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

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

MAS/410-EL/4210
15 November 1993

To : See MAS Distribution List No. 2

Subject : STANAG 4210 EL (EDITION 2) - THE NATO MULTI-CHANNEL TACTICAL DIGITAL GATEWAY - CABLE LINK STANDARDS

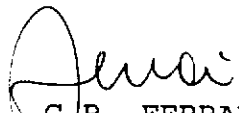
References : a. MAS/404-EL/4210 dated 9 December 1983
(Edition 1)
b. AC/302-D/543 dated 29 December 1989

Enclosure : STANAG 4210 (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

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STANAG 4210
(Edition 2)

NORTH ATLANTIC TREATY ORGANIZATION
(NATO)

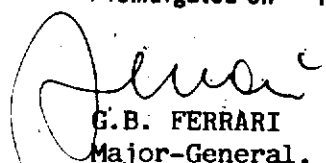


MILITARY AGENCY FOR STANDARDIZATION
(MAS)

STANDARDIZATION AGREEMENT

SUBJECT: NATO MULTI-CHANNEL TACTICAL DIGITAL GATEWAY -
CABLE LINK STANDARDS -

Promulgated on 15 November 1993



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

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(Edition 2)

RECORD OF AMENDMENTS

No.	Reference/date of amendment	Date entered	Signature
1		28.6.05	

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.

N A T O U N C L A S S I F I E D

Agreed English/English Texts

STANAG 4210
(Edition 2)

NATO STANDARDIZATION AGREEMENT
(STANAG)

THE NATO MULTI-CHANNEL TACTICAL DIGITAL GATEWAY
- CABLE LINK STANDARDS -

- Annexes: A. General Characteristics
B. Cables and Connectors
C. Interconnection Points
D. Transmission Quality Monitoring
E. *NPICs Protocol*

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 4211 - The NATO Multi-Channel Tactical Digital Gateway System Control Standards
STANAG 4212 - The NATO Multi-Channel Tactical Digital Gateway Radio Relay Links 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 - 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

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necessary for two NATO tactical digital communications systems (networks) to interconnect and exchange traffic via a gateway.

2. STANAG 4206, "The NATO Multi-Channel Tactical Digital Gateway - System Standards", 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 general electrical cable and connector characteristics, signal and impedance levels, engineering order wire transmission and cable link monitoring which are necessary for inter-operation between two NATO tactical digital communications systems via a gateway. The use of optical cable is defined in STANAG 4290 (under development).

AGREEMENT

4. The participating nations agree to use the characteristics of multi-channel cable links contained in this STANAG in the exchange of traffic between tactical digital communications systems via a gateway.

IMPLEMENTATION OF AGREEMENT

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

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CPT2182/ST4210

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ANNEX A to
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GENERAL CHARACTERISTICS

1. The general characteristics for interfacing networks within NATO are given in STANAG 4206.
2. The principle of a multichannel cable link between two nations is shown in Figure 1.
3. An EOW link shall be provided on each multichannel link. The EOW signals shall be transmitted at 16 kbps on the cable phantom as shown in Figure 1. Operation of the EOW is specified in STANAG 4211.

A-1

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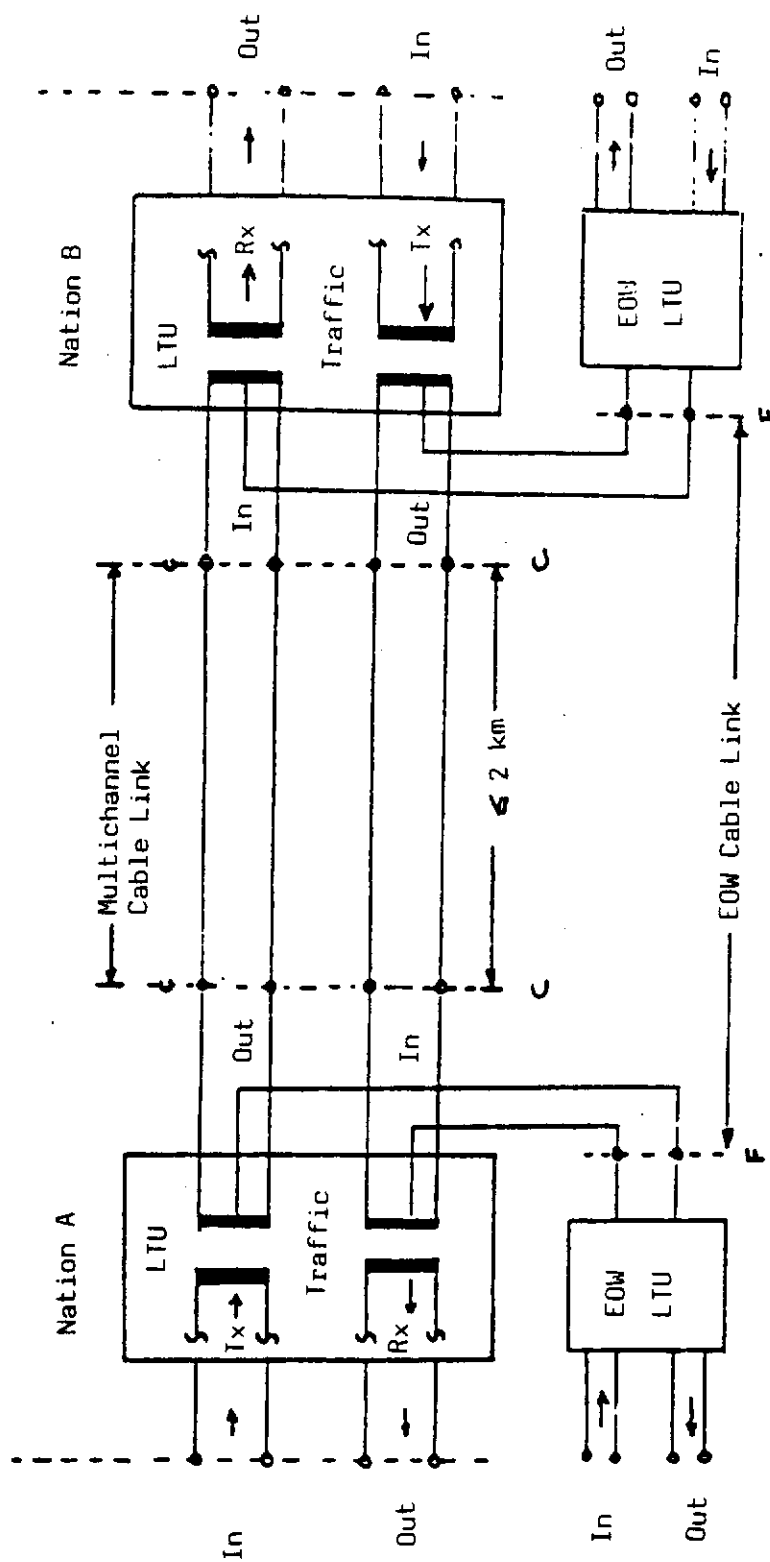


FIG. 1: MULTICHANNEL LINK

A-1-1

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CABLES AND CONNECTORS

1. The cable shall be a field-deployable type.
2. Each cable shall contain 2 balanced pairs, in spiral quad form, one for each direction of transmission.
3. The attenuation of one pair, measured with a termination of 130 ohms at both ends, shall be as given in Figure 2.
4. The cable connector type U-176/6 to be used is shown in Figure 3 and specified under MIL-C-55081.
5. The signal to be transmitted shall be assigned to the contact TX so that the received signal will be available at contact RX.

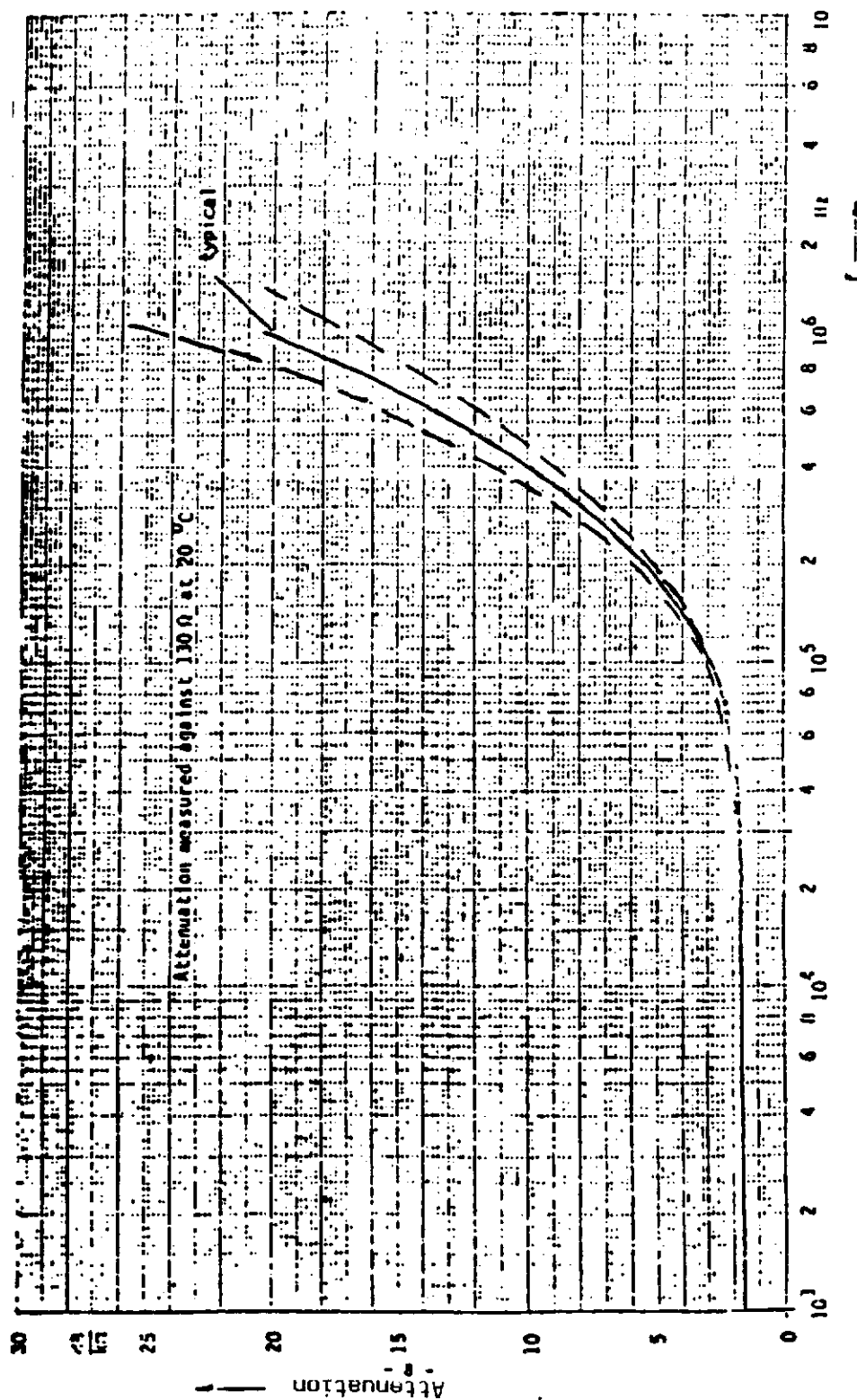


Fig. 2: CABLE ATTENUATION WITH FREQUENCY

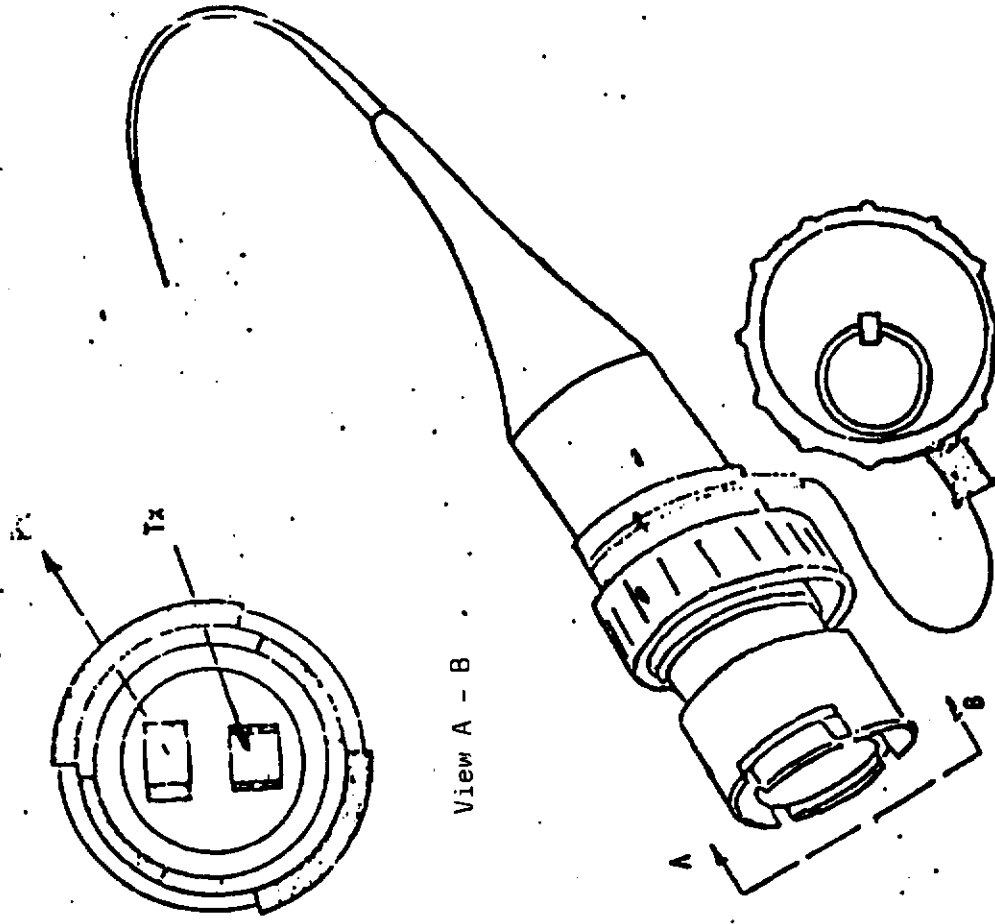


Fig. 3: CABLE CONNECTOR

INTERCONNECTION POINTS

1. Characteristics of Interconnection Point C

For interface point C, the following characteristics shall apply:

- (a) the input and output points of point C of Figure 1 shall be balanced and not referred to ground;
- (b) the code of the digital signals at point C shall be conditioned diphase. A logic diagram of a possible way of generating and detecting conditioned diphase signals is shown in Figure 4;
- (c) the transmitted voltage shall be $4.6V_{pp} \pm 10\%$ measured across a load resistor of 130 ohms. The pulse shape and amplitude of the output signal shall conform to the mask shown in Figure 5 when measured across a load resistor of 130 ohms;
- (d) positive/negative pulse amplitude ratio shall be 1 with a tolerance of 5%;
- (e) the nominal impedance at C 'IN' shall be 130 ohms. The return loss at C 'IN' shall be 16 dB measured against a nominal resistance of 130 ohms in the frequency range from 20% to 120% of the multichannel bit rate;
- (f) the maximum distance without the use of intermediate repeaters shall be 2 km between the two points C.

2. Characteristics of Interconnection Point F

For the EOW link interconnection point F of Figure 1, the following characteristics shall apply:

- (a) the interconnection point F shall be balanced and not referred to ground;
- (b) the code at point F shall be conditioned diphase at an information bit rate of 16 kbps;
- (c) the transmitted voltage shall be $1 V_{pp} \pm 20\%$ measured across a load resistor of 75 ohms. The pulse shape and amplitude of the output signal shall conform to the mask shown in Figure 6 when measured across a load resistor of 75 ohms;
- (d) positive/negative pulse amplitude ratio shall be 1 with a tolerance of 5%.

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- (e) the attenuation between interconnection points F of an EOW link shall be less than 4 dB at a frequency of 16 kHz when measured against a load resistor of 75 ohms. This attenuation shall take into account losses incurred by both cable and equipment items between the two points F.

C-2

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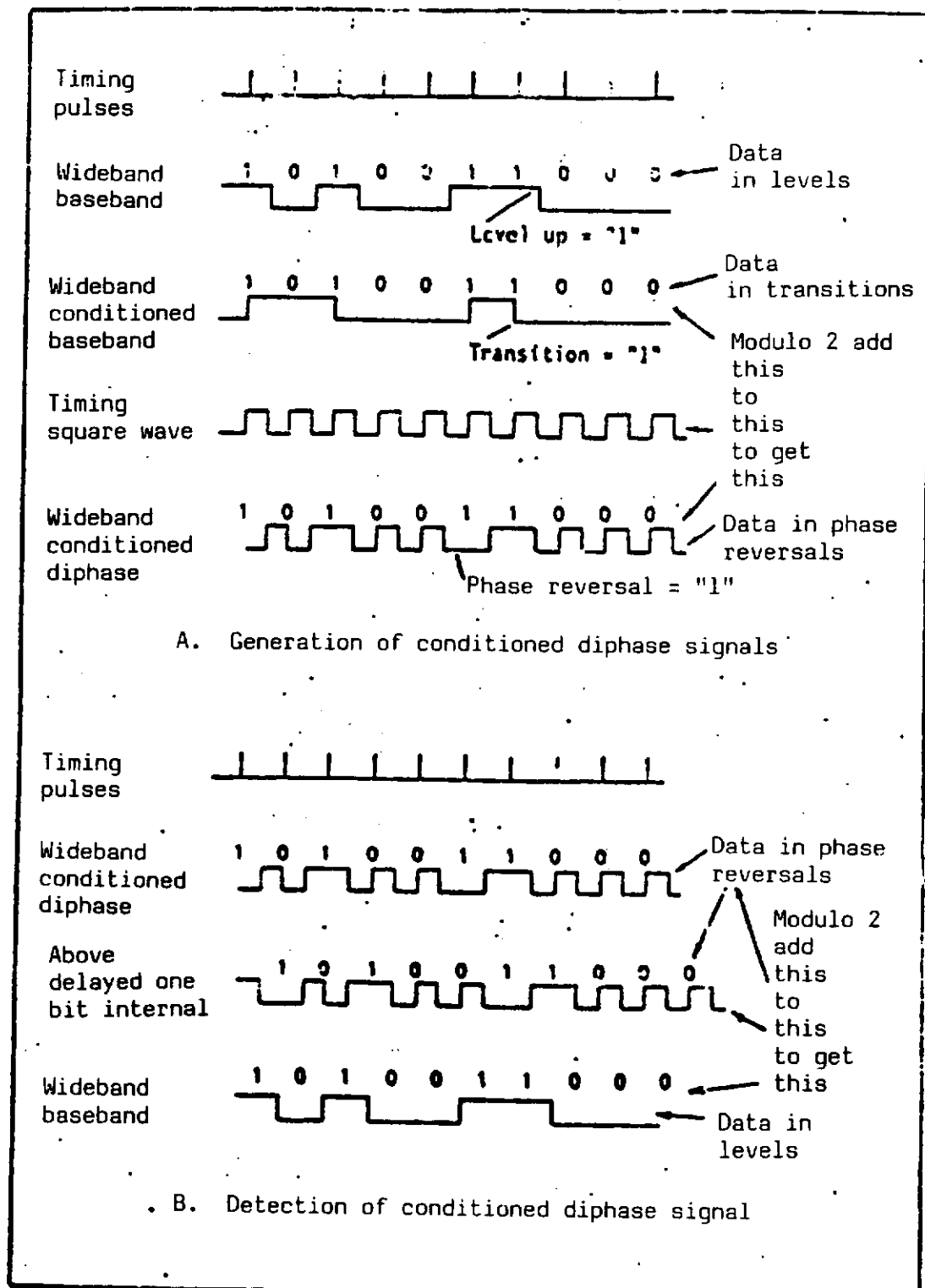


Fig. 4: LOGICAL OPERATION OF CONDITIONED DIPHAASE CODING
WITHOUT THE EFFECT OF FILTERS
C-1-1

APPENDIX 2 to
ANNEX C to
STANAG 4210
(Edition 2)

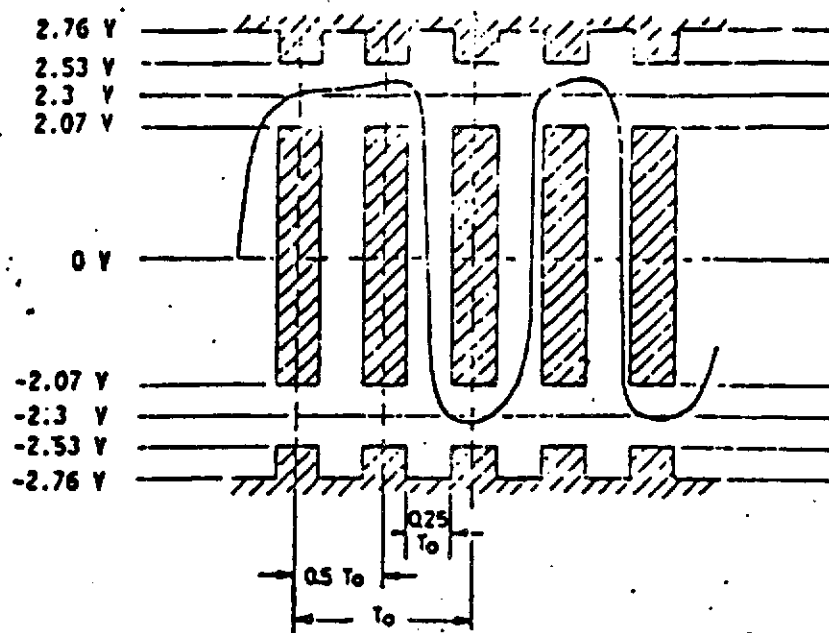


Fig. 5: PULSE MASK FOR THE OUTPUT SIGNAL AT INTERCONNECTION POINT C

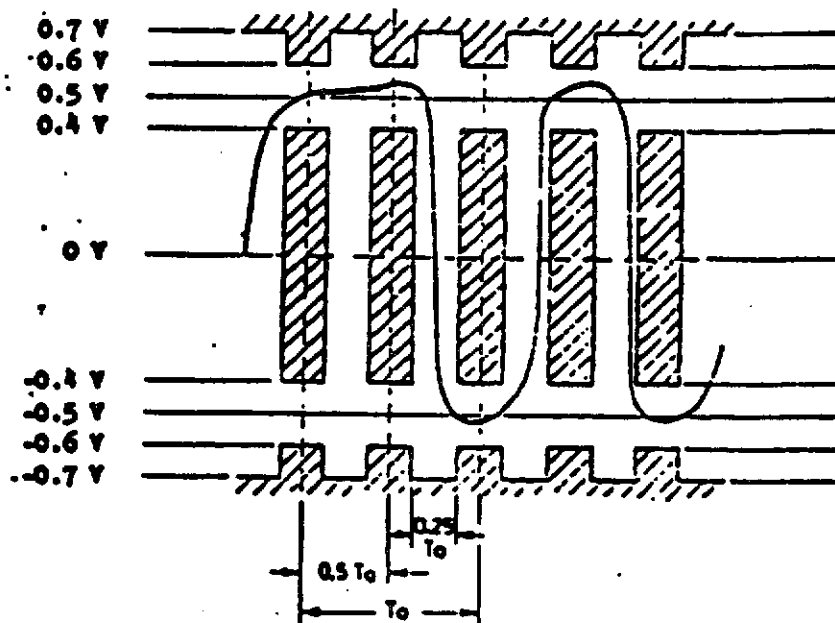


Fig. 6: PULSE MASK FOR THE OUTPUT SIGNAL AT INTERCONNECTION POINT F

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TRANSMISSION QUALITY MONITORING

1. Means shall be provided for checking transmission quality (see STANAG 4206) on the cable link before traffic is passed and as required at other times in the absence of traffic.
2. Equipment for this purpose need not be built in to the LTU.
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. It is mandatory to provide loopback facilities from the receive side (after regeneration) to the transmit side of the LTU to permit monitoring of both "go" and "return" paths from the other end of the link.

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CPT2182/ST4210.4

NATO MULTICHANNEL DIGITAL GATEWAY
CABLE LINK STANDARDS
NPICS PROFORMA

1 Introduction

1.1 A nation implementing cable link standards for the NATO multichannel digital gateway which are claimed to conform to STANAG 4210 Edition 2 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).

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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

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.

IC	Interconnection point C
IF	Interconnection point F
QM	Quality measurement
CC	Cables and connectors

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:

E.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' configuration capabilities, in case that makes for easier and clearer presentation of the information.

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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:

E.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, 0.<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 E TO
STANAG 4210
(Edition 2)

4.2 Protocol Summary

Identification of standard	STANAG 4210 Edition 2	
Identification of amendments and corrigenda to this NPICS proforma which have been completed as part of this NPICS	Am: Am: Am: Am:	Corr: Corr: Corr: Corr:
Have any exception items been required? (The answer Yes means that the implementation does not conform to STANAG 4210 Edition 2)	No [] Yes []	

Date of statement	
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5 Protocol Implementation

References in the questionnaire refer to the text of STANAG 4210 Edition 2, unless otherwise indicated.

5.1 Major Facilities

Item	Protocol Feature	References	Status	Support
	Does the implementation provide the following facilities?			
IC	Interconnection point C (Traffic)	A/2, Fig 1	M	Yes []
IF	Interconnection point F (EOW)	A/2, Fig 1	M	Yes []
QM	Measuring means	D/2, Fig 1	M	Yes []

5.2 Cables and Connectors

Item	Protocol Feature	References	Status	Support
	Do cables and connectors incorporate the following features?			
CC1	Field deployable cable with 2 balanced pairs	B/2	M	Yes []
CC2	Balanced pair for each direction	B/2	M	Yes []
CC3	Cable attenuation conforming with figure 2	B/3, Figure 2	M	Yes []
CC4	U-176/6 connector conforming with figure 3	B/4, Figure 3	M	Yes []

5.3 Traffic

Item	Protocol Feature	References	Status	Support
	Does traffic on the cable conform to the following characteristics at Interconnection Point C?			
IC1	Input and output points balanced	C/1(a)	M	Yes []
IC2	Conditioned diphase coding	C/1(b)	M	Yes []
IC3	Transmitted voltage $4.6 \text{ Vpp} \pm 10\%$	C/1(c)	M	Yes []
IC4	Pulse shape and amplitude in accordance with Figure 5	C/1(c)	M	Yes []
IC5	Positive/negative pulse amplitude ratio is $1 \pm 5\%$	C/1(d)	M	Yes []
IC6	Nominal input impedance 130 ohms	C/1(e)	M	Yes []
IC7	Return loss 16 dB within specified frequency range	C/1(e)	M	Yes []
IC8	Capability to bridge a distance up to 2km without repeaters	C/1(f)	M	Yes []
IC9	Intermediate repeaters for distances > 2km	C/1(f)	O	Yes [] No []

5.4 Engineering Order Wire

Item	Protocol Feature	References	Status	Support
	Does the EOW link conform to the following characteristics at Interconnection Point F?			
IF1	Input and output points balanced	C/2(a)	M	Yes []
IF2	Conditioned diphase coding at 16 kbit/s	C/2(b)	M	Yes []
IF3	Transmitted voltage $1 \text{ Vpp} \pm 20\%$	C/2(c)	M	Yes []
IF4	Pulse shape and amplitude in accordance with Figure 6	C/2(c)	M	Yes []
IF5	Positive/negative pulse amplitude ratio is $1 \pm 5\%$	C/2(d)	M	Yes []
IF6	Attenuation between points F < 4 dB	C/2(e)	M	Yes []

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5.5 Monitoring of Transmission Quality

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