Edna Sednitzer	M13
O	E19 OM *	Irish Man, notable accent.	
?IA	E20 YL/OM *	2 Message, dual voice version of E17 / E6, or both. All could be variants of same	M14?
II	E21 YL *	4F counting, Eng accent	
	E21a YL *	" American accent	

XI	E23 YL/OM ^	AM/USB, (Swedish Rhapsody), Changed in 1998 to “without music intro” and using the E05 “Cynthia” type voice. Typically operates on a 3 out of 4 weekly cycle, missing out week 2, and starting 1 st Mon of month. 2005, Skeds are now erratic and may be heard at other times. Updates / skeds published in E2k Newsletters. Format : - Intro of 0 – 9 as 5f stutter grps (00000 11111 etc) all x 3, then into Msg of 5F grps. Ends with stutter group and “message end”	M04
O	E24 OM *	AM, "Allo! Allo!"	
	E26	Allocated in error and immediately WITHDRAWN	
GERMAN			
?XVII	G01 OM * G01a OM * G01b OM *	Tyrolean music (both sections) Irregular tunes, 1st section Phrase messages, 1st section, and irregular tunes.	
XI	G02 YL *	Swedish Rhapsody Ceased 1997	M04
XVII	G02a YL * G03 YL *	Counting Variant Gongs or Chimes intro Ceased 23 May 1990	
XIII	G04 YL *	AM, (3 Note oddity), starts at any 5 min. Intro of 3 rising tones, “Achtung Achtung” 1 st Thurs of Month, Started using English in 98 with the TCS voice. Ceased early 2005.	M29
II	G05 YL * G05a YL *	German Counting "Zwo" "Zwei" variant	
IB	G07 YL ^	AM, German Lady, (Nui Noichen) Intro “Achtung”. Uses “noiken” for 9 ends "000 000 ende". 3/4f DK, single grps (Inactive for a long time, resurfaced 15Mar 2002 Inactive again 2005, may return)	M12 XP
XVII	G07a YL * G08 YL *	AM, 774 type variant 4 note, rising scale. Same voice as G7 Last noted scales were “so-la-ti-do” & “do-me-so-do” Ceased Apr 1990	
O	G08a YL * G08b YL *	Single repeated 5F group + Morse Rapid dots intro	M49
III	G09 YL *	Saxophone Piece	
III	G10 YL *	"Bert Kaempfert"	M03
III	G11 YL *	AM/USB, Strich Format generally as E11a, ending “00000 00000 ENDE” 0 = Zerau 2 = Zvou (very unusual pronunciation) Last heard 2 April 98 Reheard Jan 07, for a short time, after almost 10 year absence. See E2k Newsletter 39, Mar 2007. Returned again Sept 2007 and is still active (2010)	E11a S11 M03
IV	G12 YL *	NNN	E12 V12 V18 M02
V	G13 YL *	5 Dashes	
VI	G13a YL * G14 YL *	3/2 group variant DFC37/DFD21, rising and falling 20 note scale.	
VI	G14a YL * G15 YL *	Non-phonetic variant Papa November, USB sent on 3// freqs	
VI	G15a YL *	PN read over musical notes	
VI	G16 YL*	USB, 2 Letter (AU, DB, DC, DT, EG, EL, FS, GK, NU, WL, OA, PZ, RD, VO) Network gradually reduced in the mid/end 90’s	

IXA	S10 YL *	AM, Czech Lady I (piano piece, later 5 notes)	M10c
	S10a YL *	AM, 555 "idler" format	
	S10b YL *	AM, 5 note intro (3 versions)	M10c
	S10c YL *	AM, 3F ID, with "idler"	M39 distant relative ?
	S10d YL ^	AM / USB, 3F ID (Bulgarian Betty, actually Czech) M10, S10, Normally Sun /Tue 20.50z – but other skeds heard Changes freqs monthly, 2 // freqs, can have one in AM other USB 5F groups Ends "Pozor Pozor, nn nn, nn nn, Konec Konec" Predictions / updates are published in E2k Newsletters Stays on UTC time [There was an earlier version of B.Betty, ceased Dec 89]	
	S10e OM ^	AM, Slovak, 5Ff, GC x 3 in call. 4 weekly sked. M10e Ends "000"	
III	S11 YL *	AM, (Presta)	M03//F11 (Formerly FSK POL)
III	S11b YL	Format as E11b Msgs with 30's grps, starts with stutter grp, rptd (77777) this doublet as first & last 2 grps. Ends "Konyets" First noted Wed Mar 6 th 06, 09.00z, 7377kHz (freq will vary)	M03c E11b
	S12	DELETED	
IC	S13 OM	Russian Counting, 0-9, & occasional announcements such as UPT76 etc (only 2mins duration)	
IC	S14	As above, of very long duration. Shield58/South 96 etc (in Russian)	
IXB	S15 *	Rapid Dots (an early OLX) see S5a	M06a
IXB	S16 *	OLX, see S5b	M06
IXC	S17 YL	AM, Czech Lady "control" single 5F message	
	S17a YL *	AM, no circuit No, positioning index or GC	
	S17b YL *	AM, 01 GC	
	S17c YL ^	USB, Daily 12.50z, Freqs change through year, has 2 // freqs Updated skeds are published in E2k Newsletters Call always 313 313 313 05 Preamble always 42 42 05 05 Podor Podor, single 5f gps x 10 (middle fig always 0) Podor Podor, rpt of preamble Ends Konec Konec Updates: Changed to the 555 triplet call during ? On 1 Nov 06 was heard with a single 999 call but then reverted to 555 probably on 2 Nov but definitely on 3 Nov and maintained this till Feb 07. 01 Feb 07 changed to a single freq TX with 555 call. 02 Feb 07 – the big change – brings its calls fully into line with the associated M10 & S10d stations using variable triplets. Presumed ceased June 2007.	M10, S10d
IXC	S18 OM /YL	Czech Man/Lady, 3F-5F Reactivated with YL voice 2004 after very long absence. Format : - 3Ff ID, 5Ff grp, all x 5 (xxx xxx xxx xxxxx xxxxx xxxxx) x 5 ends Konec Konec no known freqs or times, pot luck.	M39
IXC	S19 OM *	Czech Man "control" 000	
	S19a OM *	888-018 (S17c type)	
O	S20 YL *	Aifada	
XIV	S21 YL/OM	AM, Russian Lady, 3f call, OM voice started Oct 2010, similar to S06 Format: 3f call (454/323/973 etc)R, nnn DK, nn GC, 5f msg Ends DK GC 000 Time/freq 3323//3823, 4454//4854 , 4973//5373 17.42/18.42z	M45, M01a?

Seasonal changes

IA	S25 OM	AM, Russian Man "control?" 40 min TX Returned to air Sept 04 with much shorter TX's , still under investigation as very unpredictable and seldom logged, reheard Dec 06, Aug 07.	
	S25a OM *	AM, 11111 22222 format, very long TX	
	S25b OM *	AM, with message/s, very long TX	
	S25c OM *	AM, "615" single group, 14720 kHz	
III	S26 YL *	"Zyt ! Zyt! (Hush! Hush!) Polish ?	M03
XIV	S27 YL *	Czech Lady II	M01c
	S27a YL *	with message/s	
IXC	S29 YL	DELETED was the S18 YL	
O	S31 YL ^	AM, Czech, 1122 & 2136 kHz 24hr, H+10 & +40 made by/over a BC station	

OTHER LANGUAGES

XVI	V01 OM *	intro "Ciocirlia " (The Skylark, tune) Romanian	M48
	V01a OM *	with additional tune	
XVIII	V02 YL *	<u>V02 & M08 Family, see also notes for M08</u> AM, Spanish Lady, "Atencion" 1/2/3 finals Call 3f2f for 3 mins, single grps Format ceased late 1996	M08
	V02b YL ^	AM, 5f 5f 4f header version of V2a	
	V02c YL ^	AM, 3f2f call for 3 mins, <u>gc x 6</u> , 3 sec pause every 10th grp. Format started Aug 04, ceased 30 Sept 05. May return. Note , V2 stations may use USB – rare.	
II	V05 YL ^	AM, Spanish Counting, 3/2F	M68
II	V05a *	AM, Spanish Counting, 4f	
IA	V06 YL ^	AM, Spanish Lady, ends "00000"	M14
IA	V06a YL *	AM,"362"	
XII	V08 YL ^	AM, Arabic Music (Umm Kultum) or J-M Jarre, E09 Arabic language, 6647 & 11292 kHz, 18.00/19.00z First Sat of Month	
O	V09 YL ^	AM, (Chinese I), (5738, 6278/80, 7584, 8036 kHz)	
O	V10 OM *	Spanish ? "Stop Schlosst"	
	V10a OM *	2 group idler	
IV	V12 YL *	NNN - French	E12 G12 V18 M02
II	V14 YL *	4F "control, Spanish	formerly M72
O	V16 YL *	Chinese, 11028 kHz, 5min max TX, 15.00z (Europe) Reported in Australasia on 3/4/6/8 meg bands, no logs. Very fast speaking, each phrase ends "Oh Sie" x 2 Poss on 13680Khz (under BC) only reported from monitor in Cambodia (1998) Last European log 1999 (by ML)	
?XVI, ?IB	V17 OM *	3F + 000, Romanian	?M12
IV	V18 YL *	NNN, Hungarian	E12 G12 V12 M02
O	V19 OM *	WTR21. Intro (Don't Cry for me Argentina tune) Spanish speaking.	(related V20?)
O	V20 OM/YL? ^	Bored Man/Lazy Man, Spanish Slow uneven delivery	(related V19?)

IA	V23 YL *	French Lady, AM. Heard for 1 week in Aug 1999, 8124 & 11060kHz Format was as S06	(related S06 E17z ?)
O	V27 YL ^	WITHDRAWN - Chinese YL Call 3SG - Identified as V26	
	V29	Reserved	

INACTIVE & DELETED MORSE STATIONS

Common abbreviations used for reporting : - (full abbreviation list available on our group site)

R4=repeated for 4 mins 5f=5 figure single groups 5F=5 figure paired groups

5Ff=5 figure triple groups Short =short zero (sent as "t") Long = long zero (- - - -)

nnn x 3= repeated 3 times // = parallel freq Hand = hand sent

Cut = numbers sent in abbreviated form (numerous systems used), example :-

A= 1, N= 2, D= 3, U= 4, W= 5, R= 6, I=7, G= 8, M= 9, T=0. As used by Cuban M08a.

Family	Ref No	Comments	Voice Counterpart (Other links in Brackets)
XIV	M01c	Revised in Jan 2016. incorporated into M01a to include all M01 variants (excepting M01b) Previously other variants, inc short 000 ending by hand. usually only 10 groups. S27	
	M01d	5730/1kHz, M01c variant, auto sent. 1st heard Sept 99	
IV	M02 *	Ends <u>AR</u> , long zero	E12, G12, V12, V18
III	M03a *	with "triplet" element, 111 or 333 552/111(or 333)/00, R5, null message, ending == 000 Last heard May 2000	
III	M03b	Msgs in 50's grps, annual, or year on year, repeats and sent on same time/freq	
III	M03c	Msgs in 30's with double quintuple sevens (stutter groups) as first and last 2 grps (77777 77777), ends '= = 000' Sometimes repeats the same msg in the same week but not at any other time.	
III	M03d	Msgs over 60 grps, some with short period repeats	
III	M03e	Msgs of (so far) 71 grps with letter R between each grp and RR Every 10 grps. Rare TX	
III	M03f	First logged 22 Aug 07 , ID assigned from 01 Sept 07 Msgs of (so Far) 71 grps. Structure as M03. Msg Format, with single quintuplet element & prefixed GC 886/71 = = 33333 33333 00071 00071 = = 000	
XI	M04 *	"LO LO"x3 /75977 75977, always 100x5f grps long Repeats msg, ending "AR SK AR SK" Last heard Sept 2000	G02 (E23)
O	M05*	MCW auto. "The Two Day Wonder" only heard on 5/6 Oct 1993. The dates of the Russian Coup. Believed to have originated in UK 6F, 000000, long zero, // freqs.	
IXB	M06 *	OLX	S16
	M06a *	rapid dots tuning signal	S05, S15
IXA	M07 ^	MCWCC, Tone sequence start & end of TX (formerly rapid dashes), 17wpm. 749 749 749 85 85 35 35 = =, 35x 5F, ending = = 85 85 35 35 000	S10, M10
XVIII	M08*	ICW/CW, some MCW cut numbers, (ANDUWRIGMT) "UAAMD MDUUA UAIAU" R3. "UAAMD x 5 + = = = 150 x 5f" Ending AR AR AR SK SK SK Format ceased late 1996.	V02
	M08b ^	"de xxx" callup	
	M08c	ICW, cut numbers, as M08a but ending OE K First noted early 2004, believed defective TX tape, has periods of absence before restarting. Format ceased mid 2005, back in Feb 06. Not currently being heard (2010)	
	M08d	Format started Mon 17 July 2006, ended 22 July 2006 MCW with 1000hz tone, a 2 sec pause every 10 th grp, usual M08's cut numbers, ending SK SK SK. It sent the same 20gp msg repeated 25 times !! every day at 16/17.00z. Logged again starting April 2009 Not currently being heard (2010)	

IXA	M10	*	<p>Last logged 13.45z, 18 June 2007 ICW, MCW, some CW. 2F DK, 5F grps, ends "000" short. S10d, S17 17-25 wpm, freqs vary +- 1k. Sending speed quickens on repeat TXs Now one of the busiest CW stations where many additional skeds have been identified in past year, operating H24 (See Newsletters for current info.) Regular skeds use 2 // freqs. Other unpredictable skeds continually subject to change. Format 555 x 3, 571 x 3 46, (R5). 571 x 3, 75 75 46 46 == 46 x 5F. Ending == 75 75 46 46 0 0 0 . Czech? Updates: From 01 Nov 06 the call changed from 555 to a variable triplet format, as did the S10d partner station.</p>
	M10a *		Triplet "000"
	M10b *		additional groups, ends triplet "000"
	M10c		5F headers S10
	M10d *		GC sent 3 times, hand keyed
	M11	*	<p>ICW/MCW Presumed ceased with M10 Formerly M10e. Hand ?, Slovak ? S10e Call always 111. Was Tue/Wed 07.00z 7891kHz ??, may return. 5f ID, only 4 used, multiple msgs only 5 to 7 grps. Format 111 45897 nn 73689 nn 53204 nn 56412 nn From late 2004 changed to :- Mon – Fri, 09.00z, 5019kHz, rolling 4wk sked. Misses days out. TX's becoming erratic with long periods of inactivity.</p> <p>2007, a further change. A possible change of pattern was noted on 14/21 Mar 07. The 4 msg format appears to have been reduced to 2 msgs and time/freq changed to 08.00z 7891kHz, its original freq.</p>
IB	M12a		Two/Three message variant, Call nnn, 2/3, DK nnn/n , GC nn, ends 000 000 This variant has not been reported since December 2011.
	M13's		<p>No M13 family TX's heard since 04.30z, 13 Mar 2006, presumed inactive Note that all the M13 family changed time with GMT/BST Freqs change monthly for all M13 family, but used year on year. So will be +- 1hr as the clock changes. Known freqs will be monitored for possible return, but considered unlikely.</p>
XV	M13 *		<p>ICW,(rarely MCW) E18, G22,S04 3f ID,5f msg, c 9wpm, short zero First TX between 00.01 – 05.00z Repeats following evening. 261, R5, =(BT) 189 22 =(BT) 22 x 5f. repeat - ID x 12 = 189 22 = 5f msg. Ending “=(BT) 000” (short) M13a * Special schedule, “ID x 3, 000” R5 (R4 on the repeat) 2nd/4th Mon/Tue of month 21.00z [if an 03.00z TX is made the ID will be different]</p> <p>nnn nnn nnn 000, R5 (nnn changes monthly) (Format can be confused with M12, check endings and speed)</p>
	M13b *		<p>Long message variant, up to 70 grps. Changes ID monthly 2nd/4th Sat/Sun 21.00/22.00z (summer/winter) Will use a type “a” call when msg is between 19 – 23 grps. Can send 2 msgs in a month.</p>
	M13c *		Special 2 x month schedule, sent in MCW , slowly. 1 st /3 rd Wed/Thu 21.00/ 22.00z (variable)
	M13d *		<p>First noted March 2002. Single 5f grps. Usually stays on 5876kHz winter, 6715kHz summer. Only 02.30z. Preamble “nnn (R5), BT, Msg No, GC, BT”. Long msg call “303 x 12 BT 264 86 BT”. Ending BT ttt (cut).</p>

			Short msg call "767 x 12 BT 265 20 BT"	
IA	M14a		Other calls & freqs used at times dual message variant, formerly Fri 19.00z Now random times, and lower GC's. Repeats ID for 2min after 1 st msg	S06e
	M14b		Rare, added 2nd msg hand keyed	
	M14c		Rare, dual msg, <u>consecutive</u> ID's	
VI	M15	*	DEA47/EC3Y	
	M16		WITHDRAWN (8BY, French Mil)	
VII	M17	*	5f, sent in MCW, ends "VA"	E01, (S01?)
IC	M18		CW, 4f, continuous. Sends time strings UTC+4. Reportedly located in Kazakstan.	
O	M19	*	MPL	
III	M20	*	WITHDRAWN V's, ends "= 000" (this is an M03, tuning sig)	
IC	M21		WITHDRAWN Continuous, occ 14f msg, 5918/7941 / 5369 / 3246kHz. E.g. "= 99 1116nn8nnnnn" Russian Air Defence, plotting station. Uses full time stamp Many variants, time stamp in minutes only.	
O	M22	^	WITHDRAWN 4XZ, Israeli Navy ?? Believed largely replaced by a "data modem" early 2005 on 7160//8780kHz	
IA	M24a		2nd addressee, hand keyed (high speed, as M14a)	
O	M25	*	KKN, KRH, KWS series. (KKN heard very rarely)	
O	M26	*	"98" continuous version of M3	
VIII	M27	*	BTV, 5f > <u>BT</u>	
O	M28	*	HEP	
XIII	M29	*	VDE, 5f, ends <u>AR</u> , 12wpm "VVV x 2, de VDE x 3" R5 "VVV x 2, de VDE x 3 = = 73 73 37 37 8 8 1900 37x5f ending AR	
	M29a	*	no preamble or GC	G04
	M29b	*	extended preamble	G04
	M30		DELETED	
	M31		WITHDRAWN (FDC etc, French Mil)	
O	M32	*	WITHDRAWN FAPSI Russ. Mil. nets 4 char. c/s	
XIX	M33	*	P8K, long zero	replaced by M51
O	M34	^	11 12345 (2F ID, no ending) long zero. erratic, 15 wpm. 5f.	M26
	M35-38		DELETED	
IXC ?	M39	^	ICW, MCW, slow, hand, short zeros Inactive / unlogged for a long time, returned May 03 No known skeds, a real "pot luck" station Format :- 3Ff ID, 5Ff grps all x 5 (xxx xxx xxx yyyyy yyyyy yyyyy) x 5 Pause, period of dashes then Same ID, different 5f grp. No ending, uses short zero	S18

There may be a further pause of 10 – 15 mins then another TX of same format with a different ID
Possibly part of M10 group.
During Jan 2007 it was noted sending alternate grps x3 and using a 0 0 0 ending.

	M40	^	20WPM, short zeros, poss N.Korean “VVV CQ 747.135” R5. “CQ 135 CQ135 CQ135 HR HR 18 18 == 18x5f AR AR RPT RPT repeats above line, ending AR AR VA VA. Last heard Oct 03	
XVII	M41		WITHDRAWN WDZ / ABV trigrams, Russ Mil tracking.	
IC	M42		WITHDRAWN FAPSI networks	
O	M43	*	WITHDRAWN 6XM8/C37A networks	
O	M44	^	Rare, Continuous "Roman" letters	
	M44a		Rare, Continuous "Cyrillic" letters (reactivated June 2004)	
XIV	M45		MCW, 5F, hand keyed, paired groups H+02, ends "000", short zero Similar format to M1 but much slower (9/12 wpm) “074 (525, 555) x 4mins, XXX XXX XX XX == 5Fgps. ending == XXX XXX XX XX 000” where XXX=DK, XX=GC. Alternatively XXX – XXX/XX = 5F Changing skeds.	S21
	M45/1		Nov – Feb	clg 525, freqs 3525//4025
	M45/2		Mar/Apr/Sept/Oct	clg 555, freqs 4555//4955
	M45/3		May - Aug	clg 074, freqs 5074//5474
			TX times are, Jan – Apr & Sept – Dec = 18.02z, May – Aug = 17.02z	
O	M46	^	3F cumulative	
O	M47	^	1/2/3 F cumulative (JST)	
XVI	M48	*	Ciocirlia Morse?	V01
XVII	M49	*	AAAAA, G8a Morse	G08a
XIV	M50		MCW,Hand keyed, sloppy, 5431/4641/5372kHz (related M1, S21) INCONSISTENT FORMAT always 50 groups (training net ??) appeared on 9567 / 7722kHz in Feb 06	
XIV	M50a	^	Hand keyed, sloppy, 5372kHz, 19.30z 20 group variant, started mid 2001.	
O	M52	*	2f 6f, long zero unpredictable, Special Forces ? heard last 12 Feb 01	
O	M53		DELETED, See M40	
O	M54	^	V98T, only null message format known	
O	M55		Rare,3F x 5, ends "000 000" long zero only null message known Tue/Thu, 9254Khz, 22.00z,erratic hand, 10min TX Example “529 x n 000, (r3), last grp 529 x n 000 000” From 2004 being heard Tue & Fri, 13.00z, 12150kHz Mid 2005 started using new operator with slower sending.	
O	M56		f : 5Ff, long zero related M52 ? unpredictable, Special Forces ? No known freqs/times, A pot-luck ? station	
Note: M57 to M61 & M66 NOW ALL WITHDRAWN				
O	M62		Repeating 4 digit (LNLL) Using mixed Lets/nums. Rarely sends msgs, then usually only c30 groups Believed Slovak Mil. Mainly 3-5 meg. Each msg has a UTC+2 D/T stamp	
O	M63		A2A net,	
O	M64	*	= 3f 3f = 11111 5F > <u>AR</u>	
O	M65	*	5f, ends == QRU QRU <u>SK SK</u>	

Format:- 64 20 09 2123 696 c/s

Where 64 = msg nr, 20 = gc (always 20) 09 = day, 2123=UTC +1, 696 = ABCD = addressee
A detailed write up by AB/FN added to the Detailed Morse Profiles List Oct 2003

- M92 Czech Mil,(Network 25), possibly associated with M90
5F or 5L. Time CET varying. Works to a 10 day freq/QRA cycle.
1 to 10 msgs of 20 or 50 grps, preamble & calls by hand (poor/errors), msgs are Auto, encrypt.
Sample format:-
W6QZ de KVF2 QTC 1 50 12 0805 = 743 W6QZ = 5LG = KVF2 +
Known freqs include 4900//5330, 4800, 6920//5340, 5200, 5270//5920kHz
A detailed write up by AB added to the Detailed Morse Profiles list, Oct 2003
Ed note :-There are some further Chinese stations being studied.
- M93 ^ First logged Apr 2004, Auto at 15wpm, long zero.
At 21.00z Tue/Thu/Fri (sometimes) on 14377kHz
Format:-
V's for 45 seconds (has been heard for 2 mins), call M6 sent 4 times,
Then single 5fig grps, ending // +
This station logged only over a period of 3 weeks on this freq but E2k informed that it regularly changes
freqs, no logs received since May 04 so presumed inactive.
- O M94 Assigned 01 June 2009
MCW station sister of voice station V24
Location believed to be S.Korea
Current freqs :- 5715, 6330 (Oct 2010)
Heard 12.00 – 16.20z (mainly 13.00/14.00z)
Variable reception, little success in Europe.
Most reliable reports come from Western USA.
- Various formats used, but typical 'head and tail' is:-

Vvv vvv vvv cq cq cq de nnnn nnnn qrv qrk qtc k
Repeated further twice

Hr Wnn (group count)

Msg
Rpt

Ends "=ar k tu va"
- IC MXII FSK mode TX
MXIII WITHDRAWN, MX covers
MXIV WITHDRAWN, MX covers
- The above MX designators apply only to Russ/E.European networks, others should use the generic "SLB" term.

Discontinued Polytones (XP Family)

- XP [Russian Intel Multitone System 1+12]
Standard Tones (Hz +-3Hz) M78?, M12
[XP used as the nominal value for measurement of other Polytone systems]
303, 319, 335, 351, 367, 383, 399, 415, 431, 447, 463, 479, 495, 511 Hz.
Datum tone 303Hz
Tone/value relationships:_
303=space, 319=end, 495=start, 511=repeat,
335=0, 351=1, 367=2, 383=3, 399=4, 415=5, 431=6, 447=7, 463=8, 479=9.
- XPH High Tones (Hz +-3Hz)
Has sent at 3 differing speeds during its lifetime, (1980's – 2003) essential that tonal values are confirmed
if comparing recordings.
814, 844, 879,914, 954, 992, 1038, M12
1089, 1143, 1202, 1234, 1271, 1304 Hz. family
Datum tone 1304Hz

Tone/value relationships :-

1304=space, 1271=separator, 992=repeat, 1234=0, 814=1, 844=2, 879=3, 914=4, 954=5, 1038=6, 1089=7, 1143=8, 1202=9.

XPL	<p>Low Tones (Hz +-3Hz)</p> <p>It would appear that the low tones are the product of mixing 2 non harmonically related tones, analysis is ongoing, tone pairs identified as (Hz +-3Hz), tone product in parenthesis:- 150/235[80], 165/255[90], 180/245[65], 205/260[55], 215/290[75] Hz</p> <p>Tone/value relationships :- Will undergo full analysis as & when we have sufficient samples. This station has only been positively identified three times in the past 10 years, lastly on 27 Mar 07 in Greece.</p>	M12 family
XPM	<p>[Russian Intel Multitone System 17+1]</p> <p>Mid Tones (Hz +-3Hz) 450, 488, 531, 568, 611, 649*, 692, 730, 773*, 811*, 854*, 891, 934, 972, 1015, 1058*, 1096*, 1177*</p> <p>*used on longer duration tones only</p> <p>Tone/value relationships :- Still under analysis.</p> <p>Often confused with the Piccolo system.</p>	

Discontinued Digital Modes

SK01	<p>Assigned 20 Jan 07, as a generic identifier. The PSK31 TX's allied to the Cuban M08a station First noted on 27 Dec 06. BPSK125 and BPSK220fec also noted during first half 2007 RDFT became the sole operating mode in late 2007 The station has a similar general structure to the M08a / V02a family but also many detail differences including the "non use" of the M08 cut numbers scheme. Further developments occurred on a sporadic basis (2007-10) and have led to a new hybrid signal [See HM01]</p>
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NOISE Stations or UNIDENTIFIED MODES [Some occasionally active]

Family	Ref No	Comments	Counterpart
VII	X01 ^	Bugle, no other TX	S02
IC	X06	See Active Polytone section.	
	X21	21 note melody, 2 variants	
	XB	Buzzer/UZB76,(UVB-76) now classified S28, usually 4625kHz AM, others used. Russ Mil, Ch marker with voice & data. See S28 entry	
	XBS ^	Buzz-saw, being heard 5.1-5.8mHz and 7019 in 08/2001	
	XC	Crackle, closely spaced carriers, total b/w =< 380Hz	
	XD	Fast ICW dots, 24hr, 3595kHz	
	XE ^	Echo	
	XF	Faders	
	XFR	Croaking Frog, 7380kHz 08.00z+- and 7992, 11173, 13975, 18864kHz at various times, all USB	
	XJT	The Jet, appears to use blocks of 10 freqs from 2 - 9 MHz Sig is about 3kHz wide and uncannily often TX's on freqs known to be used by other number stations but is not considered to be a deliberate jamming of, although a nuisance. Update:- During 2010 it was noted that many of the sigs were now up to 10kHz wide and appeared to have an affinity towards E07,E10 & Fam IB stations, is this a coincidence ? The system is known to be 'STANAG', of which there are a few variations. Most TXs are encrypted	
	XM	Backward music / whales / feedback. (original entry) Generally considered to be a result of unintentional cross mixing where RF / Audio circuits are co-located as the effect is being noticed on many different circuits with different equipment, ruling out a single user or set-up as the culprit. A close association with Link-11 TX's have been remarked upon by some monitors and this aspect is receiving further attention.2005/2006 (updated entry, July 2006) (Amid an ongoing debate with much conflicting opinion) Now considered to possibly be a form of "COMPEX" type signal as the ongoing investigation has isolated multiple voice traffic, so far unintelligible, within the signal, making it man-made rather than random, further enhancing the possibility of a LINK-11 connection. Also suspected is some form of commonality, structural rather than relational, with the XP series signals and in turn the X06 series. The XP's & Link-11 "possible" connections are very interesting as they are "conflicting signals" as regards origins. Further opinion has been given that there could be an element of "Chaos" involved.	
	XQ ^	Plaintive "mew"	
	XS	Saw/whine	
	XSL	Slot machine, widely heard in US, (Europe in winter months),believed Japanese PSK. Wide range of freqs(+/- 2k) used including :- 2578, 2656.5, 4153, 4231.5, 4291, 5807, 6250, 6416.5, 6417, 6445, 8313, 8588, 8703. Appears to be a form of pulse modulation.	
	XSW	Now S32 Squeaky Wheel. 3829/5474/6991kHz, 15010kHz reported. See S32 entry	
	XT	Tick/pip, 24hr, Superseded by S30	

XTB	1 tone, 2 buzzes. 11116kHz, early morning daily.
XT2	Pip, 22.00z + varying freqs, usually low end HF. (early 02, Issue 9 for details)
XUP	Assigned 11 Sept 2010 The Pulser The unusual Pulsed Signal being heard primarily in the USA Notified in NL60.
XW	Workshop, heard again on 24 Jan 06 on 6250kHz, i/p 16.45z
XWP	Wop Wop (wideband sig) [Ocean surface radar system] Heard from 5600 – 9400kHz, lasts 20mins then changes freq.. See Newsletter Issues 9 & 26 for more details.
XX	DELETED
XXX	DELETED

Log of Previous Changes made to ENIGMA 2000 Active Stations & N&O Ident List

V1.2 - February 2016

Page 2 Introduction

- Added FSK POL to Family III grouping
- Added HM01 to Family XVIII grouping
- Added M51a to Family XIV grouping

Page 3 Active Stations

- (E11) Added FSK POL to Non Voice Counterpart

Page 6

- (S11a) Added FSK POL to Non Voice Counterpart
- (V02a) Added HM01 to Non Voice Counterpart
- (V13) Added New Star to description (Opinion seems divided on the correct translation of the station name)

Page 8

- (V30) Added M97 to Non Voice Counterpart (This may now have ceased - But too early to remove yet)

Morse Section Changes

Many of the Morse definitions have been updated. Below are only the major changes to this current listing

Page 8

- (M01a) M01a is revised to incorporate M01c. It had become impossible to correctly separate the two variants & this was agreed in discussion during 2015, but not yet implemented.

Page 11

- Added M51a definition (Addition to original ECL)

Page 12

- Added M97 definition (Addition to original ECL)

Page 13

- New section consisting of previously withdrawn ENIGMA designations & other Morse stations

This section includes those stations still active, but withdrawn as not of interest to ENIGMA. The designations have survived & are still actively used by Ary (N&O) & possibly other groups or forums. This also includes some variants added by Ary
A few short paragraphs are included to explain the reasons for adding this

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