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EMV – Banking and Retail

NBX – LINK Application Interface Specification (AIS)

ROLE	NAME	AREA OF RESPONSIBILITY	SIGNATURE	DATE
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		Product Deployment		
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1 Document Control

1.1 Document Information

Horizon Release No:	S80R
Document Title:	EMV Banking and Retail: NBX – LINK Application Interface Specification
Document Type:	Application Interface Specification
Abstract:	This document details the application interface between the Horizon domain and LINK, including ICC
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Originator & Department:	David Gray Design Authority
Contributors:	
Post Office Distribution:	Design Authority – David Gray POL Document Control – Post Office Programme Office
Supplier Distribution:	LINK – Geoff Barker Fujitsu Services: Gill Jackson
Client Distribution:	N/A

Table 1: Document Information

1.2 Document History

Version	Date	Reason for Issue	Associated WP / CT
0.1	19 Nov 2003	First working draft. Based on document produced by IBM entitled "Network Banking Engine: NBE – LINK Application Interface Specification (AIS)" version 3.0, and including ICC support	
0.2	3 Dec 2003	Updated to reflect version 4.0 of "Network Banking Engine: NBE – LINK Application Interface Specification (AIS)", also minor changes following discussions	
0.3	12 Dec 2003	Updated following joint review on 9/12/03	
0.4	20 Jan 2004	Updated following review comments from POL	
0.5	26 Jan 2004	Updated following joint review on 22/01/04	
1.0	9 Feb 2004	Updated following joint review on 5/02/04	
1.1	7 Apr 2004	Updated following series of minor clarifications	
1.2	13 May 2004	Updated following series of minor clarifications	
2.0	13 Aug 2004	Updated following joint review on 14/05/04 and subsequent emails	

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2.1	26 May 2005	Updated for CT 363 and for minor corrections discovered during testing prior to initial release at Horizon release S75	CT 363 / CP 3997
2.2	3 Aug 2005	Updated as a result of comments received, and as a result of re-accreditation testing	
3.0	15 Aug 2005	Issued for Sign-off	

Table 2: Document History

1.3 Change Process

Any changes to this issued version of this document will be made, controlled and distributed by: -

Tony.W.Stevensmailto: GRO

1.4 Review Details

Review Comments by :	
Review Comments to :	Rex Dixon, Fujitsu Services

Mandatory Review Authority	Name
Post Office Ltd	Beverley Dunn, David Gray
Fujitsu Services Ltd	
Analysis & Solution Specification	Allan Hodgkinson
DU Design Authority	Andy Kennedy
DU Design Team Designer	Rex Dixon
Test Design	Peter J. Robinson
LINK	Michael Abendstern
Optional Review / Issued for Information	
Post Office Ltd	Bob Booth, Seamus Scullion, Jason Crellin
Fujitsu Services Ltd	
Release Manager	Bill Reynolds
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DU Development Team Leader	Peter Ambrose
LINK	

1.5 Changes in this Version

Version	Changes

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3.0	Gill Jackson added as signatory for Fujitsu Services
2.2	Section 4.1.2 – Amount, Transaction (bitmap ref. 004): removed reference to EUR cents. Section 4.1.2 – Authorisation Data (bitmap ref. 123): Sub-Field 14 removed as it only applies to PIN changes, which are not supported. Section 4.1.2 – Data, Expiration (bitmap ref.014): added clarification "This will only be for deposits". Section 4.1.2 – Message Security Code (bitmap ref. 096): format corrected from "an" to "ans". Section 4.1.2 – Point of Service Data (bitmap ref. 061), subfield 9 (Cardholder authentication entity): added value 0 (Not authenticated) if not PIN (i.e. for a deposit). Section 4.1.2 – Point of Service Data (bitmap ref. 061), subfield 12 (PIN capture capability): added value 0 if no PIN entry capability (i.e. for a deposit). Section 4.1.2 – Track 2 Data (bitmap ref. 035): added condition that it will not be present where card details have been manually entered.
2.1	Section 1.1 – Horizon Release updated to S80R. Section 1.7 – Updated to LIS5 2005-1. Sections 4.1.2, 4.2.1.2, 4.2.2.2, 4.2.3.2, 4.2.4.2, 4.2.5.2 and 4.2.6.2 – Application PAN Sequence Number (bitmap ref. 023): clarified that it is required for manually entered transactions only when the card's issue number has been captured. [FS Peak 110188, 110679] Sections 4.1.2 and 4.2.1.2 – Authorisation Data (bitmap ref 123): removed from 0100 message. [POL Incident 1153; FS Peak 108959] Section 4.1.2 – Point of Service Data (bitmap ref. 061), subfield 2 (Cardholder authentication capability): added value 0 (No electronic authentication) for deposits. [LINK MTPR 0292, 0295; POL Incident 1212; FS Peak 110150] Section 4.1.2 – Point of Service Data (bitmap ref. 061), subfield 3 (Card capture capability): changed to 0 (no capture) from 1 (capture). [LINK MTPR 0275; POL Incident 1159; FS Peak 108967] Section 4.2 – Corrected description of which bitmaps appear in the definitions. Section 4.2.4.2 (Balance Enquiry Response) – Clarified that, for a decline, the length of this field must be set to '000'. [POL Incident 1196] Section 4.2.7.2 (Reversal Request) – Added a note that NBX does not include any of the Optional fields.

Table 3: Changes in this Version

1.6 Key Contacts

Name	Position	Phone Number
Jason Crellin	Solutions Architect	GRO
Michael Abendstern	Technical Specialist	

Table 4: Key Contacts

1.7 Associated Documents

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	Reference	Version	Date	Title	Source
.	LIS5	2005-1 Vsn 1.0		LINK Switch Service Interchange Standard – LINK Card Scheme Service	LINK
.		2004-1 Vsn 1.0		LINK Reconciliation File Specification (LREC) Standard Formats	LINK
.	SU/PLA/016	0.3		NB Volume Model Comparisons	Post Office
.	NB/IFS/028			NBX – LINK Technical Interface Specification	Post Office
.	NB/IFS/033			Horizon – LINK Mapping	Post Office
.		2005-1 Vsn 1.0		LINK Switch Service Interchange Standard – LINK Deposits Service	LINK
.		Vsn 5.6	Jan 2002	LINK Switch Service Interchange Standard (LIS5 Security Standard)	LINK

Table 5: Associated Documents

Unless a specific version is referred to above, reference should be made to the current approved versions of the documents.

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2 Introduction

The purpose of this document is:

- To specify the interface between the NBX and LINK systems using LIS5.
- To provide the development teams with sufficient detail to develop the NBX - LINK interface.
- To provide a consistent communications vehicle amongst the development teams that have responsibility for developing the various components comprising the application.

2.1 Scope

This document applies to the interface between the NBX and LINK only. It includes only those financial transaction messages, network messages, reconciliation and settlement messages sufficient to support the financial services being delivered by Post Office Limited via the LINK systems.

2.2 Structure

This AIS document follows Post Office Limited's AIS standard.

Section 3 contains a high level overview of the NBX – LINK interface and its context.

Section 4 contains a detailed description of the messages to be exchanged, and the derivation and use of the exchanged data items. All data items exchanged are specified in LIS5.

Section 5 contains details of the data transfer.

Section 6 contains details of security of the exchanged data items. This section identifies the security needed for each data item (e.g. encryption) and details of the method to be used.

Section 7 contains any relevant details of operational procedures relating to the interface.

2.3 Terms and Abbreviations

Not used

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3 Overview of the Interface

3.1 Data Description

The following messages are exchanged over the NBX - LINK interface:

NBX Message Id	Description	Direction
[R3]	Authorisation / Financial Transaction Request: • balance enquiry (0100) • withdrawal (0200) • deposit (0200) Note: there is no separate message to LINK for withdrawal with balance. LINK will always return the balance to NBX if sent by the issuer.	NBX -> LINK
[A1]	Authorisation/Financial Transaction Request Response: • balance enquiry response (0110) • withdrawal response (0210) • deposit response (0210) Each of the above will have a response code that indicates approve or decline with reason and any required action (e.g. card retention).	LINK -> NBX
[E1]	Reversal Request: • reversal (0420) • reversal repeat (0421) Please note that the number of times the 0421 message is sent is configurable within the NBX, up to a maximum of 9,999 times.	NBX -> LINK
[E2]	Reversal Request Response Message (0430)	LINK -> NBX
0620	Administration Advice (0620) Administration advice messages (0620) are sent to/from LINK in order to initiate investigation of a problem by either LINK or the NBX	NBX -> LINK LINK -> NBX
0800	Network Management Request (0800): • Echo test (handshake) • Logon / Logoff • End of Day (cutover) • Security Key Change • Key Change Request • Online Key Verification	LINK -> NBX NBX -> LINK

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0810	Network Management Request Response (0810)	NBX LINK	-> ->	LINK NBX
LREC	Reconciliation File (The Report/Standard file format will be used for the LREC file (Ref. [2]. The file transfer mechanism and conditions of transfer are described in the NBX – LINK Technical Interface Specification (Ref. [4]).	LINK	->	NBX

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3.2 Derivation and Use of Data

The messages listed above are generally exchanged as a result of a transaction initiated either by a clerk at a Post Office outlet or by LINK. The NBX acts as a message router, filtering messages based on business rules and transforming received messages into the appropriate format for forwarding to the next system in the message sequence.

The following table shows the derivation and use of each message exchanged between the NBX and LINK in terms of the received message that causes each NBX - LINK message to be exchanged, and the transmitted message resulting from the NBX - LINK message exchange:

Message Sequence						
Horizon Outlet		**Horizon Campus**		**NBX**		**LINK**
	[R1] →		[R2] →		0100/0200 [R3] →	
	← [A3]		← [A2]		← 0110/0210 [A1]	
[C0] →			[C2] →		0420/0421 [E1] →	
					← 0430 [E2]	

The messages exchanged over this interface relating to end of day, reconciliation and settlement are initiated by LINK, and are neither derived from received messages nor used to generate onward messages.

Security key exchange messages are initiated by LINK or NBX and acknowledged by the other party. Either LINK may send a new AWK or NBX may request that LINK sends a new AWK. After a Logon initiated by either party LINK will send a new AWK. The connection type is Acquirer only. The following table shows the derivation and use of each security message exchanged between LINK and the NBX. See Ref. [7].

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Message Sequence						
Horizon Outlet		Horizon Campus		NBX		LINK
					←	**0800 (Logon 061)**
				0810	→	
					←	0800 (Key Change - Acquirer zone code 161)
				0810	→	
				0800 (Logon 071)	→	
					←	0810
					←	0800 (Key Change - Acquirer zone code 161)
				0810	→	
					←	**0800 (Key Change - Acquirer zone code 161)**
				0810	→	
				0800 (Key Change Request - Acquirer zone 181)	→	
					←	0810
					←	0800 (Key Change - Acquirer zone code 161)
				0810	→	
					←	**0800 (Online Key Verification Acquirer ZMK code 199)**
				0810	→	

Other 0800 messages may be initiated by either LINK or NBX (with the exception of the End of Day message, which is LINK initiated), and are acknowledged by a 0810 response from the other side.

The use of Handshakes is described in the NBX – LINK Technical Interface Specification (Ref. [4]).

All 0100 and 0200 messages sent out by NBX prior to sending the 0810 approved key change will have used the current AWK to encrypt the PIN Block. As soon as the 0810 approved response is transmitted, the new AWK becomes active so that all messages generated after its receipt use the new AWK to encrypt the PIN Block.

In the event that the Key Check Value received by NBX (with the AWK in the 0800 Key Change message) does not match the one created when testing the new AWK, NBX will return a 0810 denied response. Under these circumstances the new AWK will NOT be implemented and any subsequent transactions will continue to have the PIN Block encrypted using the current AWK.

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When a new AWK is sent, LINK sets a timer flag which inhibits further key exchanges. This flag is unset enabling further key exchanges, after a configurable period (currently 2 minutes), if a key exchange is not received.

3.3 Non Computer Data

All data being transported across this interface is originated/received from a connected computer system or from reference data (supplied by the Post Office Limited RDS or held internally within the NBX).

3.4 Clarifications to LINK Standard

Point of Service Condition Code (Bitmap Reference 025) will initially be set to value 54 (Non ICC Capable Branch ATM). Value 55 will be used to indicate ICC Capable Branch ATM when chip read support added.

Transaction Amounts are likely to contain pence - they will not be rounded to whole pounds or ten's of pounds.

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4 Data Items

4.1 Data Item List

4.1.1 General Message Element Definitions and Abbreviations

The following section summarises the list of LINK Message Elements for each group of transactions, together with which message(s) they are present in. Each message is classified and identified using the RAC (Request / Authorise / Confirm) model. Each message element references the corresponding ISO 8583 bitmap position.

The ISO 8583 bit map reference has been included for ease of reference.

The abbreviations used to describe the format of each data element (DE) and Data Sub-elements are shown in the following table (taken from the LINK Switch Service Interchange Standard (LIS5), (Ref. [1]):

Notation	Explanation
a	Alphabetic characters only (upper case)
n	Numeric Digits only
s	Special characters
an	Alphabetic (upper case) or Numeric characters
as	Alphabetic (upper case) or Special characters
ns	Numeric or Special characters
ans	Alphabetic (upper case), Numeric or Special characters only
DD	Day
MM	Month
YY	Year
hh	Hour
mm	Minutes
ss	Seconds
LL	Length of variable field that follows represented using two characters
LLL	Length of variable field that follows represented using three characters
VAR	Variable length field
3	Fixed length field (e.g. 3 characters in this example)
.. 10	Variable length field (e.g. up to a maximum of 10 characters in this example). LL or LLL to indicate the actual length of the field will prefix all variable length fields.
h	hexadecimal representation of the data
z	tracks 2 and 3 data as defined by ISO 7811 and ISO 7813

The Field Size column gives the number of characters (octets) required for the data item, as shown in the table below.

Abbreviation	Description
3	Fixed Length field. Numeric fixed length fields are right justified and zero padded. Fixed length string fields are left justified and space padded.
.. 10	Variable length field (up to a maximum of 10 characters in this example).

Notes:

- Fixed length numeric fields are unpacked, right justified and zero filled.
- Fixed length alphanumeric fields are left justified and space filled.

The “Required” column indicates whether the field is Mandatory or Conditional for the messages defined in this AIS. For conditional fields, the field description should indicate under what circumstances the data for the field should be populated or omitted from the message.

The “Description” column contains a brief description of the field, as used in the messages defined in this AIS together with any additional comments.

The LINK and NBX Servers both use the ASCII English character set (CCSID = 437).

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4.1.2 Messages Data Elements

The LIS5 Data Elements exchanged within messages over this interface are listed below. A fuller description is given in the LINK Switch Service Interchange Standard (LIS5), (Ref. [1]). The ICC data elements are represented from the 3rd bitmap on this interface.

A greyed out row in the following tables means that the field is not required and may not be populated in messages from NBX to LINK. The NBX will log any such fields received from LINK but will not process them further.

LIS5 Data Element	Bitmap Ref.	Format	Field Size	Source	Description	Required								
						[R3] 0100	[R3] 0200	[A1] 0110	[A1] 0210	[E1] 0420 /0421	[E2] 0430	0620	0800	0810
Account Identification 1	102	ans LLVAR	.. 28	Issuer	NBX does not pass Account Identification 1 field to the counter systems			M	M	M				
Acquiring Institution Country Code	019	n	3		Not appropriate to messages passed on this interface									
Acquiring Institution Identification Code	032	n LLVAR	.. 11	NBX from Ref Data	Code identifying the Acquirer (Post Office Limited). Set to 2200040000 preceded by a length indicator of 10.	M	M	M	M	M	M			
Additional Amounts	054	an LLLVAR	.. 120	Bank	Identifies account balance value (included by LINK if provided by bank)			M	C					
Additional Response Data	044	ans LLVAR	.. 25	Bank	Not appropriate to messages passed on this interface.									

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Advice / Reversal Reason Code	060	an LLLVAR	.. 9	NBX	Required for advice, reversal and ICC transactions. Used in request messages from ICC capable terminals to indicate Status of Last Chip Read attempted and to provide Cryptogram Information Data **Magnetic stripe cards** *Reversal Requests (0420/0421 messages):* Bytes 1-2 are set to 80 Bytes 3-4 give a reason for the reversal. Remaining bytes are not transmitted **ICC cards** *[R3] Requests (0100/0200 messages):* Bytes1-2 are set to 30 Byte 3 is Status of Last Chip Attempt Bytes 4-5 is Cryptogram Information Data *Fallback [R3] Requests (0100/0200 messages):* Bytes1-2 are set to 30 Byte 3 is Status of Last Chip Attempt (value 2) Bytes 4-5 is Cryptogram Information Data (value C0) *Reversal Requests (0420/0421 messages):* Bytes 1-2 are set to B0 Bytes 3-4 give a reason for the reversal Byte 5 is Status of Last Chip Attempt Bytes 6-7 is Cryptogram Information Data See Appendix A for Reversal Reasons	C	C			M				
Amount, Cardholder Billing	006	n	12		Not appropriate to messages passed on this interface – foreign currency transactions are not supported by NBX.									
Amount, Transaction	004	n	12	Clerk at Outlet	Decimal amount in smallest unit of the specified currency (e.g. GBP pence) Not required for balance enquiry.		M		M	M	M			
Amount, Transaction Fee	028	an	9		Post Office Limited will not apply Acquirer charges (format annnnnnnn)									
Amount, Transaction Processing Fee	030	an	9	Bank	Issuer charge. This field will not be returned by LINK in a LINK denied transaction (format annnnnnnn).				C					
Application Interchange Profile (AIP)	138	h	4	ICC	From ICC, indicating capability to support specific functions in application	C	C			O				

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Application PAN Sequence Number	023	n	3	Clerk at Outlet	Identifies and differentiates cards with the same PAN Required for ICC transactions, or if the card's issue number has been manually entered. Acquirer decision as to whether sent in the reversal message (0420/0421) – copied from original transaction. Required in 0430 if present in 0420/0421.	C	C	C	C	C	C			
Application Transaction Counter (ATC)	137	h	4	ICC	A sequence number (counter) calculated by the ICC and passed to the terminal application. Acquirer decision as to whether sent in the reversal message (0420/21) – copied from original transaction. Required in 0430 if present in 0420/0421.	C	C	C	C	O	C			
Authorisation Data	123	ans LLLVAR	.. 255	Clerk at Outlet	Sub-Fields 1-15, 16 do not apply. Sub-Field 17 contains number and value of cheque deposit if applicable. Number of cheques will be set by NBX to 001. Format of sub field 17 is: n 15 Position 1-3 Number of cheques (001 for NBX) Position 4-15 Value of cheques (in the smallest unit of transaction currency) Sub-Field 18 Bilateral Discretionary Data must contain Start Date of card where one exists and the card details have been manually entered. Format of Sub-Field 18 is: ans ..99		C			C				
Authorisation Identification Response	038	an	6		Not required for NBX transactions - POS Transactions Only									
Authorisation Response Data	121	ans LLLVAR	.. 255		Not required for NBX transactions - used for Cheque Clearance Date. This could be returned by an issuer to state when cheque funds will clear. NBX must be able to accept this, but will log only.									
Authorising Agent Institution Id Code	113	n LLLVAR	.. 11	Bank	Institution approving or declining the transaction			M	M					
Bit Map Secondary	001	h	16	NBX from system	Indicates presence of data elements in a message in range 065 to 128. This data element may be omitted if no elements in range 065 to 128 are contained in message	C	C	M	M	M	M	M	M	M

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Bit Map Tertiary	065	h	16	NBX from system	Required for ICC based transactions (i.e. data elements in range 129 to 192)	C	C	C	C	C	C			
Card Acceptor Identification Code	042	ans	15	NBX from system	NBX will populate with the Post Office Short Name (see Ref. [5] from Reference Data, left justified and space filled		M			M				
Card Acceptor Name / Location	043	ans	40	NBX from Ref Data	First 40 characters of outlet address in format: 01-23 first 23 characters of ADDRESS 1 24-38 first 15 characters of City (= first 15 characters of ADDRESS 4) 39-40 GB Note: this field can be sent to LINK in mixed case (except GB which must be in upper case)	M	M			M				
Card Acceptor Terminal Identification	041	ans	8	Outlet from system	Comprises 6 digit outlet id (group_id) + 2 digit terminal id (node_id)	M	M	M	M	M				
Conversion Rate, Cardholder Billing	010	n	8		Not required - foreign currency transactions are not supported by NBX.									
Cryptogram (ARQC)	136	h	16	ICC	Computed by ICC for on-line application	C	C			O				
Cryptogram Amount	147	n	12	ICC	Transaction amount used by ICC in generating cryptogram	C	C			O				
Cryptogram Currency Code	148	n	3	ICC	Contains transaction currency code used by ICC in generating cryptogram for an ICC transaction	C	C			O				
Cryptogram Transaction Type	144	n	2	ICC	Contains transaction type used by ICC in generating the cryptogram for an ICC transaction	C	C			O	O			
Currency Code, Cardholder Billing	051	an	3		Not required - foreign currency transactions are not supported by NBX									
Currency Code, Transaction	049	an	3	Clerk at outlet	Only 826 (GBP) will be accepted by LINK initially. NBX will translate GBP code received from Counters to 826 (using ISO 4217 standard) for LINK. Other values may be added to Currency Code CPF Table if required at a later date, and will be translated in the same way.	M	M	M	M	M	M			
Date, Expiration	014	YYMM	4	Clerk at Outlet	May be required where the card data is manually entered, determined by the reference data at the counter. This will only be for deposits	C	C			C				
Date, Local Transaction	013	MMDD	4	Outlet from System	As printed on receipt, transaction request date in Local Time	M	M	M	M	M	M			
Date, Settlement	015	MMDD	4	NBX, then LINK	NBX sets in request to Acquirer's settlement date, LINK sets in response to Switch settlement date. The reversal message will contain the original, NBX set Settlement Date.	M	M	M	M	M	M			

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File Name	101	ans	17		Not appropriate to messages passed on this interface.									
File Update Code	091	an	1		Not appropriate to messages passed on this interface.									
Forwarding Institution Identification Code	033	n LLVAR	.. 11		Not required, since NBX is an Acquirer only									
Info Text	124	ans LLLVAR	.. 255	Sender	Contains up to first 255 bytes of the message rejected by the sender (either NBX or LINK							M		
Issuer Application Data	134	h LLVAR	.. 64	ICC	Unique ICC related card data for card scheme (LINK)	C	C			O				
Issuer Authentication Data	139	h LLVAR	.. 32	Issuer	A value computed by the Issuer to allow the ICC to authenticate the issuer returning the response. Comprises two sub-fields: ■ Sub-field 1 - ARPC (format h16) – must be included in a response to a message where the ARQC has been verified successfully by the Issuer ■ Sub-field 2 - Optional Data (format .. h16)			C	C					
Issuer Script	142	h LLLVAR	.. 255	Issuer	Contains commands for transmission to ICC from Issuer			O	O					
Issuer Trace Id	126	ans LLLVAR	6	Issuer	Issuer specified transaction identifier. Note: The field is FIXED length 6 but with the var field header ie LLLnnnnnn			M	M	M	M			
Merchant Type	018	n	4		Not required for NBX transactions - POS Transactions Only									
Message Authentication Code	064	h	16		Not currently supported by LINK									
Message Authentication Code	128	h	16		Not appropriate to messages passed on this interface.									
Message Security Code	096	ans	8	Sender	Password to network management requests. Value set = 435TT (both directions)								C	
Network Management Information	125	ans LLLVAR	.. 60	Sender	Additional information required for key change and key verification: ■ Positions 01-32 - 32 byte working key ■ Positions 33-38 - check value ■ Positions 39-60 - Spaces (optional)								C	
Network Management Information Code	070	n	3		Codes to be used for 0800/0810 messages are defined in section 4.2.10.							M	M	M
Original Data Elements	090	n	42	NBX	Positions 1-4 will be set to 0200, remaining positions are zero filled					M	M			

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PIN Data	052	h	16	Outlet from customer	Customer PIN Entered by customer & encrypted using ISO 9564-1 Format 0 as defined in ANSI X9.8. Not supplied for verification by signature or deposit transactions (as no PIN authentication of the customer is undertaken).	C	C							
Point of Service Condition Code	025	n	2	Outlet	To initially be set by NBX (from Ref Data) to 54 (Non ICC Capable Branch ATM). 55 must be used to indicate ICC Capable Branch ATM when chip read support added.	M	M			M				
Point of Service Data	061	ans	20	NBX	Subfield 1 will be set to: 8 – Mag. stripe & key entry (counter not ICC enabled) 9 – Mag. stripe, ICC & key entry (counter ICC enabled) Subfield 2 will be set to: 1 – PIN, 0 – No electronic authentication (*assumed for deposit*) Subfield 3 will be set to 0 – No capture Subfield 4 will be set to 1 – On premises of card acceptor, attended, Subfields 5 and 6 will be set to 01 – Cardholder present, card present, Subfield 7 will be set to: 2 – Magnetic stripe, 5 – ICC, 6 – Manual Entry Subfield 8 will be set to 1 – PIN, 0 – No PIN (if deposit transaction) Subfield 9 will be set to 3 (Authorising agent = issuer) for PIN, 0 (No authentication) if not PIN (i.e. for a deposit) Subfield 10 = 1 (none) or 3 (ICC) Subfield 11 = 0 (unknown – mixed print & display capability, over time) Subfield 12 = C (pin capture length is up to 12 – h/w capability, usage is likely to be 4 digits only) if PIN entry capability, 0 if no PIN entry capability (i.e. for a deposit).	M	M			M				

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Point of Service Entry Mode	022	n	3	Outlet from system	Digits 1-2 will be: 01 (Manual entry) 05 (ICC) 90 (Mag Stripe, Track 2 read and fully transmitted, includes downgraded ICC cards) Digit 3 will be: 1 (PIN entry capability) 2 (No PIN entry capability) - *assumed for deposit*	M	M			M				
Point of Service PIN Capture Code	026	n	2		Not appropriate to messages passed on this interface - POS Transactions Only									
Primary Account Number	002	n LLVAR	.. 19	Outlet from card/Clerk at Outlet	Read from ICC for an ICC transaction, read from Track 2 data if card swiped, entered by the clerk when card details manually entered. [Identifies particular card, customer account or relationship]	M	M	M	M	M				
Processing Code	003	n	6	NBX	NBX will set digits 1 and 2 to 01 for Withdrawal 31 for Balance Enquiry 21 for cash deposit 24 for cheque deposit. Digits 3 to 6 will be set to zero (default). All 6 digits passed by NBX and LINK.	M	M	M	M	M	M			
Replacement Amounts	095	an	42		Not required - partial reversals not supported by NBX									
Response Code	039	an	2		Code indicating transaction step outcome. Source dependent on transaction type.			M	M	M	M			M
Retrieval Reference Number[1]	037	an	12	NBX	Additional transaction identifier, assigned by NBX. It will be unique for a terminal ID, at least within 10 years. Digits 01-04 set to date (YDDD) Digits 05-06 set to 00 Digits 07-12 set to a 6 digit cycling number generated at each counter	M	M	M	M	M	M			

[1] Fields Systems Trace Audit Number (011), Time Local Transaction (012), Retrieval Reference Number (037) and Card Acceptor Terminal Identification (041) are used to uniquely identify transactions

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Systems Trace Audit Number	011	n	6	NBX	Transaction identifier, assigned by NBX within the request, and included in all subsequent messages relating to that transaction ([A1] response and [E1] / [E2] reversal messages).	M	M	M	M	M	M	M	M	M
Terminal Capability Profile	130	h	6	Outlet	Required for ICC transactions - indicates card data input, CVM and security capabilities of terminal	C	C			O				
Terminal Country Code	145	n	3	Outlet	Country Code (ISO value) of terminal carrying out ICC transaction – value = 826	C	C			O				
Terminal Serial Number	133	an	8	Outlet	Unique and permanent identification number of chip terminal	O	O			O				
Terminal Transaction Date	146	n	6	Outlet	Contains transaction date in format YYMMDD used by ICC in generating the cryptogram for ICC transaction	C	C			O				
Terminal Verification Results (TVR)	131	h	10	Outlet	Status of different ICC functions as seen from terminal	C	C			O				
Time, Local Transaction	012	n	6	Outlet from System	As printed on receipt, transaction request time in Local Time in format hhmmss	M	M	M	M	M	M			
Track 2 Data	035	z LLVAR	.. 37	Outlet from card	Track 2 image. Will not be present where card details have been manually entered.	C	C			C				
Transmission Date and Time	007	n	10	Sender	Date and time of transmission of the message (not carried forward from previous messages), expressed in GMT or BST as appropriate. Format MMDDhhmmss	M	M	M	M	M	M	M	M	M
Unpredictable Number	132	h	8	Generated by terminal	Value providing variability and uniqueness to generation of the application cryptogram for an ICC transaction	C	C			O				

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4.2 Data Interpretations

This section contains the definition of each message type to be sent over this interface. The Message Element column lists those elements required for the message by Horizon name, and relates to list in Section 4.1.

The Required column in the message definition tables within this section contain the following codes:

Code	Meaning
M	The element is mandatory and must be present in this message
C	The element is conditional for this message, and the condition to be applied is stated in the Conditions column. If the condition is true, the element must be present in the message, otherwise the element must not be present in the message. It should be noted that the receiving system may not be able to assess whether the condition has been met, in which case it must be able to interpret the presence or non-presence of the element according to appropriate business rules.
O	Optional (see Message Definitions below for specific rules)

The Conditions column lists the conditions for inclusion of a conditional message element; inclusion of the element may depend on details of the transaction type, or simply whether the data is available to the sending system.

The message definitions given in the sections below do not include primary bitmaps. Primary, secondary and tertiary bitmaps will be used as required by the LINK Switch Service Interchange Standard (LIS5), (Ref. [1]).

It is essential that developers of this interface also refer to the LINK Switch Service Interchange Standard (LIS5), (Ref. [1]) and the Horizon - LINK Mapping document, (Ref. [5]) for further details of data derivation and use.

A greyed out row in the following tables means that the field is not required and may not be populated in messages from NBX to LINK. The NBX will log any such fields received from LINK but will not process them further.

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4.2.1 [R3] - Balance Enquiry

4.2.1.1 Overview

This message is sent by the NBX to LINK. The message requests a balance enquiry transaction.

The [R3] Balance Enquiry message maps to the following LINK message:

- 0100 - Balance Enquiry

4.2.1.2 Message Definition

Message Element	Bitmap Reference	Required	Notes / Conditions
Bit Map Secondary	001	C	
Primary Account Number	002	M	
Processing Code	003	M	310000 for Balance Enquiry
Amount, Cardholder Billing	006		Not required
Transmission Date and Time	007	M	
Conversion Rate, Cardholder Billing	010		Not required
Systems Trace Audit Number	011	M	
Time, Local Transaction	012	M	
Date, Local Transaction	013	M	
Date, Expiration	014	C	Required for manually key entered balance enquiry transaction
Date, Settlement	015	M	Acquirer's settlement date
Point of Service Entry Mode	022	M	Please refer to 4.1.2 for values
Application PAN Sequence Number	023	C	Required for ICC transactions, or if the card's issue number has been manually entered
Point of Service Condition Code	025	M	Please refer to 4.1.2. for contents of the field
Acquiring Institution Identification Code	032	M	
Forwarding Institution Identification Code	033		Not required
Track 2 Data	035	C	Will not be present where card details manually entered.
Retrieval Reference Number	037	M	Please refer to 4.1.2. for contents of the field
Card Acceptor Terminal Identification	041	M	
Card Acceptor Name / Location	043	M	
Currency Code, Transaction	049	M	
Currency Code, Cardholder Billing	051		Not required
PIN Data	052	C	Required if PIN used
Advice / Reversal Reason Code	060	C	Required for ICC transactions
Point of Service Data	061	M	Please refer to 4.1.2 for values
Message_Authentication_Code	064		Not to be sent to LINK for this implementation.
Bit Map Tertiary	065	C	Required for ICC transactions
Terminal Capability Profile	130	C	Required for ICC transactions
Terminal Verification Results	131	C	Required for ICC transactions
Unpredictable Number	132	C	Required for ICC transactions
Terminal Serial Number	133	O	Optional for ICC transaction - to be inserted if available
Issuer Application Data	134	C	Required for ICC transactions
Cryptogram (ARQC)	136	C	Required for ICC transactions
Application Transaction Counter	137	C	Required for ICC transactions
Application Interchange Profile	138	C	Required for ICC transactions
Cryptogram Transaction Type	144	C	Required for ICC transactions
Terminal Country Code	145	C	Req'd for ICC transactions – see 4.1.2 for value
Terminal Transaction Date	146	C	Required for ICC transactions
Cryptogram Amount	147	C	Required for ICC transactions
Cryptogram Currency Code	148	C	Required for ICC transactions
Message Authentication Code	192		Not required in this implementation

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4.2.2 [R3] - Financial Transaction Request - Withdrawal

4.2.2.1 Overview

This message is sent by the NBX to LINK. The message requests a withdrawal transaction.

The [R3] Financial Transaction Request message maps to the following LINK message:

- 0200 - Financial Transaction Request.

4.2.2.2 Message Definition

Message Element	Bitmap Reference	Required	Notes / Conditions
Bit Map Secondary	001	C	Required for ICC transactions
Primary Account Number	002	M	
Processing Code	003	M	010000 for Financial Transaction
Amount, Transaction	004	M	
Amount, Cardholder Billing	006		Not required
Transmission Date and Time	007	M	
Conversion Rate, Cardholder Billing	010		Not required
Systems Trace Audit Number	011	M	
Time, Local Transaction	012	M	
Date, Local Transaction	013	M	
Date, Expiration	014	C	Not required
Date, Settlement	015	M	Acquirer's settlement date
Point of Service Entry Mode	022	M	Please refer to 4.1.2 for values
Application PAN Sequence	023	C	Required for ICC transactions, or if the card's issue number has been manually entered
Point of Service Condition Code	025	M	Please refer to 4.1.2 for contents of the field
Amount, Transaction Fee	028		Not required - acquirer charge will not be used
Acquiring Institution Identification Code	032	M	
Forwarding Institution Identification Code	033		Not required.
Track 2 Data	035	C	Will not be present where card details manually entered.
Retrieval Reference Number	037	M	Please refer to 4.1.2. for contents of the field
Card Acceptor Terminal Identification	041	M	
Card Acceptor Identification Code	042	M	
Card Acceptor Name / Location	043	M	
Currency Code, Transaction	049	M	
Currency Code, Cardholder Billing	051		Not required
PIN Data	052	C	Required if PIN used
Advice / Reversal Reason Code	060	C	Required for ICC and fallback transactions
Point of Service Data	061	M	Please refer to 4.1.2 for values
Message_Authentication_Code	064		Not to be sent to LINK for this implementation.
Bit Map Tertiary	065	C	Required for ICC transactions
Authorisation Data	123	C	Sub Field 18 contains start date of card if it exists and card details are manually entered
Terminal Capability Profile	130	C	Required for ICC transactions
Terminal Verification Results	131	C	Required for ICC transactions
Unpredictable Number	132	C	Required for ICC transactions
Terminal Serial Number	133	O	Optional for ICC transaction
Issuer Application Data	134	C	Required for ICC transactions
Cryptogram (ARQC)	136	C	Required for ICC transactions
Application Transaction Counter	137	C	Required for ICC transactions
Application Interchange Profile	138	C	Required for ICC transactions
Cryptogram Transaction Type	144	C	Required for ICC transactions
Terminal Country Code	145	C	Req'd for ICC transactions – see 4.1.2 for value
Terminal Transaction Date	146	C	Required for ICC transactions
Cryptogram Amount	147	C	Required for ICC transactions
Cryptogram Currency Code	148	C	Required for ICC transactions
Message Authentication Code	192		Not required in this implementation

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4.2.3 [R3] - Financial Transaction Request - Deposit

4.2.3.1 Overview

This message is sent by the NBX to LINK. The message details a cash deposit or cheque deposit request. Mixed deposits ie cash and cheque in one transaction will not be supported on this interface.

The [R3] Financial Transaction Request message maps to the following LINK message:

- 0200 - Financial Transaction Request

4.2.3.2 Message Definition

Message Element	Bitmap Reference	Required	Notes / Conditions
Bit Map Secondary	001	C	Required for ICC transactions
Primary Account Number	002	M	
Processing Code	003	M	210000 for cash deposit 240000 for cheque deposit
Amount, Transaction	004	M	
Amount, Cardholder Billing	006		Not required
Transmission Date and Time	007	M	
Conversion Rate, Cardholder Billing	010		Not required
Systems Trace Audit Number	011	M	
Time, Local Transaction	012	M	
Date, Local Transaction	013	M	
Date, Expiration	014	C	Required for manually key entered deposit transaction
Date, Settlement	015	M	Acquirer's settlement date
Point of Service Entry Mode	022	M	Please refer to 4.1.2 for values
Application PAN Sequence Number	023	C	Required for ICC transactions, or if the card's issue number has been manually entered
Point of Service Condition Code	025	M	Please refer to 4.1.2 for contents of the field
Amount, Transaction Fee	028		Not required - acquirer charge will not be used
Acquiring Institution Identification Code	032	M	
Forwarding Institution Identification Code	033		Not required.
Track 2 Data	035	C	Will not be present where card details manually entered.
Retrieval Reference Number	037	M	Please refer to 4.1.2 for contents of the field
Card Acceptor Terminal Identification	041	M	
Card Acceptor Identification Code	042	M	
Card Acceptor Name / Location	043	M	
Currency Code, Transaction	049	M	
Currency Code, Cardholder Billing	051		Not required
PIN Data	052		Not required for deposit transactions
Advice / Reversal Reason Code	060	C	Required for ICC transactions and fallback transactions
Point of Service Data	061	M	Please refer to 4.1.2 for values
Message_Authentication_Code	064		Not to be sent to LINK for this implementation.
Bit Map Tertiary	065	C	Required for ICC transactions
Authorisation Data	123	C	Sub Field 17 contains 1 for cheque deposit (number of cheques) and value of transaction inserted. Sub Field 18 contains start date of card if it exists and card details are manually entered
Terminal Capability Profile	130	C	Required for ICC transactions
Terminal Verification Results	131	C	Required for ICC transactions
Unpredictable Number	132	C	Required for ICC transactions
Terminal Serial Number	133	O	Optional for ICC transaction – to be inserted if available
Issuer Application Data	134	C	Required for ICC transactions
Cryptogram (ARQC)	136	C	Required for ICC transactions
Application Transaction Counter	137	C	Required for ICC transactions
Application Interchange Profile	138	C	Required for ICC transactions

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Cryptogram Transaction Type	144	C	Required for ICC transactions
Terminal Country Code	145	C	Req'd for ICC transactions – see 4.1.2 for value
Terminal Transaction Date	146	C	Required for ICC transactions
Cryptogram Amount	147	C	Required for ICC transactions
Cryptogram Currency Code	148	C	Required for ICC transactions
Message Authentication Code	192		Not required in this implementation

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4.2.4 [A1] - Balance Enquiry Response

4.2.4.1 Overview

This message is sent by LINK to the NBX. The message contains a balance enquiry response.

The [A1] Balance Enquiry Response message maps to the following LINK messages:

- 0110 - Balance Enquiry Response

4.2.4.2 Message Definition

Message Element	Bitmap Reference	Required	Notes / Conditions
Bit Map Secondary	001	M	
Primary Account Number	002	M	Echoed from the request message
Processing Code	003	M	Echoed from the request message
Amount, Cardholder Billing	006		Not required
Transmission Date and Time	007	M	
Conversion Rate, Cardholder Billing	010		Not required
Systems Trace Audit Number	011	M	Echoed from the request message
Time, Local Transaction	012	M	Echoed from the request message
Date, Local Transaction	013	M	Echoed from the request message
Date, Settlement	015	M	Switch settlement date
Application PAN Sequence	023	C	Echoed from the request message if present
Acquiring Institution Identification Code	032	M	Echoed from the request message
Forwarding Institution Identification Code	033		Not required because not in request.
Retrieval Reference Number	037	M	Echoed from the request message
Response Code	039	M	
Card Acceptor Terminal Identifier	041	M	Echoed from the request message
Currency Code, Transaction	049	M	Echoed from the request message
Currency Code, Cardholder Billing	051		Not required
Additional Amounts	054	M	For a decline, the length of this field must be set to '000'
Bit Map Tertiary	065	C	Required for ICC transactions
Account Identification 1	102	M	Not used by NBX
Authorising Agent Institution Id Code	113	M	
Issuer Trace Id	126	M	
Message_Authentication_Code	128		Not to be sent to LINK for this implementation.
Application Transaction Counter	137	C	Required for ICC transactions
Issuer Authentication Data	139	C	Required for ICC transactions (omitted if cannot be generated)
Issuer Script	142	O	At Issuer's discretion
Message Authentication Code	192		Not required in this implementation

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4.2.5 [A1] - Financial Transaction Request Response - Withdrawal

4.2.5.1 Overview

This message is sent by LINK to the NBX. The message contains a withdrawal request response.

The [A1] Financial Transaction Request Response message maps to the following LINK message:

- 0210 - Financial Transaction Request Response.

Note that LINK will never return a partial authorisation.

4.2.5.2 Message Definition

Message Element	Bitmap Reference	Required	Notes / Conditions
Bit Map Secondary	001	M	
Primary Account Number	002	M	Echoed from the request message
Processing Code	003	M	Echoed from the request message
Amount, Transaction	004	M	Echoed from the request message
Amount, Cardholder Billing	006		Not required
Transmission Date and Time	007	M	
Conversion Rate, Cardholder Billing	010		Not required
Systems Trace Audit Number	011	M	Echoed from the request message
Time, Local Transaction	012	M	Echoed from the request message
Date, Local Transaction	013	M	Echoed from the request message
Date, Settlement	015	M	Switch settlement date
Application PAN Sequence	023	C	Echoed from the request message if present
Amount, Transaction Processing Fee	030	C	Field will not be returned by LINK in a LINK denied transaction.
Acquiring Institution Identification Code	032	M	Echoed from the request message
Forwarding Institution Identification Code	033		Not required because not in request.
Retrieval Reference Number	037	M	Echoed from the request message
Response Code	039	M	
Card Acceptor Terminal Identifier	041	M	Echoed from the request message
Currency Code, Transaction	049	M	Echoed from the request message
Currency Code, Cardholder Billing	051		Not required
Additional Amounts	054	C	Required if available from issuer
Bit Map Tertiary	065	C	Required for ICC transactions
Account Identification 1	102	M	Not used by NBX
Authorising Agent Institution Id Code	113	M	
Authorisation Response Data	121		Not required in NBX implementation
Issuer Trace Id	126	M	
Message_Authentication_Code	128		Not to be sent to LINK for this implementation.
Application Transaction Counter	137	C	Required for ICC transactions
Issuer Authentication Data	139	C	Required for ICC transactions (omitted if cannot be generated)
Issuer Script	142	O	At Issuer's discretion
Message Authentication Code	192		Not required in this implementation

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4.2.6 [A1] - Financial Transaction Request Response - Deposit

4.2.6.1 Overview

This message is sent by LINK to the NBX. The message contains a deposit request response.

The [A1] Financial Transaction Request Response message maps to the following LINK message:

- 0210 - Financial Transaction Request Response.

Note that LINK will never return a partial authorisation.

4.2.6.2 Message Definition

Message Element	Bitmap Reference	Required	Notes / Conditions
Bit Map Secondary	001	M	
Primary Account Number	002	M	Echoed from the request message
Processing Code	003	M	Echoed from the request message
Amount, Transaction	004	M	Echoed from the request message
Amount, Cardholder Billing	006		Not required
Transmission Date and Time	007	M	
Conversion Rate, Cardholder Billing	010		Not required
Systems Trace Audit Number	011	M	Echoed from the request message
Time, Local Transaction	012	M	Echoed from the request message
Date, Local Transaction	013	M	Echoed from the request message
Date, Settlement	015	M	Switch settlement date
Application PAN Sequence	023	C	Echoed from the request message if present
Amount, Transaction Processing Fee	030	C	Field will not be returned by LINK in a LINK denied transaction.
Acquiring Institution Identification Code	032	M	Echoed from the request message
Forwarding Institution Identification Code	033		Not required because not in request.
Retrieval Reference Number	037	M	Echoed from the request message
Response Code	039	M	
Card Acceptor Terminal Identifier	041	M	Echoed from the request message
Currency Code, Transaction	049	M	Echoed from the request message
Currency Code, Cardholder Billing	051		Not required
Additional Amounts	054	C	Required if available from issuer
Bit Map Tertiary	065	C	Required for ICC transactions
Account Identification 1	102	M	Not used by NBX
Authorising Agent Institution Id Code	113	M	
Authorisation Response Data	121		Not used in the NBX implementation
Issuer Trace Id	126	M	
Message_Authentication_Code	128		Not to be sent to LINK for this implementation.
Application Transaction Counter	137	C	Required for ICC transactions
Issuer Authentication Data	139	C	Required for ICC transactions (omitted if cannot be generated)
Issuer Script	142	O	At Issuer's discretion
Message Authentication Code	192		Not required in this implementation

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4.2.7 [E1] - Reversal Request

4.2.7.1 Overview

This message is sent by the NBX to LINK when a financial transaction that has been processed by the issuer needs to be reversed.

The [E1] message maps to the following LINK messages:

- 0420 - Reversal Request
- 0421 - Reversal Repeat.

A Reversal Request [E1] can only be generated when the [A1] message to be reversed can be mapped against a [R3] request.

Reversal Requests may be sent up to a (configurable) period, initially set to 5 days, after the original transaction to which it refers.

Note that partial reversals are not supported over this interface.

4.2.7.2 Message Definition

Message Element	Bitmap Reference	Required	Notes / Conditions
Bit Map Secondary	001	M	
Primary Account Number	002	M	
Processing Code	003	M	Copied from the [A1]
Amount, Transaction	004	M	
Amount, Cardholder Billing	006		Not required
Transmission Date and Time	007	M	
Conversion Rate, Cardholder Billing	010		Not required
Systems Trace Audit Number	011	M	
Time, Local Transaction	012	M	
Date, Local Transaction	013	M	
Date, Expiration	014	C	Required if present on original transaction. Copied from original transaction
Date, Settlement	015	M	Copied from the [[R3]
Merchant type	018		Not required
Acquiring Institution Country Code	019		Not required
Point of Service Entry Mode	022	M	
Application PAN Sequence Number	023	C	Required if present on original transaction
Point of Service Condition Code	025	M	
Amount, Transaction Fee	028		Not required - acquirer charge will not be used
Acquiring Institution Identification Code	032	M	
Forwarding Institution Identification Code	033		Not required
Track 2 Data	035	C	Required if present on original transaction
Retrieval Reference Number	037	M	
Authorisation Identification Response	038		Not required
Response Code	039	M	Copied from the [A1]
Card Acceptor Terminal Identifier	041	M	
Card Acceptor Identification Code	042	M	
Card Acceptor Name / Location	043	M	
Currency Code, Transaction	049	M	
Currency Code, Cardholder Billing	051		Not required
Advice / Reversal Reason Code	060	M	
Point of Service Data	061	M	
Bit Map Tertiary	065	C	Required for ICC transactions if any of the optional fields included
Original Data Elements	090	M	

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Replacement Amounts	095		Not required
Account Identification 1	102	M	
Authorisation Response Data	121		Not used in the NBX implementation
Authorisation Data	123	C	Required if present on original transaction
Issuer Trace Id	126	M	
Terminal Capability Profile	130	O	Optional for ICC transactions. Copied from original transaction
Terminal Verification Results	131	O	Optional for ICC transactions. This should contain the latest TVR which may be different to that in the original request. If the latest TVR is unavailable, the value in the original request should be used
Unpredictable Number	132	O	Optional for ICC transactions. Copied from original transaction
Terminal Serial Number	133	O	Optional for ICC transactions. Copied from original transaction
Issuer Application Data	134	O	Optional for ICC transactions. This should contain the latest IAD which may be different to that in the original request. If the latest IAD is unavailable, the value in the original request should be used
Cryptogram (ARQC)	136	O	Optional for ICC transactions. This should contain the ARQC from the 2nd Gen. AC command or if unavailable, the ARQC from the 1st Gen. AC command
Application Transaction Counter	137	O	Optional for ICC transactions. Copied from original transaction
Application Interchange Profile	138	O	Optional for ICC transactions. Copied from original transaction
Cryptogram Transaction Type	144	O	Optional for ICC transactions. Copied from original transaction
Terminal Country Code	145	O	Optional for ICC transactions. Copied from original transaction
Terminal Transaction Date	146	O	Optional for ICC transactions. Copied from original transaction
Cryptogram Amount	147	O	Optional for ICC transactions. Copied from original transaction
Cryptogram Currency Code	148	O	Optional for ICC transactions. Copied from original transaction
Message Authentication Code	192		Not required in this implementation

Note: NBX does not include any of the Optional fields.

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4.2.8 [E2] - Reversal Request Response

4.2.8.1 Overview

This message is sent by LINK to the NBX in response to a reversal request from the NBX.

The [E2] message maps to the LINK message 0430.

4.2.8.2 Message Definition

Message Element	Bitmap Reference	Required	Notes / Conditions
Bit Map Secondary	001	M	
Processing Code	003	M	Echoed from the 042x message.
Amount, Transaction	004	M	Echoed from the 042x message.
Transmission Date and Time	007	M	Echoed from the 042x message.
Systems Trace Audit Number	011	M	Echoed from the 042x message.
Time, Local Transaction	012	M	Echoed from the 042x message.
Date, Local Transaction	013	M	Echoed from the 042x message.
Date, Settlement	015	M	Echoed from the 042x message.
Application PAN Sequence	023	C	Required if present on original transaction
Acquiring Institution Identification Code	032	M	Echoed from the 042x message.
Forwarding Institution Identification Code	033		Not required
Retrieval Reference Number	037	M	Echoed from the 042x message.
Response Code	039	M	
Currency Code, Transaction	049	M	Echoed from the 042x message.
Bit Map Tertiary	065	C	Required for ICC transactions
Original Data Elements	090	M	Echoed from the 042x message.
Replacement Amounts	095		Not required
Authorisation Response Data	121		Not required
Authorisation Data	123		Not required
Issuer Trace Id	126	M	Echoed from the 042x message.
Application Transaction Counter	137	C	Required for ICC transactions if present in reversal request. Copied from request
Cryptogram Transaction Type	144	O	Optional for ICC transactions. Copied from original transaction
Message Authentication Code	192		Not required in this implementation

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4.2.9 Administration Advice (0620)

4.2.9.1 Overview

Administration advice messages are sent to/from LINK in order to initiate investigation of a problem by either LINK or the NBX.

The Administration advice message maps to LINK message 0620.

4.2.9.2 Message Definition

Message Element	Bitmap Reference	Required	Notes / Conditions
Bit Map Secondary	001	M	
Transmission Date and Time	007	M	
Systems Trace Audit Number	011	M	
Network Management Information Code	070	M	Set to be 900
Info Text	124	M	

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4.2.10 Network Management Messages (0800 / 0810)

The following Network Management Messages will be exchanged between LINK and the NBX:

- 0800 - Network Management Request Message
- 0810 - Network Management Response Message

They are used for the following purposes (followed by associated Network Management Information Code):

- Sign On, acquirer, LINK initiated (061)
- Sign On, acquirer, NBX initiated (071)
- Sign Off, acquirer, LINK initiated (062)
- Sign Off, acquirer, NBX initiated (072)
- End of Day, Acquirer from LINK (261)
- Handshake, Acquirer from LINK (361)
- Handshake, Acquirer from NBX (371)
- Key Change - Acquirer Zone from LINK (161)
- Key Change Request - Acquirer Zone from NBX (181)
- Online Key Verification Acquirer ZMK from LINK (199)

The usage, sequence and inter-relation between these and other message is defined in the body of the document “LINK Switch Service Interchange Standard (LIS5)”(Ref. [1]) and in Appendix C1 of the “LIS5 Security Standard” section of that document under Network Management Option 2 (Ref. [7]).

4.2.10.1 Network Management Request (0800)

Message Element	Bitmap Reference	Required	Notes / Conditions
Bit Map Secondary	001	M	
Transmission Date and Time	007	M	
Systems Trace Audit Number	011	M	Set for this transaction – a new STAN is used when a 0800 message is repeated
Network Management Information Code	070	M	Values will depend on message purpose, as described above.
Message Security Code	096	C	Required for key change, key verification, logon and logoff
Network Management Information	125	C	Required for key change and key verification

4.2.10.2 Network Management Request Response (0810)

Message Element	Bitmap Reference	Required	Notes / Conditions
Bit Map Secondary	001	M	
Transmission Date and Time	007	M	
Systems Trace Audit Number	011	M	Echoed from the 0800
Response Code	039	M	
Network Management Information Code	070	M	This is echoed from the 0800 received message.

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4.2.11 LREC – Reconciliation File

The LREC reconciliation file which is sent from LINK to the NBX is in accordance with the LINK Reconciliation File Specification (LREC) Standard Formats, (Ref. [2]). The file transfer mechanism and conditions of transfer are described in the NBX – LINK Technical Interface Specification (Ref. [4]).

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5 Transfer Structure

5.1 Transfer Grouping

The following figure shows the end to end message sequences, using the RACE (Request / Authorise / Confirm / Exception) model, for all application messages between the NBX and the LINK Switch. No knowledge is assumed of the interface between LINK and its member financial institutions.

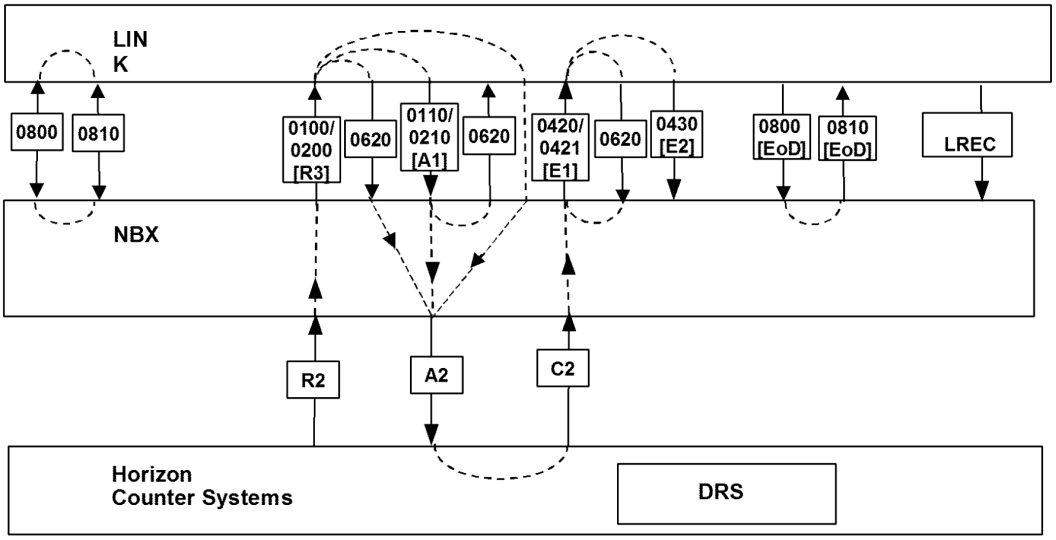

Figure 1 - LINK Message Flows in the Network Banking Environment

A 0620 message may be issued by the NBX in response to all messages from LINK (for simplicity, only one such flow is shown on the diagram).

Reversals (0420 messages) are not sent from NBX to LINK unless and until an approved response (0210 message) has been received from LINK. Repeat Reversals (0421) are only sent in the event that the prior 0420 (or 0421) reversal messages have not had a response processed at the NBX.

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Each incoming request is time-stamped as it is received by LINK. The settlement day in which the transaction will be processed will depend on whether the transaction was time-stamped before or after LINK transmitted the 0800 cut-over message (irrespective of whether a subsequent 0810 message was received).

The interface should be resilient to the transfer of duplicate messages; in practice, however, this should only happen after failure and recovery of either end of the interface.

LINK will not validate transmission date and time in messages against the date and time that messages are received.

The interface details are also described in the NBX – LINK Technical Interface Specification (Ref. [4])

5.2 Transfer Structure

The messages defined in this AIS will be exchanged in accordance with Section 3 of the LINK Switch Service Interchange Standard (LIS5), (Ref. [1]), which describes the use of Message Type Identifier, Bit Map and Data Elements in the message structure. Note that the messages exchanged over this interface use the third bit map for the ICC data elements.

Messages for one transaction may be interleaved with messages for any other transaction.

5.3 Record Structure

The record structure for the messages defined in this AIS is as described in the LIS5 Interchange Standard, Reference (Ref. [1]). The details are not repeated here.

The record structure for the LREC file passed over this interface is described in LINK Reconciliation File Specification (LREC) Standard Format, (Ref. [2]). The details are not repeated here.

5.4 Sequences

Figure 1 above (see Section 5.1) shows the end to end message sequences of all the messages supported by this AIS, from the PO Outlet to the issuing financial institution. Further detail relating specifically to the NBX - LINK connection can be found in the NBX – LINK Technical Interface Specification (Ref. [4]). The interface must be resilient to the disconnection or loss of any part of the total network banking environment for short or extended periods.

5.5 Data Volumes

Data Rates and Volumes over this interface are addressed through the NB Volume Model Comparisons, (Ref. [3]).

5.6 Data Authentication

For this implementation, Message Authentication Codes (MACs) will not be included in the messages sent between the NBX and LINK.

5.7 Data Dictionary

The Data Elements used on this interface are defined and described within Appendix G of the LINK Switch Service Interchange Standard (LIS5), (Ref. [1]).

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6 Security of Transmitted Data

The security standards for the LINK-NBX interface are described in the NBX – LINK Technical Interface Specification (Ref. [4]).

6.1 Protected Data

PIN blocks that pass across the interface from NBX to LINK are encrypted under an Acquirer Working Key (AWK). This key is used in the LINK – NBX shared security zone. PIN Block encryption is translated from internal keys to protection under this shared key using a hardware encryption module. The PIN blocks are never rendered in clear outside the hardware module.

Acquirer Working Keys are exchanged electronically under a Acquirer Zone Master Key (AZMK) shared between NBX and LINK. The AZMK is generated and owned by the NBX. The AWK is owned and generated by LINK.

6.2 Encryption and Decryption Methods

PIN Block and Acquirer Working Key transmission is protected by Triple DES double length keys, 112bit plus key check data.

All data transmitted on communication lines between the NBX and LINK is encrypted using Line Encryption Units. LINK is responsible for the Line Encryption Units at both ends of the communication line.

6.3 Session Establishment

Sessions Establishment can be initiated by LINK or NBX. Initial Logon messages exchanges are followed by transmission by LINK to NBX of a new AWK with a key check value protected by encryption under the shared current AZMK.

NBX verifies the key and acknowledges it to LINK. All PIN Block data is protected by this AWK until the session ends or the AWK is renewed.

6.4 Key Management

Key ownership is described in section 5.4 of the NBX – LINK Technical Interface Specification (Ref. [4]). LINK - NBX Zone Management Keys are managed by the Horizon Key Management Application (KMA) with manual processes.

According to local manual processes the NBX staff will:

- Generate three new AZMK components
- Transfer the AZMK components onto secure stationery
- Key components will contain
  - A key identifier (visible)
  - A key generation date (visible)
  - A component number (visible)
  - 32 hex characters in eight groups of four characters – component plus check data (hidden)

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- Provide a Key Manager Key Check value
- Load the keys into the Horizon KMA

The Horizon KMA:

- Activates keys for use by Horizon Agents, which manage the TCP/IP connections to LINK.

Keys component documents must be stored and transported separately and securely.

The LINK – NBX AZMK is renewed every six months by this manual procedure. The AZMK, having been produced as described above, is securely transported, manually, to LINK. It is expected that the resulting online key verification message sequence would be preceded by telephone co-ordination. If this online key verification procedure is successful, it is followed by the manual promotion of the AZMK, where the Next AZMK becomes the Current AZMK. It is recommended that after promotion of the keys, an Operator issue a command to drive an AWK Key change request sequence, in order to test that the verified AZMK has been promoted by both parties.

LINK requires more than one Processor Interface (PI) to support the transaction throughput for the NBX. For this configuration each PI will be configured to support one TCP/IP socket connection. A logical session will be initiated by a logon, and data for that session will flow over the socket connection belonging to that PI (see Ref. [5] for further details). Each PI generates a LINK-NBX Acquirer Working Key (AWK) which it sends to NBX for validation. This AWK, if validated by the NBX, is used by both socket connections between NBX and the PI that generated it. Logical sessions for a different PI will use the AWK generated by that PI. All LINK PIs will protect their AWK in transit to NBX by encryption using the same AZMK, during its six months of currency.

The AWKs are changed under the following conditions (note that it is not necessary to change the AWKs as soon as the AZMK is changed).

- Every 24 hours where the session remains active (an AWK may be changed at a set (configurable) clock time and will remain valid until it is changed)
- At session initiation by either party
- On receipt by LINK of a 6th consecutive invalid PIN block on a session
- When either a NBX or LINK operator requests a key change.

Load balancing between the PIs will be performed by the NBX ensuring that the appropriate AWK for the PI is used for PIN block translation.

There may be a short outage at the FI (typically up to 90 seconds) while the manual process for changing the AZMK is under way.

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7 Operational Procedures

7.1 Processing Cycles

This interface relates to online message exchange to support real time financial transactions, and to the daily transmission from LINK of the LREC file.

A transaction, which is subsequently discarded, must be logged after receipt, prior to being discarded

7.2 Transfer Initiation

All transfers defined in this AIS are automatic.

7.3 Security Procedures

Manual Procedures are required to support the above key management protocol, as described in Section 6 above.

7.4 Fallback Procedures

Fallback procedures are described in the NBX – LINK Technical Interface Specification (Ref. [4]).

Each system is responsible for its own recovery after failure. Restoration of the interface and the disposal of stale messages (other than “must deliver” messages) is expected to be automatic. 0100, 0200, 0110 and 0210 ([R] and [A]), 0620 and 0800 messages awaiting transmission at the time of failure can safely be discarded, as the integrity of the transaction is protected by timeouts.

The only messages categorised as “must deliver” are Network Management (0800) and Reversal Request (0420/0421) messages - see Section 6 of the LINK Switch Service Interchange Standard (LIS5), (Ref. [1]). Sign On, Sign Off, Key Change, Key Change Request and Online Key Verification 0800 messages are “must deliver” but do not have to survive across processes when moving from active to standby sites.

Handshake 0800 messages are sent every few minutes anyway (which is sufficient).

End of Day 0800 messages are “must deliver” but note that LINK will send the message just once. Whether or not LINK receives a response, LINK will cut over to the next Settlement Day and create LREC files accordingly. LINK will not send another End of Day message on a PI for which no response was received.

Reversal Request 0420/0421 messages are “must deliver” messages and do have to survive when moving from active to standby sites.

7.5 Downgrade Transactions

A ‘Downgrade’ transaction is one where an IC Card has been used at an ICC enabled terminal, but the card issuer has advised, via POL reference data (dependent upon IIN), that the card must not be processed as ICC. The on-line message will be formatted as a standard magnetic stripe transaction.

Nothing, apart from the Track 2 Service Code in the on-line LIS5 Message sent to LINK, will indicate that an IC Card was used.

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Note that in the case of a Downgrade transaction, data must not be used from the IC, but that normal procedures must be followed as for magnetic stripe cards.

7.6 Control

The interface must be resilient to duplicate messages, which may occur after recovery of any element in the system, but are not otherwise expected to occur.

Lost or discarded messages are handled by timeout processing at every stage of the message sequence, to ensure that incomplete transactions are declined if unauthorised or reversed if authorised.

The NBX will log events affecting this interface (e.g. response indicating receipt by LINK of an invalid PIN block) to an Event Log. These events will be managed by Tivoli for escalation to the relevant Help Desk, as appropriate to the code associated with the event.

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8 Appendix A

8.1 Response Codes and Reversal Codes

These are defined in the document Horizon – LINK Mapping (Ref. [5]).

END OF DOCUMENT