NORTH ATLANTIC TREATY ORGANIZATION
ORGANISATION DU TRAITE DE L'ATLANTIQUE NORD

MILITARY AGENCY FOR STANDARDIZATION (MAS)
BUREAU MILITAIRE DE STANDARDISATION (BMS)
1110 BRUSSELS

MAS/414-EL/4212
15 November 1993

To   : See MAS Distribution List No. 2

Subject   : STANAG 4212 EL (EDITION 2) - THE NATO MULTI-
                CHANNEL TACTICAL DIGITAL GATEWAY - RADIO RELAY
                LINK STANDARDS

References   : a.   MAS/406-EL/4212 dated 9 December 1983
                      (Edition 1)
                b.   AC/302-D/542 dated 29 December 1989

Enclosure   : STANAG 4212 (Edition 2)

1.   The enclosed NATO Standardization Agreement which has been
ratified by nations as reflected in page iii is promulgated
herewith.

2.   The references listed above are to be destroyed in
accordance with local document destruction procedures.

3.   AAP-4 should be amended to reflect the latest status of the
STANAG.

ACTION BY NATIONAL STAFFS

4.   National staffs are requested to examine page iii of the
STANAG and if they have not already done so, to advise the
Defence Support Division, IS, through their national delegation
as appropriate of their intention regarding its ratification and
implementation.

G.B. FERRARI
Major-General, ITAF
Chairman, MAS

- 1 -

STANAG 4212
(Edition 2)

NORTH ATLANTIC TREATY ORGANIZATION

(NATO)

MILITARY AGENCY FOR STANDARDIZATION

(MAS)

STANDARDIZATION AGREEMENT

SUBJECT :   NATO MULTI-CHANNEL TACTICAL DIGITAL GATEWAY –
RADIO RELAY LINK STANDARDS –

Promulgated on 15 November 1993

G.B. FERRARI
Major-General, ITAF
Chairman, MAS

STANAG 4212
(Edition 2)

RECORD OF AMENDMENTS

No.	Reference/date of amendment	Date entered	Signature
1		23.3.01	

EXPLANATORY NOTES

AGREEMENT

1. This NATO Standardization Agreement (STANAG) is promulgated by the Chairman MAS under the authority vested in him by the NATO Military Committee.

2. No departure may be made from the agreement without consultation with the tasking authority. Nations may propose changes at any time to the tasking authority where they will be processed in the same manner as the original agreement.

3. Ratifying nations have agreed that national orders, manuals and instructions implementing this STANAG will include a reference to the STANAG number for purposes of identification.

DEFINITIONS

4. Ratification is "The declaration by which a nation formally accepts the content of this Standardization Agreement".

5. Implementation is "The fulfilment by a nation of its obligations under this Standardization Agreement".

6. Reservation is "The stated qualification by a nation which describes that part of this Standardization Agreement which it cannot implement or can implement only with limitations".

RATIFICATION, IMPLEMENTATION AND RESERVATIONS

7. Page iii gives the details of ratification and implementation of this agreement. If no details are shown it signifies that the nation has not yet notified the tasking authority of its intentions. Page iv (and subsequent) gives details of reservations and proprietary rights that have been stated.

Agreed English/French Texts   •   STANAG 4212
                                                              (Edition 2)

NATO STANDARDIZATION AGREEMENT
(STANAG)

THE NATO MULTI-CHANNEL TACTICAL DIGITAL GATEWAY
- RADIO RELAY LINK STANDARDS -

Annexes:- A. General Characteristics
          B. Engineering Order Wire
          C. Transmission
          D. Radio Relay Parameters
          E. Transmission Quality Monitoring
          F. NPICS Proforma

Related Documents:-

    STANAG 4206 - The NATO Multi-Channel Tactical Digital Gateway
                  System Standards
    STANAG 4207 - The NATO Multi-Channel Tactical Digital Gateway
                  Multiplex Group Framing Standards
    STANAG 4208 - The NATO Multi-Channel Tactical Digital Gateway
                  Signalling Standards
    STANAG 4209 - The NATO Multi-Channel Tactical Digital Gateway
                  Standards for Analogue to Digital Conversion of
                  Speech Signals
    STANAG 4210 - The NATO Multi-Channel Tactical Digital Gateway
                  Cable Links Standard
    STANAG 4211 - The NATO Multi-Channel Tactical Digital Gateway
                  System Control Standards
    STANAG 4213 - The NATO Multi-Channel Tactical Digital Gateway
                  Data Transmission Standards
    STANAG 4214 - International Routing and Directory for Tactical
                  Communications Systems
    STANAG 4249 - The NATO Multi-Channel Tactical Digital Gateway
                  Data Transmission Standards - Packet Switching
                  Service
    STANAG 4290 - The NATO Multi-Channel Tactical Digital Gateway
                  - Cable Link (Optical) Standards

INTRODUCTION

    1. This STANAG is one of a series which, when taken together,
specify all the technical characteristics, parameters and procedures
necessary for two NATO tactical digital communications systems
(networks) to interconnect and exchange traffic via a gateway.

2.   STANAG 4206 provides an overview of the gateway concept and summarizes the key requirements and characteristics contained within this and the other STANAGs of this series.

AIM

3.   The aim of this agreement is to define the characteristics and parameters for digital radio relay equipment when used for inter-operation between trunks networks of different nations via a gateway.

AGREEMENT

4.   Participating nations agree to use the standards defined in this STANAG as the radio relay link standards for interoperation between trunk networks of different nations via a gateway.

IMPLEMENTATION OF AGREEMENT

5.   This STANAG is implemented by a nation when multi-channel tactical digital gateways (radio relay link standards) in that nation's forces comply with the characteristics detailed in this agreement and are placed in service.

GENERAL CHARACTERISTICS

1.   The standardized multi-channel bit rates are listed in Table 1.

2.   During the interim period, while both 32 kbps and 16 kbps are in use, the multi-channel link between two nations using different channel bit rates shall be at 256 kbps. The nation using 32 kbps shall be responsible for providing any conversion necessary to interconnect 16 kbps and 32 kbps channels via a multi-channel link.

3.   If different channel bit rates have to be interconnected, the terminals with 32 kbps (and the single channel crypto if employed) shall be switched to operate at 16 kbps and duplicate each bit for transmission within the 32 kbps network.

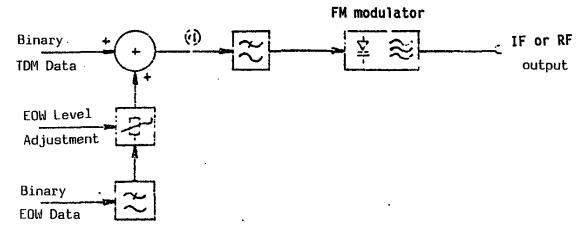|	SINGLE CHANNEL BIT RATE (Kbps)	MULTI-CHANNEL BIT RATE (Kbps)	BIT-SLOTS PER FRAME
Interim Period	16 32	256 512	16 16
Ultimate Solution	16	256	16

TABLE 1 - MULTI-CHANNEL BIT RATES

CPT2183/ST4212.1

ENGINEERING ORDER WIRE (EOW)

1.   A full duplex EOW link (in a half duplex mode of operation) shall be provided on each multi-channel radio relay link.

2.   The 16 kbps EOW shall be added to the 256 and 512 kbps traffic in the manner shown in Figure 1. The modulation, as defined in Figure 1, shall be in accordance with Table 2 (Appendix 1 to Annex D).

3.   EOW transmission shall be possible both in the presence, and in the absence, of group traffic.

4.   The error rate on an EOW link shall be lower than 1 in 10^3 when the group traffic error rate is 1 in 10^4 or lower.

5.   The limits of path loss capability given in Table 2 shall be maintained in the presence of EOW Signals.

6.   It is recommended that EOW filtering be divided between transmitter and receiver to achieve approximately the overall curve shown in Figure 2.
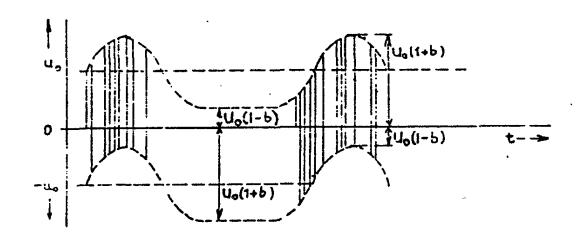
7.   Synchronization time:

   -    Following a phase disturbance in the EOW data stream, synchronization shall be re-established within 16 msecs;

   -    Following a complete interruption of the radio path, EOW synchronization shall be re-established within 200 msecs.

CPT2183/ST4212.2

FM modulator

Binary TDM Data

(a)

EOW Level Adjustment

Binary EOW Data

IF or RF output

EOW block diagramm

signal at point a (modulation **overemphasized**
for demonstration only)

$b = (\text{EOW deviation})/(\text{traffic deviation})$

Figure 1: Transmitter Side of AEOW–System

B-1-1

CPT2183/ST4212.2A

EOW Frequency Response (OVERALL)
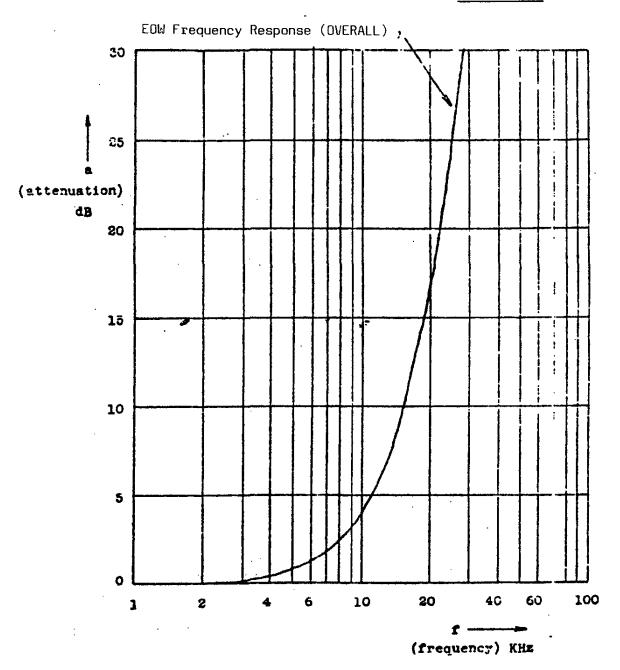
Figure 2:   EOW Filter Parameters

B-2-1
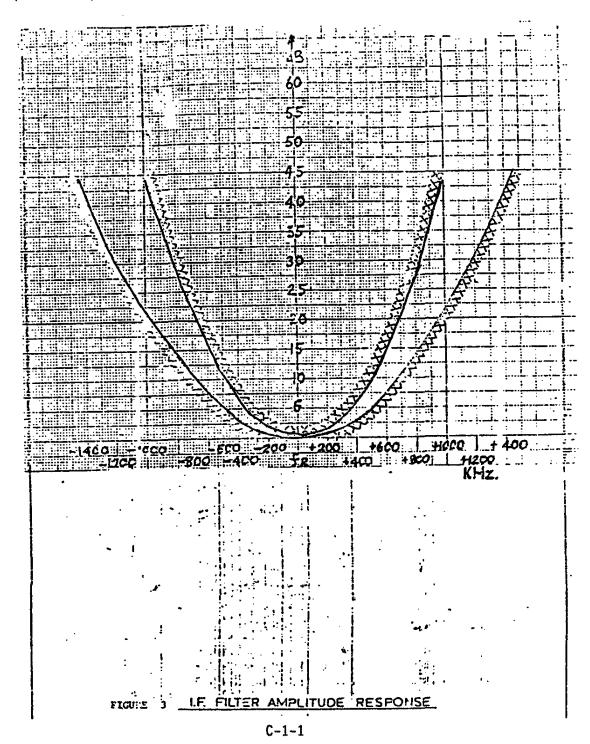
CPT2183/ST4212.2B

TRANSMISSION

1. The radio transmitter shall accept digital inputs at 256 and 512 kbps for transmission as 256 and 512 kbps binary FM signals.

2. The timing circuit in a radio relay receiver, which shall be used not only in plesiochronous networks with high stability clocks but also in connection with different multiplex equipments handling bit rates of 256 and 512 kbps, must have adequate pulling range. To meet these requirements, the clock extraction device must be able to cope with signals having a clock accuracy of 1 in 10^4.

3. The optimization of individual pre-modulation, intermediate frequency (IF) and post detection filter responses will depend on the emphasis placed by users on criteria such as Occupied Bandwidth (OBW), Path Loss Capability (PLC) and the desire to work at various bit rates without undue switching complexity. Accordingly, the IF filter, the pre-modulation filter and the post detection filter response masks given in Figure 3, 4 and 5 are recommended as the limits between which the nominal frequency characteristics should fall to achieve satisfactory radio relay performance at Gateways (256 kbps and 512 kbps).

4. To facilitate compatibility between national equipments, group delay distortion shall be corrected within the equipment in which it occurs.

5. The adjacent channel selectivity performance of the radio, which is necessary to ensure compatible working with like equipments, shall be better than the limits of the curve of Figure 6.

CPT2183/ST4212.3

FIGURE 3   I.F. FILTER AMPLITUDE RESPONSE

C-1-1

CPT2183/ST4212.3A
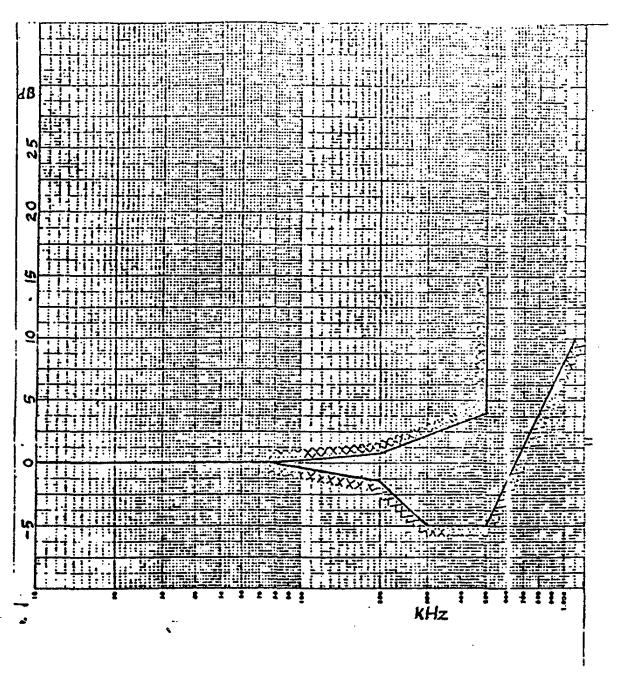
FIGURE 4   PRE-MODULATION FILTER RESPONSE

C-2-1

APPENDIX 3 to
ANNEX C to
STANAG 4212
(Edition 2)
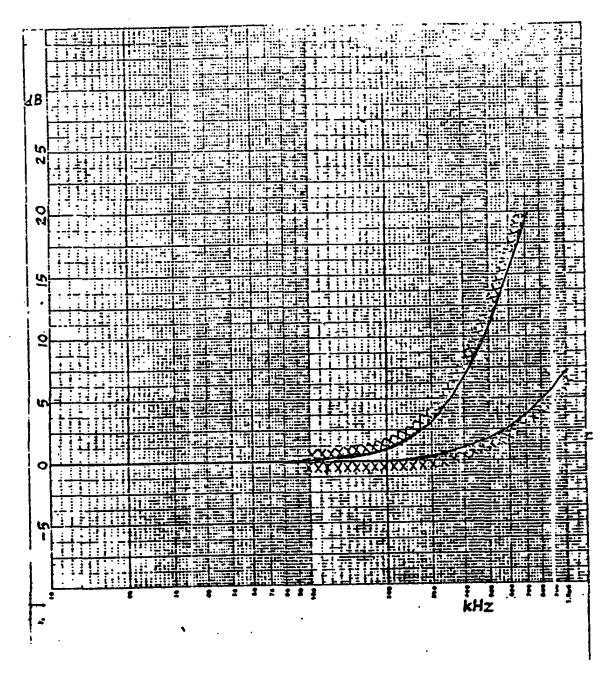
FIGURE 5   POST DETECTION FILTER RESPONSE

C-3-1

CPT2183/ST4212.3C

LEVEL OF INTERFERER RELATIVE TO WANTED SIGNAL
TO REDUCE BER FROM 10^{-5} TO 10^{-4}
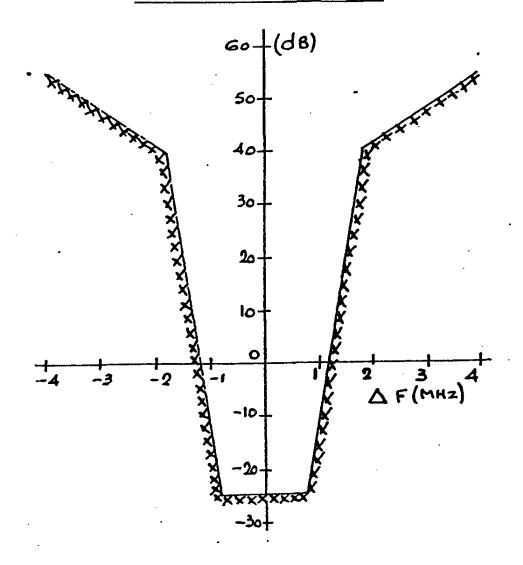
FIGURE 6: MINIMUM ADJACENT CHANNEL SELECTIVITY.
MASK FOR OPERATION AT 256/512 KBIT/S

C-4-1

CPT2183/ST4212.3D

RADIO RELAY PARAMETERS

1.   The standardized parameters are shown in Table 2.

2.   The radio relay equipment must be capable of supporting Gateway links in the 225 to 400 MHz band and comply with the parameter values shown in Table 2 under the column heading Preferred Gateway.

3.   If Gateway operation in other UHF bands has been agreed on a bilateral basis, then equipments for this purpose must be capable of operation in either the 610 to 960 MHz band or the 1350 to 1850 MHz band or both. Such equipments must conform to the parameters listed in the columns headed Supplementary Gateways in Table 2.

CPT2183/ST4212.4

APPENDIX 1 to
ANNEX D to
STANAG 4212 (Edition 2)

PARAMETERS		PREFERRED GATEWAY		SUPPLEMENTARY GATEWAY			
Frequency band (MHz) Frequency setting interval (MHz) Frequency setting reference point (MHz) Frequency accuracy		225-400 (a) 0.125 (b) 225.000 ≤ ± 2x10E-5		610-960 0.125 (b) 610.000 ≤ ± 2x10E-5		1350 - 1850 0.125 (b) 1350.000 ≤ ± 2x10E-5	
Antenna gain (nominal) (dBi)		11 ± 3		16 ± 3		21 ± 3	
Antenna polarisation (c)		Linear: horizontal and vertical					
Radiated power (e) (dBm)		50 ± 3		50 ± 3		50 ± 6	
Transmit/receive minimum frequency separation (in same equipment) (MHz)		≤ 30		≤ 30		≤ 30	
Receiver Noise figure (max) (dB)		≤ 8.0		≤ 8.0		≤ 8.0	
Tranmsmitter spurious emissions (dB) below Tx power (d) :- a. within ± 2 MHz of carrier frequency b. beyond ± 2 MHz of carrier frequency c. harmonics of carrier		≥ 60 ≥ 90 ≥ 60		≥ 60 ≥ 90 ≥ 60		≥ 60 ≥ 90 ≥ 60	
Receiver spurious emissions (max) (dB) (over the frequency range 1 MHz - 5GHz)		- 40		- 40		- 40	
Image frequency suppression (min) (dB) (ratio of receiver sensitivity at image frequency to that at the carrier frequency)		60		60		60	
Trunk capacity (channels)		16		16		16	
Single channel bit rate (kbit/s)		32	16	32	16	32	16
Trunk bit rate (kbit/s)		512	256	512	256	512	256
Path loss capability for BER = 10E-4 (dB)		≥ 142	≥ 145	≥ 142	≥ 145	≥ 142	≥ 145
Transmitter occupied bandwidth (99%)(kHz)		≤1000	≤750	≤1000	≤750	≤1000	≤750
Deviation ratio (f) (peak-peak)/(bit rate)		0.3-1.0	0.6-2.0	0.3-1.0	0.6-2.0	0.3-1.0	0.6-2.0
Modulation method		Binary FM					
Sense of carrier deviation		Increase RF carrier frequency for change from binary '0' to '1' with positive logic					
EOW binary modulation rate (kbit/s)		16					
EOW modulation method		Additive binary					
(EOW deviation)/(traffic deviation)		0.18					
EOW filtering		EOW filtering shall be divided bewteen transmitter and receiver to achieve approximately the curve shown in Figure 2.					

TABLE 2 —RADIO RELAY PARAMETERS

NOTES:-
a. New equipments shall be designed to operate over the 220-400 MHz band although prsent equipments may operate with a slightly reduced PLC in the 220-225 MHz sub-band.

b. The use of a setting interval of 0.5 MHz is permitted for existing equipment only.

c. The facility to select either polarisation in the field shall be provided.

d. As a result of the mixing process, there may be a small number of discrete frequencies at which spurious signals, greater than the specified levels, occur. The acceptability of these spurious signals should be determined at the discretion of Nations in accordance with CCIR recommendations.

e. Radiated power (dBm) = transmitter power (dBm) - feeder loss (dB) + forward antenna gain (dBi)

f. Links between RR equipments using the same deviation ratio will achieve the Path Loss Capabilities of this STANAG. But links between RR equipments with different deviation ratios may suffer a reduction in range of up to 60% with respect to those employing the same deviation ratio.

TRANSMISSION QUALITY MONITORING

1.   Means shall be provided for checking transmission quality (see STANAG 4206) on the radio link before traffic is passed and as required at other times in the absence of traffic. The objective is to check the adequacy of the fade margin and absence of interference.

2.   Equipment for this purpose need not be built into the radio equipment.

3.   The measurement should be performed during the transmission of a pseudo random test pattern with a periodicity of $(2^{15}-1)$ bits.

4.   The pattern generator could be, for instance, implemented with a 15 stage shift register in which the modulo 2 addition of the outputs of stages 14 and 15 is fed back to the input of the first stage.

5.   The pattern shall be applied at Gateway group bit rate to the traffic input.

6.   Bit rate accuracy shall be better than 1 in 10^4.

7.   The duration of the test shall be such that the required measurement accuracy is achieved.

8.   The pattern shall modulate the radio transmitter such that the characteristics of the modulated carrier at the output are the same as those for the traffic.

9.   It is mandatory to provide loopback facilities from the receiver baseband to the local transmitter baseband to permit monitoring of both "go" and "return" paths from the other end of the link.

CPT2183/ST4212.5

NATO MULTICHANNEL DIGITAL GATEWAY
RADIO RELAY LINK STANDARDS
NPICS PROFORMA

1   Introduction

1.1 A nation implementing radio relay link standards for the NATO
multichannel digital gateway which are claimed to conform to STANAG 4212 shall
complete the following NATO Protocol Implementation Conformance Statement
(NPICS) proforma.

1.2 For a NATO standard, the NPICS corresponds to the Protocol Implementation
Conformance Statement (PICS) defined in ISO/IEC 9646-1 for an international
standard. The term NPICS is used to avoid confusion where the requirements for
NPICS and PICS differ.

1.3 The NPICS proforma is a document, in the form of a questionnaire designed
by the responsible group in the TSGCE, which, when completed for an
implementation or system including any Additional Information and Exception
Information, becomes the NPICS for the implementation in question.

1.4 Nations should complete the NPICS proforma at the time of ratification
of the STANAG in order to indicate their intentions for implementation: they
may revise their NPICS if their plans for implementation change. In any case,
no later than the date of implementation, nations are required to forward the
NPICS to the Allied Tactical Communications Agency Allied Interoperability
Database through their ATCA representatives.

1.5 The NPICS is a statement of which capabilities and options of the
protocol have been implemented. The NPICS can have a number of uses, including
use:

   a.   By the protocol implementer, as a check list to reduce the risk of
   failure to conform to the standard through oversight.

   b.   By the supplier and acquirer – or potential acquirer – of the
   implementation, as detailed indication of the capabilities of the
   implementation, stated relative to the common basis for understanding
   provided for by the standard NPICS proforma.

   c.   By the user – or potential user – of the implementation, as a basis
   for initially checking the possibility of interworking with another
   implementation. (Note that while interworking can never be guaranteed,
   failure to interwork can often be predicted from incompatible NPICS.)

   d.   By a protocol tester, as the basis for selecting appropriate tests
   against which to assess the claim for conformance of the implementation.

   e.   By the Allied Tactical Communications Agency (ATCA) for compilation
   of the Allied Interoperability Database (AID).

2 Abbreviations and Special Symbols

2.1 Status Symbols

M	Mandatory
O	Optional
O.<n>	Optional, but support of at least one of the groups of options labelled by the same numeral <n> is required.
X	Prohibited
<pred>:	Conditional-item symbol, including predicate identification, see 3.4
¬	Logical negation, applied to a conditional item's predicate

2.2 Abbreviations

N/A	not applicable
NPICS	NATO Protocol Implementation Conformance Statement
EOW	Engineering order wire
BER	Bit error rate

2.3 Item References. Items in the NPICS proforma are identified by mnemonic item references. NPICS items dealing with related functions are identified by item references sharing the same initial letter or letter pair (in capitals). There follows a list of those initials, in the order in which the groups of items occur in the NPICS proforma.

MCB	Multi Channel Bitrate
FS	Frequency support
Tm	Transmission
E	Engineering Order Wire
QM	Quality measurement
RP	Radio Parameters

2.4 Base Standard References. The generic format of a reference of the NPICS proforma is:

    <Paragraph>

for a reference to the main part of the STANAG, and

    [<Part>]<Annex>[<Appendix>]/<Paragraph>

for all other STANAG references.

```
<Part>       = A capital Roman number       (I, II, etc)
<Annex>      = An upper case character       (A, B, etc)
<Appendix>   = A number or upper case character    (A, B, etc, 1, 2, etc)
<Paragraph>  = <n>.[<n>] or <n>.[<x>] as appropriate
[ ]      enclose an optional entry
< >      denote a generic identifier
<n>      a numeral (1, 2, 3, etc)
<x>      a lower case character (a, b, c, etc)
```

In the case when there are references to one or more CCITT or ISO base standards in addition to STANAG references, the STANAG references shall be prefixed by "STnnnn", while the CCITT or ISO references are direct to chapters, paragraphs, etc. Such CCITT or ISO base standards shall be listed in the "Related Documents" sections of this STANAG or STANAG Annex, to which this NPICS Proforma is attached. If more than one CCITT or ISO standard is referenced in the NPICS Proforma, only one reference should be used in each table, with the reference stated above the table.

3   Instructions for Completing the NPICS Proforma

3.1 General Structure of the NPICS Proforma.

a.   The first part of the NPICS proforma – Implementation Identification and Protocol Summary – is to be completed as indicated with the information necessary to identify fully both the nation and the implementation.

b.   The main part of the NPICS proforma is a fixed-format questionnaire, divided into a number of major subclauses: these can be divided into further subclauses each containing a group of individual items. Answers to the questionnaire items are to be provided in the rightmost column, either by simply marking an answer to indicate a restricted choice (usually Yes or No) or by entering a value or a range or set of values. There are some items where two or more choices from a set of possible answers can apply: all relevant choices are to be marked.

c.   Each item is identified by a Item Reference in the first column; the second column contains the question to be answered; the third column contains the reference or references to the material that specifies the item in the main body of the STANAG or in other STANAGs. The remaining columns record the status of the item – whether support is mandatory, optional, prohibited or conditional – and provide space for the answers: see also 3.4 below.

d.   A nation may also provide – or be required to provide – further information, categorised as either Additional Information or Exception Information. When present, each kind of further information is to be provided in a further subclause of items labelled A<i> or X<i> respectively for cross-referencing purposes, where <i> is any unambiguous identification for the item (eg simply a numeral): there are no other restrictions on its format and presentation.

Note:
F.1 Where an implementation is capable of being configured in more than one way, a single NPICS may be able to describe all such configurations. However, the nation has the choice of providing more than one NPICS, each covering some subset of the implementations's configuration capabilities, in case that makes for easier and clearer presentation of the information.

3.2 Additional Information. Items of Additional Information allow a nation to provide additional information intended to assist the interpretation of the NPICS. It is not intended or expected that a large quantity will be supplied, and an NPICS can be considered complete without any such information. Examples might be an outline of the ways in which a (single) implementation can be set up to operate in a variety of environments and configurations; or a brief rationale – based perhaps upon specific application needs – for the exclusion of features which, although optional, are nonetheless commonly present in implementations of this protocol. References to items of Additional Information may be entered next to any answer in the questionnaire and may be included in items of Exception Information.

3.3 Exception Information. It may occasionally happen that a nation will wish to answer an item with mandatory or prohibited status (after any conditions have been applied) in a way that conflicts with the indicated requirement. No pre-printed answer will be found in the Support column for this: instead, the nation shall write the missing answer into the Support column, together with an X<i> reference to an item of Exception Information, and shall provide the appropriate rationale in the Exception item itself.

Note:
F.2 A possible reason for the situation described above is that a defect in the STANAG has been reported, a correction for which is expected to change the requirement not met by the implementation.

3.4 Conditional Status

3.4.1 Conditional Items.

    a. The NPICS proforma contains a number of conditional items. These are items for which the status – mandatory, optional or prohibited – that applies is dependent upon whether or not certain other items are supported, or upon values supported for other items.

    b. In many cases, whether or not the item applies at all is conditional in this way, as well as the status when the item does not apply.

    c. When a group of items is subject to the same condition for applicability, a separate preliminary question about the condition appears at the head of the group, with an instruction to skip to a later point in the questionnaire if the "Not Applicable" answer is selected. Otherwise, individual conditional items are indicated by one or more conditional symbols (on separate lines) in the Status column.

d. A conditional symbol is of the form "<pred>:<x>" where "<pred>" is a predicate as described in 3.4.2 below, and "<x>" is one of the status symbols M, O, O.<n> or X.

e. If the value of the predicate in any line of a conditional item is true (see 3.4.2), the conditional item is applicable, and its status is that indicated by the status symbol following the predicate; the Support column is to be marked in the usual way. If the value of a predicate is false, the Not Applicable (N/A) answer is to be marked in the relevant line. Each line in a multi-line conditional item should be marked.

3.4.2 Predicates

a. A predicate is one of the following:

(1) An item-reference for an item in the NPICS proforma: the value of the predicate is true if the item is marked as supported and is false otherwise: or

(2) A predicate name, for a predicate defined elsewhere in the NPICS proforma item: see below; or

(3) The logical negation symbol "¬" prefixed to an item-reference or predicate name; the value of the predicate is true if the value of the predicate formed by omitting the "¬" is false, and vice versa.

b. The definition for a predicate name is a Boolean expression constructed by combining simple predicates, as at (1) or (2) above, using the Boolean operators AND, OR and NOT, and parentheses, in the usual way. The value of such a predicate is true if the Boolean expression evaluates to true when the item-references are interpreted as at (1) above.

c. Each item whose reference is used in a predicate or predicate definition is indicated by an asterisk in the Item column.

4 Identification

4.1 Implementation Identification

Nation	
Contact point for queries about the NPICS	
Implementation Name(s) and Version(s)	

ANNEX F TO
STANAG 4212
(Edition 2)

4.2 Protocol Summary

Identification of standard	STANAG 4212 Edition 2
Identification of amendments and corrigenda to this NPICS proforma which have been completed as part of this NPICS	Am: Corr: Am: Corr: Am: Corr: Am: Corr:
Have any exception items been required? (The answer Yes means that the implementation does not conform to STANAG 4212 Edition 2)	No [ ] Yes [ ]

Date of statement	

5   Protocol Implementation.

Note: All references are to STANAG 4212 Edition 2

5.1 Major Features

Item	Protocol Feature	References	Status	Support
	Does the implementation support the following major features?			
~~SCB1~~ *~~SCB2~~	~~Single channel bitrate:~~ ~~Interim period:~~ ~~16 kbit/s~~ ~~32 kbit/s~~	~~Table 1~~ ~~Table 1~~	~~O.1~~ ~~O.1~~	~~Yes [ ] No [ ]~~ ~~Yes [ ] No [ ]~~
~~SCB3~~	~~Ultimate solution:~~ ~~16 kbit/s~~	~~Table 1~~	~~M~~	~~Yes [ ]~~
MCB1 *MCB2	Multi channel bitrate: 256 kbit/s 512 kbit/s	Table 1 A/2, Table 1	M O	Yes [ ] N/A [ ] Yes [ ]
FS1 *FS2 *FS3	Frequency support: 225-400 Mhz band 610-960 MHz band 1350-1850 MHz band	D/2 D/3 D/3	M O O	Yes [ ] Yes [ ] No [ ] Yes [ ] No [ ]

Predicate usage:

MCB2 is used in Items RP13, RP15, RP17
FS2 is used in 5.7
FS3 is used in 5.8

F-6

Amendment 1

5.2 Transmission

Item	Protocol Feature	References	Status	Support
	Does the implementation support the following transmission and multiplexing facilities?			
~~TM1~~	~~16 bit slots per frame~~	~~Table 1~~	~~M~~	~~Yes [ ]~~
~~TM2~~	~~Means to interconnect 32 kbit/s channels with 16 kbit/s channels~~	~~A/2~~	~~SGB2: M~~	~~N/A [ ] Yes [ ]~~
Tm 3 ~~TM3~~	Receiver clock extraction device able to cope with signals having clock accuracy of 1 in 10E4	C/2	M	Yes [ ]
Tm 4 ~~TM4~~	IF filter response mask limits in accordance with Figure 3	C/3, Figure 3	O	Yes [ ] No [ ]
Tm 1 ~~TM5~~	Modulation method binary FM	C/4,3, Table 2	M	Yes [ ]
Tm 2 ~~TM6~~	Sense of carrier deviation: increase RF carrier frequency for change from binary 0 to binary 1 with positive logic	D/4, Table 2	M	Yes [ ]
Tm 5 ~~TM7~~	Pre-modulation filter response mask limits in accordance with Figure 4	C/3, Figure 4	O	Yes [ ] No [ ]
Tm 6 ~~TM8~~	Post detection filter response mask limits in accordance with Figure 5	C/3, Figure 5	O	Yes [ ] No [ ]
Tm 7 ~~TM9~~	Correction of group delay distortion	C/4	M	Yes [ ]
Tm 8 ~~TM10~~	Adjacent channel selectivity performance better than the limits of the curve in Figure 6	C/5, Figure 6	M	Yes [ ]

5.3 Engineering Order Wire

Item	Protocol Feature	References	Status	Support
	Does the EOW link conform to the following characteristics?			
E1	Full duplex	B/1	M	Yes [ ]
E2	Half duplex mode of operation	B/1	M	Yes [ ]
E3	16 kbit/s *EOW* information binary ~~modulation rate~~ *added to traffic signal*	B/2; *D/1* Table 2	M	Yes [ ]
~~E4~~	~~Additive binary modulation method~~	~~Table 2~~	~~M~~	~~Yes [ ]~~
~~E5~~ 4	EOW deviation to be 18% of traffic deviation	*D/1* Table 2	M	Yes [ ]
~~E6~~ 5	Transmission in presence of group traffic	B/3	M	Yes [ ]
~~E7~~ 6	Transmission in absence of group traffic	B/3	M	Yes [ ]
~~E8~~ 7	BER lower than 1 in 10E3 when BER on group traffic rate 1 in 10E4 or lower.	B/4	M	Yes [ ]
~~E9~~ 8	Overall frequency response approximately in accordance with Figure 2	B/6, Figure 2	M	Yes [ ]
	Re-establishment of synchronisation:			
~~E10~~ 9	<16 msec following phase disturbance	B/7	M	Yes [ ]
~~E11~~ 10	<200 msec following interruption of radio path	B/7	M	Yes [ ]

5.4 Monitoring of Transmission Quality

Item	Protocol Feature	References	Status	Support
	Are the following means of monitoring link quality provided?			
QM1	Monitoring means built in	E/2	O	Yes [ ] No [ ]
QM2	Test pattern periodicity (2E15 - 1) bits	E/3	O	Yes [ ] No [ ]
QM3	Bit rate of test pattern equals gateway group bit rate	E/5	M	Yes [ ]
QM4	Bit rate accuracy better than 1 in 10E4	E/6	M	Yes [ ]
QM5	Loopback facilities	E/~~8~~9	M	Yes [ ]

5.5 General Radio Parameters

Item	Protocol Feature	References	Status	Support
	Does the implementation conform to the following characteristics?			
RP1	Frequency setting interval 0.125 MHz	D/₄ Table 2	M	Yes [ ]
RP2	Frequency accuracy ≤ ± 2x10E-5	D/₄ Table 2	M	Yes [ ]
RP3	Minimum transmit/receive frequency separation ≤ 30 MHz	D/₄ Table 2	M	Yes [ ]
	Antenna polarisation:			
RP4	Horizontal linear	D/₄ Table 2	O.ℓ ₁	Yes [ ] No [ ]
RP5	Vertical linear	D/₄ Table 2	O.Z ₁	Yes [ ] No [ ]
RP6	Selection of either polarisation in the field	D/₄ Table 2	M	Yes [ ]
	Level of transmitter spurious emissions below transmitted power:			
RP7	≥ 60dB within ± 2 MHz of carrier frequency	D/₄ Table 2	M	Yes [ ]
RP8	≥ 90dB beyond ± 2 MHz of carrier frequency	D/₄ Table 2	M	Yes [ ]
RP9	≥ 60dB at harmonics of carrier frequency	D/₄ Table 2	M	Yes [ ]
RP10	Receiver spurious emissions maximum of -40dBm	D/₄ Table 2	M	Yes [ ]
RP11	Suppression of image frequencies minimum of 60dB	D/₄ Table 2	M	Yes [ ]
	Path loss capability for BER 10E-4:			
RP12	for 256 kbit/s ≥ 145dB	D/₄ Table 2	M	Yes [ ]
RP13	for 512 kbit/s ≥ 142dB	D/₄ Table 2	MCB2:M	N/A [ ] Yes [ ]
	Transmitter occupied bandwidth:			
RP14	for 256 kbit/s ≤ 750 kHz	D/₄ Table 2	M	Yes [ ]
RP15	for 512 kbit/s ≤ 1000kHz	D/₄ Table 2	MCB2:M	N/A [ ] Yes [ ]
	Deviation ratio:			
RP16	for 256 kbit/s 0.6-2.0	D/₄ Table 2	M	Yes [ ]
RP17	for 512 kbit/s 0.3-1.0	D/₄ Table 2	MCB2:M	N/A [ ] Yes [ ]

5.6 Radio Parameters Specific to 225-400 MHz Band

Item	Protocol Feature	References	Status	Support
	Does the implementation conform to the following characteristics?			
RP18	Frequency setting point 225.000 MHz	D/1 Table 2	M	Yes [ ]
RP19	Antenna gain 11 ± 3 dBi	D/1 Table 2	M	Yes [ ]
RP20	Receiver noise figure ≤ 8.0dB	D/1 Table 2	M	Yes [ ]

5.7 Radio Parameters Specific to 610-960 MHz Band

If the implementation does not not support operation in the 610-960 MHz band, ie Item FS2, mark N/A and skip to the next Section.   N/A [ ]

Item	Protocol Feature	References	Status	Support
	Does the implementation conform to the following characteristics?			
RP21	Frequency setting point 610.000 MHz	D/1 Table 2	M	Yes [ ]
RP22	Antenna gain 16 ± 3 dBi	D/1 Table 2	M	Yes [ ]
RP23	Receiver noise figure ≤ 8.0dB	D/1 Table 2	M	Yes [ ]

5.8 Radio Parameters Specific to 1350-1850 MHz Band

If the implementation does not not support operation in the 1350-1850 MHz band, ie Item FS3, mark N/A.   N/A [ ]

Item	Protocol Feature	References	Status	Support
	Does the implementation conform to the following characteristics?			
RP24	Frequency setting point 1350.000 MHz	D/1 Table 2	M	Yes [ ]
RP25	Antenna gain 21 ± 3 dBi	D/1 Table 2	M	Yes [ ]
RP26	Receiver noise figure ≤ 9.0dB	D/1 Table 2	M	Yes [ ]

F-10

Amendment 1