

APTRATM **Advance NDC & NDC+**

EMVTM Integrated Circuit Card (ICC) Reference Manual

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Canadian Class A Device Declaration

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Revision Record

| Date | Page | Description Of Change |
|--------|------------------------|--|
| Mar 07 | - | Updated to support 'EMV/CAM2 Exits for APTRA Advance NDC' (Release 02.01.00). Changed 'NDC+ and APTRA Advance NDC' to 'APTRA Advance NDC and NDC+' to de-emphasise NDC+. Changed Europay to MasterCard, as Europay International acquired by MasterCard International. Removed Easy Entry processing as no longer supported. Changed Terminal Action Code (TAC) - Decline to TAC - Denial. |
| | xxii | Clarified abbreviations in new table. |
| | xxiv | Updated pre-requisite NCR training course numbers/titles. Added <i>APTRA Advance NDC</i> , <i>Multi-Vendor Support Reference Manual</i> . |
| | 1-3, 5-8, 5-20, 7-4 | Changed Europay to MasterCard. |
| | 1-4 | In "Terminal Action Analysis", added that TAC-Online and TAC-Default are set to 'FFFFFFFFF. |
| | 1-5 | In "Terminal Risk Management", added floor limit checking. |
| | 1-6 | Added "Host Processing" section. |
| | 1-12 | For Advance NDC, replaced "Logging Mechanism" with new "Tracing Mechanisms" section, covering journal and Debug Log tracing. |
| | 1-13 | Added "EMV Checksum" section. |
| | 2-1 | Added "T - Card Read - PIN Entry Initiation State" to table, and amended Note on use. |
| | 2-3 | In "G - Amount Check State", simplified description and added reason for use. |
| | 2-4 | Updated "I - Transaction Request State" section. |
| | 2-8 | Added new "T - Card Read - PIN Entry Initiation State" section, including flow diagram and points for consideration. |

| Date | Page | Description Of Change |
|------|----------|--|
| | 2-10 | In "+ - Begin ICC Initialisation State", updated table entry 6. |
| | 2-13 | Updated "ICC Initialise and Candidate List Build" overview procedure, and added "Canadian List Filtering" sub-section. |
| | 2-15 | Updated ", - Complete ICC Initialisation State" section. |
| | 2-19 | In " Begin ICC Application Selection & Initialisation State", added table entry 6. In Exit Paths Extension State, added table entry 7. |
| | 2-25 | Updated "ICC Application Select & Initialise Processing" section. |
| | 2-27 | Updated "/ - Complete ICC Application Selection & Initialisation State" section. |
| | 3-2 | In "Enhanced Configuration Parameters Load Message", updated option 69 values and added bit 4. |
| | 4-2 | In "Terminal Application Version Information", added NDC Interface component 'INT'. |
| | 4-4 | In "Terminal Hardware Information", removed unsupported CIM86 smart card variants 12 to 19. Added smart card variants 1F and 20. |
| | 4-8 | In "CAM Flags", added new 'Transaction declined offline' flag. |
| | 4-10 | In "Command Rejects", B95 is now Reserved. |
| | 4-14 | In "ICC Application Solicited/ Unsolicited Error Message", updated Note 2 on bit 1 of option 69. |
| | 5-24 | Added new "Default EMV Customisation Data" section. |
| | 5-25 | In "Transaction Reply", Note 2: and Note 3:, added why transaction response cryptogram and code fields are optional. In Note 3:, added ARC value 30 30 effect. |
| | 6-1, 6-2 | In "Overview" and "Supervisor Menus/Functions", added that Miscellaneous Functions option is available in APTRA Advance NDC and NDC+. |

| Date | Page | Description Of Change |
|------|----------|--|
| | 6-2 | In supervisor function "0 PRNT CMPNT VERS", updated example to ICC version 02.01.00. Added that NDC Interface component version is not printed. |
| | 7-6 | In "Terminal Specified BER-TLV Data Objects", added that this table lists all the automatically populated objects. |
| | 7-12 | In "Terminal Verification Results (TVR) Processing", updated On-line PIN Entered Flag (byte 3 bit 3) and Transaction Exceeds Floor Limit Flag (byte 4 bit 8). |
| | 7-16 | In "Transaction Status Information (TSI) Processing", added that Terminal Risk Management Performed Flag is set if the terminal floor limit is downloaded from the host. |
| | 7-22 | In "Example Display", corrected example. |
| | 7-23 | In "Error Handling", added new "Fake ICC Application Errors" sub-section. |
| | 7-26 | Updated "ICC Application Journal Error Message" section. |
| | 7-29 | Added new "Offline Decline Journal Message" section. |
| | App. B | Clarified "Reading/Writing Magnetic Stripes" and "Immediate Smart Card Eject" processing restrictions for DASH card reader. |
| | App. C | In "Advance Application Development Environment", removed ADE documentation no longer supplied with Advance NDC. In "Other Documentation", clarified EMV specification descriptions. Added EMVCo web page for specifications, now available in PDF format. CEN web site is now www.cen.eu. |
| | App. D | Clarified how to create Startapps.vbs. Updated silent installation with Advance NDC. |
| | App. E | In "EMV Smart Card Screens", added U076 'DECLINED OFFLINE'. |
| | Glossary | Updated Easy Entry application and EMV definitions. Added CLA, Fallback, GENAC, INS, MSB, P1 and P2 definitions. |

| Date | Page | Description Of Change |
|---------|---------------|---|
| Oct. 04 | D-3, 4, 6 | Updated to support 'EMV/CAM2 Exits for APTRA Advance NDC' Release 01.00.02. |
| Sep. 04 | - | Updated to support 'EMV/CAM2 Exits for APTRA Advance NDC' (Releases 01.00.02 and 02.00.00) and EMV 4.1 specifications. |
| | x | In 'Abbreviations Used in This Publication', added host (Central). |
| | xii | In 'What Experience Should I Have?', moved NCR Seminars On Demand before classroom course. |
| | 1-3 | In 'Standards Compliance', updated supported EMV specification versions. |
| | 1-6 | For the 'EMV/CAM2 Exits for APTRA Advance NDC' product, added Issuer Script Processing, Application Selection Indicator and Track 2 Data sections. |
| | 2-4 | Added Note 1 that if the CID indicates an AAC was returned when an ARQC was requested, or an AAR was returned by the card, CAM data is not expected in the Transaction Reply from the host. Also added other conditions when the Transaction Reply may be rejected. |
| | 2-5 | Added Note 2 that fake ICC application level error may be sent to host in specified conditions. |
| | 2-26, 2-27 | Corrected example in Note to FDK Information Entry state 'X'. |
| | 5-7, App A | Changed Euro currency code from 0954 to 0978. |
| | 5-16 | In 'ICC Terminal Acceptable Application IDs Table', added new fields f17 to f21. |
| | 5-22 | Added 'Simulated Track 2 Data' section with example. |
| | 5-23 | Added 'Impact on Central (host)' section. |
| | 5-24 | In 'Transaction Reply', corrected Note 3 to refer to Authorisation Response Code. |
| | 5-25 | Added Note 4 on error processing if script is longer than 256 bytes. Renumbered Notes 5, 6 and 7. |
| | 7-3 | Updated 'Issuer Script Processing' section. |

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| | 7-5 | In 'BER-TLV Data Object Processing', removed two byte restriction on object length field. |
| | 7-18 | Updated 'PIN Encryption and Verification' description, and added reference to Acceptable AIDs table entries f18 to f21. |
| | 7-23 | In 'Error Handling' sub-section 'Host Processing', added invalid script data processing. |
| | Арр С | In 'Other Documentation', updated EMV version 4.0 (2000) specifications to version 4.1 (2004). |
| | App D onwards | Removed FixPak, added Startapps.vbs. |
| | App F | For Advance NDC, removed reference to fontdefs.txt as not required. ISO 8859 character sets are supported by Advance NDC. |
| | Glossary | Added AAR, ARC and CID definitions. |
| May 04 | - | Updated to support multi-vendor 'EMV/CAM2 Exits for APTRA Advance NDC' (Release 02.00.00) for Windows NT/XP. |
| | ix | Added 'Supported Software Releases' section. |
| | xii | In 'What Experience Should I Have?', updated prerequisite course to 'APTRA Advance NDC 3.x Implementation Workshop'. Added 'EMV Solution for NDC' Seminars on Demand. Updated NCR University web site link. |
| | 1-3 | In 'Standards Compliance', added that 'EMV/CAM2 Exits for APTRA Advance NDC' release 2.0 supports EMV version 4.0 specifications and CEN XFS 2.0 interface standards. |
| | 1-6 | Added new 'EMV/CAM2 Exits for APTRA Advance NDC' section summarising version 2.0, and changes from version 1.0. |
| | 1-8 | Added new 'EMV/CAM2 Exits for NDC+' summary section. |
| | 2-1 | In State Tables overview, moved 'ICC Re-initialise' state to end of list. |
| | 2-6 | In the 'Begin ICC Initialisation' state, removed ICC stage and power on. |

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| | 2-9 | In 'ICC Initialise and Candidate List Build' section, removed ICC stage and power on. |
| | 2-12 | In the 'Complete ICC Initialisation' state, added that the default exit state is taken if automatic ICC application is selected in the Begin ICC Initialisation state. |
| | 2-25 | In the 'Set ICC Transaction Data' state, added that can now use this state to set the amount authorised data objects to zero, and table entry 6 to specify another source. |
| | 2-26 | In the 'Set ICC Transaction Data' state, updated table entry 5 (Amount Authorised Source). |
| | 2-27 | In the 'Set ICC Transaction Data' state, added table entry 6 (Amount Other Source). |
| | 2-28 | In the 'Set ICC Transaction Data' state, added when the default close exit is taken. |
| | 2-29 | Moved 'ICC Re-initialise' state to end of chapter |
| | 4-2 | In 'Terminal Application Version Information', updated release/version numbers in table and following example. |
| | 4-6 | In 'Transaction Request Message Format', added PIN Retry Count to example requested data. |
| | 4-18 | In 'Issuer Script Results and Completion Data', clarified format of script results for different script IDs. |
| | 5-10 | In 'ICC Language Support Table', added that Screen Base values 1 to 9 now represent 1000 to 9000. |
| | 5-15 | In 'ICC Terminal Acceptable Application IDs Table', added note that to include PIN retry count, include tag 0x9F17 in object list. |
| | 5-27 | In 'User Defined Functions', stated for Advance NDC only (not NDC+). Changed location of TransFuncIds.txt file to c:\emvdata. Updated reference to moved/renamed section in APTRA Advance NDC, Developer's Guide. |
| | 6-1 | In 'Supervisor Menus/Functions' Overview, stated these are for NDC+ only (not Advance NDC 3.0). |

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| | 6-2 | In 'Supervisor Menus/Functions' section, stated these are for NDC+ only (not Advance NDC 3.0). Changed note to refer to relevant Supervisor's manual for details of options. |
| | 6-3 | In '0 PRNT CMPNT VERS', updated printed component version numbers. |
| | 7-4 | In 'Data Object List (DOL) Processing', specified object length field must not be more than one byte long. |
| | 7-13 | In 'TVR Processing', corrected Cardholder Verification Successful Flag values. |
| | 7-14 | In 'TVR Processing', corrected Card Verification Method Recognised Flag values. |
| | 7-19 | In 'ICC Application Name Display', added how displayed name depends on availability and validity of data object values. |
| | 7-23 | In Error Handling, added 'Host Processing' section stating that fake errors may be received by host (Central). |
| | 7-27 | In 'Journal Print Examples' section, updated example dates. |
| | 7-28 | In 'ICC Processing Termination' section, removed ICC power off. |
| | Арр В | In 'BER-TLV Field Size', specified object length field can be variable length, provided other restrictions met. |
| | App C | In 'Advance NDC Documentation,' added Multi-Vendor Support Reference Manual. |
| | Арр С | Moved 'Advance Application Development Environment' documentation under Advance NDC documentation, as is included in Advance NDC. |
| | App C | In 'Other Documentation', added EMV 4.0 ICC specifications (Books 1 to 4) and CEN XFS 2.0 specification. |

| Date | Page | Description Of Change |
|--------|----------|---|
| | App D | In 'Installation' appendix, moved Advance NDC installation section before NDC+. In Advance NDC Development PC installation, added 'Multi-Vendor Installation' section. In Advance NDC Terminal installation, added 'Multi-Vendor Installation' section. In Advance NDC Terminal single-vendor installation, added that must wait at least 30 seconds after calling DATADEP before running the Advance NDC Application Core. |
| | App F | In 'ISO 8859 Character Sets', moved 'Advance NDC' section before NDC+. |
| | Glossary | Added ATC, CEN, Cryptogram and XFS definitions. |
| Aug 03 | - | Updated to support 'EMV/CAM2 Exits for APTRA Advance NDC' (Release 01.00.01) for Windows NT/XP, and 'EMV/CAM2 Exits for NDC+' (Release 01.00.02) for OS/2. |
| | x | Added Windows XP abbreviation. |
| | xii | Added Windows XP experience. Added reference to NCR University web page. |
| | 2-26 | In '? - Set ICC Transaction Data State', added note that major to minor currency conversion should only be specified if not already set in NDC+ or Advance NDC. |
| | 4-3 | In 'Terminal Application Version Information', updated version numbers in example. |
| | 4-4 | Updated 'Terminal Hardware Information' table. Added reference for complete lists of smart/non-smart card device values. |
| | 4-12 | Corrected publication name to <i>Using NDC Exits</i> . |
| | 5-24 | In 'Transaction Reply', changed 'at1' to 'as1/at1' for NDC+/Advance NDC respectively. Changed 'at2' to 'as2/at2'. |
| | 5-27 | In Transaction Reply section, added 'User Defined Functions' sub-section. |
| | 6-2 | Added reference to APTRA Advance NDC, Supervisor's Guide for Advance NDC menus. |
| | 6-3 | Updated example version numbers. |

| Date | Page | Description Of Change |
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| | 7-10 | In MAC Configuration Transaction Reply, changed to 'as1 and as2' for NDC+, or 'at1 and at2' for Advance NDC. Changed Transaction Reply offset from 36 to 35 for NDC+ or 36 for Advance NDC. |
| | 7-27 | In 'Journal Print Examples', updated date in examples. |
| | D-3 | In 'NDC+ Installation' section, changed MISCONT format/names reference to <i>Using NDC Exits</i> publication, instead of release bulletin. Added that MISCMULT.DLL use with NDC+ is supported but not essential, as multiple hook points are supported by NDC+ 07.01.00. |
| | D-4 | Added step to transfer MISCMULT.DLL (if used) and Definition Files to SST. |
| | D-7 | In Advance NDC Silent Installation sub-section, added 'SST' sub-directory. |
| | D-7 | In Advance NDC Installation section, added 'SST De-Installation' sub-section. |
| | Glossary | Added DASH definition. In NCR Direct Connect definition, added Windows XP. |
| Jan. 03 | | Updated with feedback for 'EMV/CAM2 Exits for APTRA Advance NDC' product (Release 01.00.00). |
| | Title | Updated document number to B006-6297-B000. Changed document date to January 2003. Added copyright 2003. |
| | 1-2 | Added that a single ICC application is only automatically selected if configured to do this. |
| | 2-4 | Removed reference to NDC+ Programmer's Reference Manual and APTRA Advance NDC, Reference Manual as use of Transaction Request state extension table entry 8 (Perform EMV CAM Processing) is stated here. |
| | 2-7 | Expanded description of Begin ICC Initialisation State table entry 8. |
| | 2-8 | Added how secondary AIDs are used to filter the remaining primary AIDs. |

| Date | Page | Description Of Change |
|---------|----------|---|
| | 3-2 | Added 002 and 003 values to CAM/EMV Extended Status option 69. |
| | 4-15 | Updated Note 2 to include option code values 002 and 003. Changed Note 3 to CmdData and RspData (instead of Lc and Le). |
| | 5-12 | Corrected ICC Terminal Acceptable AIDs Table reference to 'ICC Initialise and Candidate List Build' section in Chapter 2. |
| | 7-1 | Added 'EMV Data Validation' and 'Issuer Script Processing' to list of sections. For Application ID (AID) processing summary, added reference to 'ICC Initialise and Candidate List Build' section in Chapter 2. |
| | 7-2 | Added 'EMV Data Validation' section. |
| | 7-3 | Added 'Issuer Script Processing' section. |
| | 7-4 | Added reference to 'Error Handling' section. |
| | 7-22 | Added references to ICC application error message and journalled error formats. |
| | A-1 | Added to Note that the example configuration data provided does not necessarily reflect the data used by the base configuration state flow in Appendix G. |
| | D-3 | In 'NDC+ Installation' section step 12, changed 'RESRVD' to 'RESRVD.DEF' file. In NDC+ installation step 14, advised to check for differences between previous and EMV STCONT and SUPCTR files. |
| | D-4 | In 'NDC+ Installation' section step 22, added that CONFIG.CON file should be transferred to drive C root directory (C:\) using specified file type. |
| | D-5, D-6 | Updated 'Advance NDC' section installation steps. |
| | G-1 | Added a reference to the configuration data in Appendix A. |
| | G-2 | Added Key to state flow diagram. |
| Dec. 02 | All | New publication to support the NCR 'EMV/CAM2 Exits for NDC+' product (Release 01.00.00) and the 'EMV/CAM2 Exits for APTRA Advance NDC' product (Release 01.00.00). |

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User Feedback Form

About This Publication

Supported Software Releases

This publication supports the following NCR software releases:

- multi-vendor 'EMV/CAM2 Exits for APTRA Advance NDC' (Release 2.x and above)
- single-vendor 'EMV/CAM2 Exits for APTRA Advance NDC' (Release 1.x)
- 'EMV/CAM2 Exits for NDC+'.

For the 'EMV/CAM2 Exits for APTRA Advance NDC' product, see the following table for the compatible software releases:

| | Single-Vendor EMV/CAM2 Exits for APTRA Advance NDC 1.x | Multi-Vendor EMV/CAM2 Exits for APTRA Advance NDC 2.x |
|---|---|--|
| Advance NDC 2.x | Yes | No |
| Advance NDC 3.x Single-Vendor application | Yes | No |
| Advance NDC 3.x Multi-Vendor application | No | Yes |

Who Should Read This Publication?

This publication is a reference for any APTRA Advance NDC or NDC+ developer who wishes to add Integrated Circuit Card (ICC) Card Authentication Method (CAM) functionality to their Advance NDC or NDC+ application.

Before using this publication, you should be familiar with using Advance NDC or NDC+, and have received the relevant EMV ICC and Advance NDC or NDC+ training. For more information on training availability, contact your local NCR representative.

You should also be familiar with the relevant third party specifications listed in the "Other Documentation" section of Appendix C, "Related Documentation".

Abbreviations Used in This Publication

The following abbreviations are used in this publication.

| Abbreviation Used | Meaning |
|---------------------|--|
| Advance NDC | APTRA™ Advance NDC for Windows XP or APTRA™ Advance NDC for Windows NT |
| NDC+ | NDC+ for IBM® OS/2® |
| NDC | Advance NDC or NDC+ |
| EMV Exits | EMV/CAM2 Exits for APTRA Advance NDC or EMV/CAM2 Exits for NDC+ |
| ICC | Integrated Circuit Card or 'Smart Card' |
| CAM | Card Authentication Method |
| EMV | Europay Mastercard Visa; see the "Glossary". EMV is a trademark owned and registered by EMVCo LLC. |
| Windows XP | Microsoft® Windows XP® Professional Edition |
| Windows NT | Microsoft® Windows NT® Workstation |
| Central or the host | Central NDC host computer |

What Is in This Publication?

The publication contains the following information:

Chapter 1, "Introduction To ICC Processing"

Gives you an overview of the ICC processing, and the functions performed by it.

Chapter 2, "State Tables"

Provides the function and format of the ICC related state tables, required to use an EMV ICC with Advance NDC or NDC+.

Chapter 3, "Configuration Parameters"

Provides details of the EMV ICC related configuration parameters, for ICC configuration using Advance NDC or NDC+.

Chapter 4, "Terminal to Central Messages"

Provides details of the function and format of each type of EMV ICC related message sent from the terminal to Central.

Chapter 5, "Central to Terminal Messages"

Provides details of the function and format of each type of EMV ICC related message sent from Central to the terminal.

Chapter 6, "Supervisor Menus/Functions"

Provides you with a brief overview of the EMV ICC related supervisor menus and functions.

Chapter 7, "ICC Processing"

Provides you with specific information on the ICC processing, and the functions performed.

Appendix A, "Example Configuration Data"

Gives example configuration data, showing the types of data you may include in the download to the terminal.

Appendix B, "Processing Restrictions"

Lists the EMV ICC processing restrictions, of which you should be aware.

Appendix C, "Related Documentation"

Provides details of all related NCR documentation.

Appendix D, "Installation"

Provides brief instructions on installing the EMV/CAM2 Exits products for Advance NDC and NDC+.

Appendix E, "EMV ICC Reserved Screens"

Lists the new reserved screens introduced by the EMV/CAM2 Exits product for Advance NDC and NDC+.

Appendix F, "ISO 8859 Character Sets"

Lists the ISO 8859 character sets and font IDs supported by the EMV/CAM2 Exits products for Advance NDC and NDC+.

Appendix G, "State Flow Diagram"

Provides a diagram of the base configuration state flow.

How Should I Use This Publication?

Initially, you should read all the chapters and appendices to obtain an understanding of the EMV ICC functions which can be added to Advance NDC or NDC+.

Subsequently, use this publication as a reference for the specific EMV ICC functions you wish to implement.

Should you have any problems using this manual, refer to the "User Feedback Form" at the back of the manual, where you will find our email and postal addresses. Please take the time to reply; your comments are appreciated.

What Experience Should I Have?

You are expected to be familiar with using the Windows XP or Windows NT operating system and APTRA Advance NDC, or the IBM OS/2 operating system and NDC+.

You should have completed the following NCR web-based courses:

- EMV Technical Overview (Course No. 32630)
- EMV for NDC Overview. Parts 1 and 2 (Course No. 32631)

Alternatively, all the seminars in these courses can be ordered as the self-study CD-ROM 'EMV for NDC (Seminar-on-Demand)' (Course No. 25636).

We recommend that you then attend the 'EMV Solution for NDC Workshop' (Course No. 23003).

Having completed these courses, you can then obtain APTRA Engineer (EMV for NDC) Certification (Course No. 34226).

In addition, especially if you are going to develop Exits, you should have work experience of either Advance NDC or NDC+, or have completed the 'APTRA Advance NDC Implementation Workshop' (Course No. 28777).

To understand the use of the Encrypting PIN Pad (EPP), we recommend you also attend 'EPP and the Implementation of Remote Key Management' (Course No. 23435).

You can view these courses using the NCR University intranet web page at http://www.ncru.ncr.com.

What Else Should I Read?

You should be familiar with either the *APTRA Advance NDC*, *Reference Manual* (B006-6180) or the *NDC+ Programmer's Reference Manual* (B006-2486) as this *EMV ICC Reference Manual* is designed to supplement either of these publications.

For a multi-vendor APTRA Advance NDC application, you should also read the *APTRA Advance NDC*, *Multi-Vendor Support Reference Manual* (B006-6344).

All the documentation related to Advance NDC and NDC+, and some third party 'Other Documentation' is listed and described in Appendix C, "Related Documentation."

Chapter 1

Introduction To ICC Processing

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EMV/CAM2 Exits for NDC+

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What Is ICC Processing?

ICC (Integrated Circuit Card) processing provides the functions to enable the addition of ICC processing to an existing Advance NDC or NDC+ terminal application.

ICC processing enables the terminal to accept ICCs and perform the appropriate CAM (Card Authentication Method) ICC application processing. For more details, refer to the third party specifications listed in "Other Documentation" in Appendix C, "Related Documentation."

This ICC processing produces card verification information which is supplied to Central, as described in Chapter 4, "Terminal to Central Messages."

Central can return similar verification information to the card, as described in Chapter 5, "Central to Terminal Messages."

CAM authentication is supported; the CAM authentication enables the update of ICC related data.

For a list of the terms used throughout this publication and their definitions, see the "Glossary".

ICC Processing Overview

The following steps give an overview of the ICC processing for Advance NDC or NDC+, and how it can be configured. For the purpose of this overview, it is assumed that the transaction flow indicates that the card inserted is to be initialised as an ICC, and that the card is an ICC.

- 1 When a card is inserted, the magnetic stripe is read from the card. If track 2 from the magnetic stripe is found to contain the ATB (Alternative Technology Byte) with a setting of '2' or '6', the card is processed as an ICC. For the track 2 format, see *ISO 7811: Identification Cards Recording Technique*.
- 2 If the cardholder's language preference is obtained during ICC initialisation, the cardholder information is automatically displayed in their preferred language. Alternatively, the cardholder can manually choose their preferred language.
- 3 If there is more than one ICC application available, the ICC applications are presented to the cardholder. The cardholder then selects the ICC application they wish to use.

Introduction To ICC Processing What Is ICC Processing?

- 4 If there is only one ICC application available, this can be configured to be automatically selected. Alternatively, the cardholder is prompted to confirm/select the application to use.
- 5 If, during initialisation, the terminal determines that the ICC application is not available or usable, the cardholder is asked to select another ICC application.
- 6 If there are no more ICC applications, or the choice is being made automatically, the transaction flow displays the appropriate message to the cardholder.
- 7 If the account or product cannot be handled at the terminal, the transaction flow informs the cardholder.
- 8 If the account or product can be handled, the cardholder is asked to enter the PIN for the account or product that relates to the ICC application.
- 9 The cardholder then selects a service offered by the transaction flow. Once this is done, a transaction request is sent to Central with the CAM data included to enable authorisation of the transaction.
- 10 Central then responds to the transaction request with a transaction reply containing CAM data.
- 11 Processing continues until the cardholder completes all the services they require, or Central directs the terminal to return the card, and ends with a controlled termination of the transaction.

For an overview diagram of the state flow used, see Appendix G, "State Flow Diagram".

Standards Compliance

The 'EMV/CAM2 Exits for APTRA Advance NDC' product is designed to be compliant with the EMV version 4.1 specifications, and the MasterCard version 2.0 and Visa version 1.3.2 standards.

The 'EMV/CAM2 Exits for NDC+' product is designed to be compliant with the EMV version 3.1.1 specifications, and the MasterCard version 2.0 and Visa version 1.3.2 standards.

For more information on these specification standards, see "Other Documentation" in Appendix C, "Related Documentation".

Implementation Compliance

The CAM ICC processing performed for Advance NDC and NDC+ has been designed to maximise flexibility and performance using configurable features. However, you should be aware that certain configurations in your terminal network may result in partial non-compliance with Visa and/or MasterCard requirements.

NCR recommends you seek guidance from MasterCard and Visa to ensure that your configured options do not contravene these requirements.

Areas of Non-Compliance

Since the CAM ICC processing performed for Advance NDC and NDC+ is for an on-line only (not off-line) terminal, some aspects of the standards are not applicable and are therefore not supported.

To improve terminal performance, a number of areas identified in the standards are also not supported.

The areas of the standards not supported, which NCR has discussed as appropriate with the EMV consortium, are as follows.

Data Integrity - Presence of Data Object

This aspect of data integrity checking is not supported.

Checks are not made to see if all mandatory data objects have been provided by the ICC. The presence of additional optional data objects, indicated by data object settings, is also not checked.

This functionality is not supported in its entirety because it impacts the performance of the terminal. Only where data objects are fundamental for terminal processing are they checked.

The terminal performs an additional data integrity check to ensure that data objects returned are in BER-TLV format, thus ensuring only valid ICC data is used.

Terminal Objects

Not all objects identified within the standards are supported. Some objects are unsupported because they are not applicable to the ICC processing performed.

The only objects maintained by CAM ICC are those identified in "Terminal Specified BER-TLV Data Objects" in Chapter 7, "ICC Processing". Where the content of a terminal maintained object is expected to be dynamically updated, the support is as stated in the appropriate processing.

Note: The terminal can be configured with additional terminal data objects, but these must be supplied by Central.

Offline Static / Dynamic Data Authentication

This processing is not applicable and therefore is not supported.

This functionality is not applicable because all transactions are online only, with no need to perform any offline data authentication.

The implications of not performing this processing is that an imposter ICC application is detected as not genuine by Central, rather than by the CAM ICC processing.

Terminal Action Analysis

Terminal Action Analysis is performed, but 'Terminal Action Code - Default' and 'Terminal Action Code - Online' data items are not configurable, and are both set to 'FFFFFFFFF'.

These data items are not configurable as the terminal is unable to complete, or authorise, a transaction without going online. This is a restriction of the environment of use.

The 'Terminal Action Code - Online' data item, in effect, always takes the transaction online.

The 'Terminal Action Code - Default' data item, in effect, always declines the transaction offline, when the transaction cannot be completed online.

The impact of this is that the terminal does not query the ICC to authorise transactions offline.

Terminal Risk Management

None of these checks are applicable to an ICC CAM online only terminal, and are therefore not performed.

The checks not performed would involve checking exception files, floor limits, random on-line transactions and velocity, none of which are relevant to an online only terminal.

However, if floor limit checking is required, the host can download the Terminal Floor Limit object and the terminal will then perform floor limit checking.

Host Processing

Where applicable, the NDC host (Central) is responsible and must cater for the following requirements:

- PIN Entry
- Track 2 Data
- Transaction Amount
- Account Type
- Fallback
- Application Cryptogram
- Receipt Printing
- Script Errors & Card Declines on Second GENAC Command
- Zero Length Objects

PIN Entry

The ICC contains information required by the terminal to make decisions on PIN entry. In order to use the ICC, the information in state type 'k' (Smart FIT Check state) is required to be used instead of the magnetic stripe information. This enables a FIT match to be found based on the ICC information. In order to operate correctly, this state must follow the successful completion of the "/ - Complete ICC Application Selection & Initialisation State".

To enable the PIN to be encrypted based on the information from the ICC instead of the magnetic stripe, the PIN Entry state must follow the "/ - Complete ICC Application Selection & Initialisation State" and the Smart FIT Check state.

For details of the Smart FIT Check state, see the *APTRA Advance NDC*, *Reference Manual* or the *NDC+ Programmer's Reference Manual*.

Track 2 Data

There are two possible sources of Track 2 data; the standard Advance NDC/NDC+ Track 2 buffer field, and the CAM buffer host requested objects field of the transaction request message.

By default, the standard Advance NDC/NDC+ transaction request Track 2 data buffer contains the magnetic Track 2 data. Assuming it has been requested, the Track 2 equivalent data from the chip (tag 0x57) is sent to the host in the CAM buffer, together with all the other objects the host has requested.

There are two alternative ways the Advance NDC host can decode the PIN buffer and pass Track 2 information to the issuer:

- a Recognise that the transaction is EMV based, and instead of using the Track 2 data in the standard Advance NDC transaction request message, use the tag 0x57 data object in the CAM buffer. However, this requires decoding of the CAM buffer, and extraction and reformatting of the tag 0x57 object into the standard Track 2 format; for example, addition of any start/end sentinels, changing of any field separators characters, removal of any padding 'F' characters. Alternatively you can:
- b Use an option in the ICC Terminal Acceptable AIDs Table to force the Track 2 data used by the EMV transaction to be sent to the host in the standard Advance NDC Track 2 data buffer. To do this, set field f18 'Track 2 Data for Central' to the value '02'. This method should require no additional host processing.

Transaction Amount

In order to correctly initialise the EMV Amount Authorised objects (tags 9F02 and 81), Advance NDC or NDC+ requires the transaction amount to be placed in either the Amount Buffer, General Purpose Buffer B or General Purpose Buffer C, prior to the "? - Set ICC Transaction Data State".

When the amount is selected using FDKs during a Fast Cash transaction, it is important to use the "X - FDK Information Entry State", as this state type automatically populates a buffer with the transaction amount. Using any other Advance NDC or NDC+ state type for a Fast Cash transaction (for example, a "Y - Eight FDK Selection Function State") will not populate the buffer with the transaction amount, and the EMV Amount Authorised objects will not be correctly set. This could cause some cards or issuer hosts to refuse the transaction.

Account Type

The 'EMV/CAM2 Exits for APTRA Advance NDC' product supports the Account Type object (tag 5F57) defined by EMV. If this object is required, it can be downloaded in any of the data object download tables; most likely, the transaction objects table.

Fallback

When the terminal attempts to perform a transaction using an ICC and an error occurs, it is possible for the acquirer host to approve the transaction based only on the magnetic stripe information. This approval based on the magnetic stripe is often referred to as fallback.

When and if fallback can occur depends on the type of card reader in the terminal, and the stage where a failure occurred.

For a smart DIP reader, the magnetic data is only read on card removal, and this only takes place if the chip is not found during the card read state. Note that 'chip not found' can mean the card does not have a chip, or that it has a chip which cannot be successfully

Introduction To ICC Processing **Host Processing**

powered up. If the chip is not found, then on card removal Track 2 data would be available to use, and therefore fallback can be performed at this point. Once the chip has been successfully powered up, fallback cannot be performed because the card remains in the reader and there is no magnetic data to use for fallback.

For a motorised card reader (MCRW) fallback can occur at any stage, as the magnetic data can be read at any time.

In order to make the decision to allow fallback, the host must know the nature and position of the failure during EMV processing. This can be determined by a combination of the CAM flags in the Transaction Request message and the opcode buffer. It is therefore important that the state flow updates the opcode buffer uniquely using the Pre-set Operation Code Buffer state (state type D) when an EMV error occurs.

For details of the Pre-set Operation Code Buffer state, see the APTRA Advance NDC, Reference Manual or the NDC+ Programmer's Reference Manual.

Table entry 8 of the ", - Complete ICC Initialisation State", and table entry 9 of the "/ - Complete ICC Application Selection & Initialisation State" exit paths extension state, are designed to resolve previous issues with fallback involving blocked cards and applications.

Application Cryptogram

In some cases, a transaction may be denied on the first Generate Application Cryptogram (GENAC) command, but a Transaction Request message is still sent to the host. This can occur if the terminal denies the transaction after terminal action analysis requests an Application Authentication Cryptogram (AAC), or if the card denies the transaction after returning an AAC to the first GENAC.

In these circumstances, the chip transaction completes offline but the NDC environment means the terminal must pass the information to the host and wait for it to instruct the terminal how to complete the transaction. For example, the required information could include screens to display, next state number, any journal data, and so on. The terminal does not have sufficient local information to complete this transaction.

By going online, the terminal is simply requesting the host to complete the NDC transaction; the transaction is already complete according to the ICC.

The NDC host should recognise this request, and in these specific cases should not involve the card's issuer, but deal with the request itself and simply close down the transaction.

The host can identify these scenarios by checking the Cryptogram Information Data object sent by the terminal, which for an offline decline is set to "00", that is, AAC.

Additionally, if the 'service not allowed' bit is set in the Cryptogram Information Data object, the same host behaviour is expected. CAM data is not expected in the Transaction Reply.

In these scenarios, the relevant "CAM Flags" (byte 1 bit 5) will be set to 0x1 to enable the host to identify the scenario.

Receipt Printing

It is the host's responsibility to print the cardholder's receipt and any transaction information to the journal. This means the Application Label, Application Identifier (AID) and Amount Authorised should be requested by the host in the Transaction Request. In this way, the host can extract the information, format it appropriately, and send the information back to the terminal within the printer data field of the Transaction Reply.

The processing that the host is required to do in formatting the receipt includes the removal of any padding characters which may be found in the Primary Account Number (PAN) or Track 2 Equivalent Data objects.

Script Errors & Card Declines on Second GENAC Command If the terminal requests a Transaction Certificate (TC) in the second Generate Application Cryptogram (GENAC) command but instead receives an Application Authentication Cryptogram (AAC), the processing continues until all issuer scripts (if any) are performed, and only then is a solicited error message sent to the host system. The terminal will await a new Transaction Reply without CAM data, which should close down the transaction.

The solicited error message is a fake ICC application level error message with CLA = 0xFF, INS = 0xFF, P1 = 0xFF, P2 = 0xFF, Lc = 0x00, Le = 0x00, SW1 = 0xFF and SW2 = 0xFF, containing any host requested completion objects and any issuer script results.

However, this solicited error message is also sent to the host when an unsolicited issuer script error message has been previously sent to the host. When the script fails, this enables the host to complete the transaction with a different cardholder message; for example, so that after a failed PIN Change script the displayed message could read 'Sorry, your PIN could not be changed'.

In order to determine the reason behind this error, the host should check the host completion objects, and specifically the Cryptogram Information Data (9F27) object, to establish the cryptogram returned by the card. In the case of a card decline on the second GENAC command, this object will be set to AAC and the host should close down the NDC transaction. If however, the object instead contains a

Introduction To ICC Processing **Host Processing**

TC, the transaction has been approved and despite the script failure the host should continue the transaction.

Alternatively, option 69 can be used to stop the terminal sending solicited script failure errors. With bit 3 of this option set, the error can only result from the card returning an AAC when a TC was requested, which simplies the host processing. However, this also means that if a script fails no solicited error will result, and the transaction will complete. In the above PIN Change example, this would mean that the cardholder would be incorrectly informed that the PIN had been changed.

Zero Length Objects

Although the EMV Exits software accepts any host downloaded object with a zero length, during EMV processing it is treated as if the object is not known. If a script command (tag 0x86) within the issuer script field of the Transaction Reply is found to be zero length, this is treated as an invalidly formatted script.

EMV/CAM2 Exits for APTRA Advance NDC

The 'EMV/CAM2 Exits for APTRA Advance NDC' product includes changes in the following areas:

- Issuer Script Processing
- Application Selection Indicator
- Track 2 Data
 - used during an ICC transaction
 - to send to the host
- Components
- Error Handling
- Tracing Mechanisms
- EMV Checksum.

For the latest details of the 'EMV/CAM2 Exits for APTRA Advance NDC' product, see the Release Bulletin included with this product.

Issuer Script Processing

Invalidly formatted issuer script data is not rejected during transaction reply validation, prior to issuer script processing. Instead, an attempt to process each script is made until the script is complete, an ICC level error occurs, or a formatted error is discovered.

A formatting error will result in a fake script unsolicited error message being sent to the host (Central). The formatted failure is also reported in the Issuer Script Results.

Application Selection Indicator

The addition to the candidate list of a partial matching AID is now configurable for each AID. To do this, use the Application Selection Indicator field in the "ICC Terminal Acceptable Application IDs Table" download message.

Track 2 Data

The track 2 data used by an ICC transaction and sent to the host can be configured.

Track 2 Data Used During An ICC Transaction

You can specify the track 2 data to be used in the "ICC Terminal Acceptable Application IDs Table" to use either:

- the track 2 equivalent data card object (tag 0x57), or
- the track 2 data obtained from the card's magnetic stripe, or

 simulated track 2 data made up from the card ICC object Application PAN (tag 0x5A) and Application Expiration Date (tag 0x5F24), and the data downloaded in field f21 of the "ICC Terminal Acceptable Application IDs Table" for the selected AID.

Track 2 Data To Be Sent To The Host

You can specify the data to be sent to the host in the track 2 buffer field of the transaction request. Either the track 2 data obtained from the magnetic card, or the track 2 data used for the smart card transaction can be sent.

Components

The following components are included:

- EMV/CAM2 NDC Kernel, which deals with the smart card interaction
- EMV/CAM2 NDC Interface, which deals with the NDC message interface.

Error Handling

The same error handling mechanism (mERRORs) is used as in APTRA Advance NDC, instead of system escapes (ADI_SYSTEM_ESCAPES).

Tracing Mechanisms

For debugging/testing, tracing can be enabled to the journal and/or the Advance NDC Debug Log tool. Tracing should only be enabled for debugging/testing, and not in a live SST environment.

Journal Tracing

Journal tracing of all EMV/CAM2 commands and responses to/from the chip can be enabled via the Windows registry. The data will be traced to the active journal printer(s), including Electronic Journal if it is enabled.

Additionally all terminal-known EMV objects can be traced to the active journal at specific points during the transactions, during the building of DOL objects prior to the 'GET PROCESSING OPTIONS' command and the first and second 'GENERATE APPLICATION CRYPTOGRAM' commands.

The key in the registry to control the tracing is:

HKEY_LOCAL_MACHINE\SOFTWARE\NCR\APTRA\
EMV EXITS\dump ctrl

To enable or subsequently disable tracing, use the Registry Editor (regedit) to:

1 If not already present, create the dump ctrl key in the above location (select Edit | New | Key)

- 2 Under this key, create the value "trace" as type DWORD (select Edit | New | DWORD Value). Set this value to 1 to enable chip input/output tracing, or to 0 to disable this tracing (select Edit | Modify).
- 3 Under the same key, create the value "objects" as type DWORD. Set this value to 1 to enable object store tracing, or to 0 to disable this tracing.
- 4 Reset the SST for the changes to take effect.

Note: Enabling these keys will increase the transaction times, but the traces are useful for debugging issues with specific cards, and for obtaining any required test evidence, for example during Brand Approval.

Debug Log Tracing

The terminal can log all the commands to and responses from the ICC to an Advance NDC Debug Log tool window named 'EMVTrace'. This debug window is created using the **File** | **New** option in the Debug Log tool, or defined in the .ini file if the silent Debug Log tool is being used.

A general debug window named 'EMVDebug' and an XFS-level tracing window named 'EMVXFS' are also available.

Debug logging is enabled via the Windows Registry. If the registry key HKEY_LOCAL_MACHINE\SOFTWARE\NCR\APTRA\EMV EXITS exists and has a DWORD entry 'debuglog' with a non-zero value, all logging is enabled.

EMV Checksum

The terminal produces an EMV checksum covering the EMV kernel software. This checksum is required by EMV and is produced using the SHA-1 Hash algorithm on terminal resident data, for example component version numbers, operating system, and terminal capabilities.

On power-up, if the NDC configuration identifier number has a non-zero value, indicating that the host customisation download information has been retained over the power fail, the EMV checksum is printed together with the component version numbers.

If Debug Log tracing is enabled, the terminal traces the checksum to the 'EMVDebug' window of the Debug Log tool just before the terminal attempts to power-on the chip.

EMV/CAM2 Exits for NDC+

The 'EMV/CAM2 Exits for NDC+' product is designed to be used with NDC+ for IBM OS/2.

For the latest details of the 'EMV/CAM2 Exits for NDC+' product, see the Release Bulletin included with this product.

Chapter 2

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Overview

This chapter describes the function of each of the state table types used for ICC Processing, and their format.

Apart from state types 'A', 'G' and 'I', these state table types are additional to the standard state table types listed in the *APTRA Advance NDC*, *Reference Manual* or the *NDC+ Programmer's Reference Manual*. Refer to the required reference manual for details of state types 'A', 'G' or 'I'.

The state table is made up of the state number, state type and table data. Most states include a screen number and a next state number as part of the table data. In general, where a screen is present it is displayed when the state is entered, the terminal performs the action specified by the state type, and the transaction flow continues from the specified next state.

The following table lists each of the state table types that control transaction processing using ICC processing:

| State Table Type | Description |
|---------------------|---|
| A | Card Read |
| G | Amount Check |
| I | Transaction Request |
| T | Card Read - PIN Entry Initiation. See Note. |
| + | Begin ICC Initialisation |
| , (comma) | Complete ICC Initialisation |
| - | Automatic Language Selection |
| . (full stop) | Begin ICC Application Selection & Initialisation |
| / | Complete ICC Application Selection & Initialisation |
| ? | Set ICC Transaction Data |
| ; | ICC Re-initialise |

Note: The "T - Card Read - PIN Entry Initiation State" must be used for a Dip And Smart Hardware (DASH) card reader.

A - Card Read State

The Card Read state performs the following actions:

- Displays the screen that you have selected to prompt the cardholder to enter a card
- Displays the error screen that you have selected if the card cannot be read
- Sets the Media Entry Indicator flashing while the card reader is waiting for the cardholder to enter a card. The indicator is switched off when the card is entered.
- Defines from the read conditions which track(s) and/or chip data on the card will be read.

For further details of this state type, see the relevant *APTRA Advance NDC*, *Reference Manual* or the *NDC+ Programmer's Reference Manual*.

G - Amount Check State

This state checks to see whether the cardholder has entered a whole amount (for example, dollars only) or a non-whole amount (for example, dollars and cents). Two additional checks are performed:

- Whether the amount held within a specified buffer is a multiple of an identified value.
- Whether the amount held within a specified buffer is dispensable when taking into account the currency required, denominations available, dispenser status and cassette status. Note counts are ignored.

For EMV smart card processing, use the Amount Check state to more efficiently check the entered amount, instead of submitting an invalid value to the smart card for authorisation. Submission of an invalid value to the card would cause an ARQC to be returned, but the transaction would be subsequently refused as the requested amount cannot be dispensed, and the smart card would need re-initialisation before requesting another amount.

For further details of this state type, see the relevant *APTRA Advance NDC*, *Reference Manual* or the *NDC+ Programmer's Reference Manual*.

I - Transaction Request State

This state sends a Transaction Request message to Central, and executes the Transaction Reply command received from Central. The information that is to be included in the Transaction Request message is defined in this state table.

As part of the Advance NDC or NDC+ Transaction Request State, the terminal optionally performs the CAM processing required to generate the appropriate data for transmission in the Transaction Request.

If CAM processing is to be performed, this is indicated by the presence of an extension state (identified in table entry 9) which has table entry 8 (Perform EMV CAM Processing) set to '001'. In order for table entry 9 in the 'I' state to be an extension state, the Most Significant Bit (MSB) of table entry 8 must be set to '1'.

All relevant ICC data is sent to Central in the Transaction Request 'Smart Card Data' buffer as indicated in "Transaction Request Message Format" in Chapter 4, "Terminal to Central Messages".

Transaction Request Processing

The processing performed at this point in the transaction flow consists of the following main steps.

Processing Restrictions

The processing restriction checks not already done are now performed. This involves comparing the cardholder's selected transaction against the card's Application Usage Control.

The other checks which make up the EMV Processing Restrictions stage are performed earlier in the transaction; see "Processing Restrictions" in "ICC Application Select & Initialise Processing".

Terminal Risk Management

If the Terminal Floor Limit data object (tag 0x9F1B) has been downloaded from the host, and the Application Interface Profile indicates this is supported, card floor limit checking is performed according to standard EMVCo rules.

CVM Processing

Cardholder Verification Method (CVM) processing is performed according to standard EMVCo rules.

The terminal will only recognise and support the 'Enciphered PIN verified online' (0x02/0x42) and 'Fail CVM Processing' (0x00/0x40)

CVM codes. However, the terminal will also recognise (but not support) the codes:

- Plain text PIN, verification performed by ICC (0x01/0x41)
- Plain text PIN, verification performed by ICC, combined with paper based signature (0x03/0x43)
- Enciphered PIN, verification performed by ICC (0x04/0x44)
- Enciphered PIN, verification performed by ICC, combined with paper based signature (0x05/0x45)
- Paper based signature (0x1E/0x5E)
- No CVM required (0x1F/0x5F).

Terminal Action Analysis

As an Advance NDC/NDC+ terminal can only perform transactions online, only the IAC-Denial and TAC-Denial objects are verified against the Terminal Verification Results (TVR) during terminal action analysis. The terminal will not approve a transaction offline.

If the result of comparing the Denial objects against the TVR is zero, an Authorisation Request Cryptogram (ARQC) request to go online is submitted by the terminal.

If the result of comparing the Denial objects against the TVR is non-zero, the ICC application is not usable, and the following actions are taken:

- **a** The offline denial journaling described in "Offline Decline Journal Message" is performed.
- b The 'Authorisation Response Code' (tag 0x8A) data object is created, set to a value of 'Z1' and stored.
- c An ICC 'GENERATE AC' command is used to generate an Application Authentication Cryptogram (AAC). This command is submitted with command data obtained by processing the CDOL1 data object (tag 0x8C).

Card Action Analysis

Card action analysis processing is performed according to standard EMVCo rules.

If the ICC 'GENERATE AC' command was successful and the response data contained the required data objects, the Cryptogram Information Data (CID) is checked.

If the CID indicates that a Transaction Certificate (TC) was returned, or that an Application Authentication Cryptogram (AAC) was not returned when an AAC was requested, a fake ICC application level error 'Authentication Failure' (SW1 = 0x63, SW2 = 0x00) is generated.

If the CID indicates that an Application Authorisation Referral (AAR) was returned, a fake ICC application level error 'Authentication Failure' (SW1 = 0x63, SW2 = 0x00) is also generated.

Host Processing

Central replies with an Interactive Transaction Response (ITR) or a Transaction Reply. The ITR can also return CAM data prior to the Transaction Reply.

The ITR and Transaction Reply are validated as per standard Advance NDC or NDC+. If this validation fails, a standard command reject or specific command reject is sent. A new response with or without CAM data, as appropriate for a rejected Central response, is awaited.

In addition, if the host response contains CAM data in any of the following conditions:

- no CAM data was transmitted
- CAM flags transmitted indicated an error (byte 1 bits 2, 3 & 4 and byte 2 bit 6)
- CAM data has already been received in an earlier ITR, or
- the cryptogram returned by the card indicated a decline,

then the Transaction Reply or ITR will be rejected with a specific command reject of 'B98'. A new response, without CAM data, will be awaited.

If any of the following events occur while the host response is being processed:

- issuer script processing suffered an ICC application level error or formatting error which resulted in a script failing to complete successfully, and the 'Enhanced Configuration Parameters Load' option number '69' either has no value or has a value in which bit 3 is not set, or
- issuer script processing encountered an incorrectly formatted script template, script command, or script identifier, and the 'Enhanced Configuration Parameters Load' option number '69' either has no value or has a value in which bit 3 is not set, or
- the ICC 'GENERATE AC' command requested a 'TC' (Transaction Certificate), but did not get a 'TC' in the command response,

then if no solicited status message has been sent to the host since these events, a fake ICC application level error will be generated with CLA = 0xFF, INS = 0xFF, P1 = 0xFF, P2 = 0xFF, P3 = 0xFF, P4 = 0xFF, P5 =

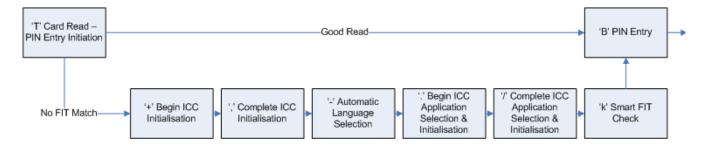
status message to the host. A new response, without CAM data, is awaited.

T - Card Read - PIN Entry Initiation State

This state **must** be used for Dip And Smart Hardware (DASH) card readers. However, if the DASH reader is used as a DIP reader, the "A - Card Read State" state can also be used.

The "T - Card Read - PIN Entry Initiation State" should be used as shown in the following diagram.

'T' State Flow Diagram



Note: If using a DASH card reader, but no chip connect bit is set, the DASH will behave as a standard DIP reader.

The following points should also be considered:

- If this state is configured to look for a chip, that is the chip connect bit is set in one or more of the read conditions, Advance NDC will attempt to power-on and obtain the Answer To Reset (ATR) from the chip card. If this is successful, then the magnetic tracks will not be read. Only if the attempt to obtain the ATR fails will the magnetic tracks then be attempted to be read.
- If a chip is found, there will be no track 2 data available to Advance NDC until the "/ Complete ICC Application Selection & Initialisation State" has finished successfully and the good exit from this state is taken. In this case, the Track 2 data will be derived from the chip data object(s). If any other exit is taken from this completion state, Track 2 data will not be available for Advance NDC.
- Due to there being no track data available, the checking that is done on the Alternative Technology Byte (ATB) of the magnetic stripe in the "+ - Begin ICC Initialisation State" should be turned off (that is, table entry 4 should be set to 000).

- Without Track 2 data, the states which require it (for example, PIN Entry, FIT Switch, Smart FIT Check) will not operate correctly and so should not be used until the Track 2 data is available.
- The "+ Begin ICC Initialisation State" can now additionally take the 'ICC Initialisation Not Started' exit for a DASH reader, if the Advance NDC Answer To Reset shared buffer is found to be empty.
- If the DASH reader is present, the terminal capabilities object (tag 9F33) will be populated with the value of 60 40 00 to reflect that the reader is not capable of card capture.

For further details of this state type, see the relevant *APTRA Advance NDC*, *Reference Manual* or the *NDC+ Programmer's Reference Manual*.

+ - Begin ICC Initialisation State

The purpose of this state is to activate parallel processing to perform the ICC application candidate list build.

In addition, automatic ICC application selection may be performed if configured via table entry 5 'Automatic ICC Application Selection Flag'.

| Table Entry | Number of Characters | Contents | Description |
|----------------|-------------------------|---|---|
| 1 | 1 | State Type | ·+ ' |
| 2 | 3 | ICC Initialisation Started Next State Number (Range 000-254 or 256-750) | Next state to process if ICC initialisation has been started. |
| 3 | 3 | ICC Initialisation Not Started Next State Number (Range 000-254 or 256-750) | Next state to process if ICC initialisation has not been started. ICC initialisation is not started if the ATB condition in table entry 4 has not been met, or the MCRW device has a severity of 'Suspend' or 'Fatal'. |
| 4 | 3 | ICC Initialisation Requirement (Range 000-001) | Indicates when ICC processing should be initiated. 000 - Always begin ICC initialisation. 001 - Only begin ICC initialisation if the magnetic stripe track 2 data has been read and contained an ATB value of '2' or '6'. |
| 5 | 3 | Automatic ICC Application Selection Flag (Range 000-001) | Flag to indicate if automatic ICC application selection is required. 000 - Cardholder ICC application selection or confirmation to be performed. 001 - Automatic ICC application selection to be performed. |

| Table Entry | Number of Characters | Contents | Description |
|----------------|-------------------------|--|--|
| 6 | 3 | Default Application Label Usage Flag (Range 000-002) | Flag to indicate the action to be taken if an ICC application name is not provided by an ICC application during candidate list build processing. See the following "ICC Initialise and Candidate List Build" section. |
| | | | 000 - If an ICC application name is not provided, the corresponding default 'Application Label' is used as the name. If no default label is supplied, the application is added to the candidate list without any name. |
| | | | 001 - If an ICC application name is not present, the default 'Application Label' is not used as the name; the application is added to the candidate list without any name. |
| | | | 002 - No longer supported. Accepted only for backward compatibility. If set to this value, the behaviour is as option '001'. |
| 7 | 3 | Cardholder Confirmation Flag (Range 000-001) | Flag to indicate the action to be taken if an ICC application indicates that cardholder confirmation is required, via the 'Application Priority Indicator' (tag 0x87) during candidate list build processing. |
| | | | 000 - Do not check if the ICC application requires cardholder confirmation. |
| | | | 001 - Check if the ICC application requires cardholder confirmation. If cardholder confirmation is required then the ICC application is not added to the candidate list. If the 'Application Priority Indicator' data object is not provided, the ICC application is treated as not requiring cardholder confirmation. |

+ - Begin ICC Initialisation State

| Table Entry | Number of Characters | Contents | Description |
|----------------|-------------------------|--|--|
| 8 | 3 | Screen To Clear Screen Number (Range 000 - 999) | Number of ICC application name screen, which is to be overwritten with a single space (0x20) character. If no screen is to be overwritten, the table entry is set to '000'. |
| | | | This table entry is used to enable one PIN entry state to be used for both magnetic stripe and ICC transactions. |
| | | | If this table entry is used, the PIN entry screen used in the PIN entry state should include the ICC Application Name Screen, used in table entry 4 of the "/- Complete ICC Application Selection & Initialisation State". For example, "Please enter your PIN <si>xxx", where xxx is the ICC Application Name Screen number.</si> |
| | | | The 'xxx' screen content should contain the ICC Application Name, set up by the "/ - Complete ICC Application Selection & Initialisation State", using the ICC Application Name Template Screen Number, table entry 3. For example, "for ************************************ |
| | | | Using this method, for an ICC transaction the cardholder would be prompted with the message: |
| | | | "Please enter your PIN for <icc application="" name="">"</icc> |
| | | | For a magnetic stripe transaction, the cardholder would be prompted with the message: |
| | | | "Please enter your PIN" |
| | | | The screen number identified by this entry (in this example 'xxx') has a single space written to it in this Begin ICC Initialisation State. This 'blanks' the screen, required when an ICC transaction is followed by a magnetic stripe transaction, or when a second ICC transaction fails before the card is initiated. |
| 9 | 3 | Must be 000 | Reserved for future extension state. |

If the MCRW device severity is 'Suspend' or 'Fatal', ICC Initialisation is not performed. Processing proceeds to the next state identified in table entry 3 'ICC Initialisation Not Started Next State Number'.

If the MCRW device severity is not 'Suspend' or 'Fatal', then the conditions for performing ICC initialisation, as indicated by table entry 4 'ICC Initialisation Requirement', are checked.

If the conditions have been met, the processing identified in "Data Object List (DOL) Processing" in Chapter 7, "ICC Processing" is started in parallel with the main NDC CAM application. Processing proceeds to the next state identified in table entry 2 'ICC Initialisation Started Next State Number'.

If the conditions have not been met, processing proceeds to the next state identified in table entry 3 'ICC Initialisation Not Started Next State Number'.

If automatic ICC application selection is required, this is handled by the processing described in "Data Object List (DOL) Processing" in Chapter 7, "ICC Processing".

ICC Initialise and Candidate List Build

The ICC Initialise and Candidate List Build procedure is summarised as follows.

After successfully powering up the ICC, the ICC is searched for ICC applications which can be processed by the terminal, for inclusion in a candidate list.

The ICC is searched for candidates by selecting the Primary AID Full/Partial Value from each ICC Terminal Acceptable AIDs Table entry in turn, starting with entry '00' and finishing with entry 'FF' inclusive.

The ICC application-related data is checked, and if it is found to be invalid or incorrectly formatted, processing continues using the next 'ICC Terminal Acceptable AIDs Table' entry. If there are no more entries to process, the search process is complete.

To improve the search performance, remaining ICC Terminal Acceptable AIDs Table entries are selectively eliminated from the search process, based on the Secondary AID Full/Partial Values held in each successfully selected Primary AID Full/Partial Value entry.

The eliminated entries are those where the Primary AID value is shorter than the shortest Secondary AID value, or if the Primary AID value does not start with the same value as a Secondary AID value of equal or shorter length.

The following example illustrates this procedure.

+ - Begin ICC Initialisation State

For example, if a card has three applications with Acceptable AIDs 26, 27 and 28 and the Acceptable AIDs Table contains:

| Primary AID value | Secondary AID value |
|-------------------|---------------------|
| 26 | 27 and 28 |
| 27 | |
| 28 | |
| 30 | |
| 32 | |

In this case, AID value 26 is successfully selected, so 30 and 32 are filtered out of the list.

AID value 27 is successfully selected, so 28 is filtered out of the list because there are no secondary entries

There are no more entries to be checked, so the candidate list consists of values 26 and 27 only.

Note: For all three applications (AIDs 26, 27 and 28) to be accepted and shown, the AID table entry containing Primary AID value 27 would have to include the Secondary AID value 28.

For details of the ICC Terminal Acceptable Application IDs Table, see "ICC Terminal Acceptable Application IDs Table" in Chapter 5, "Central to Terminal Messages".

Canadian List Filtering

If there are one or more ICC applications in the EMV candidate list, Canadian list filtering may now be optionally performed. By default, this processing is not performed.

Canadian list filtering is performed if the candidate list contains one or more applications and the registry key \HKEY_LOCAL_MACHINE \SOFTWARE\NCR\APTRA\EMV EXITS\Canadian Filter is present, is of type DWORD, and contains a non-zero value.

In this case, each application on the current EMV candidate list is checked and added to either a Canadian primary or Canadian secondary candidate list, or ignored and not added to either list. The Canadian primary list, or secondary list if the primary list is empty, is then used by the terminal from this point onwards.

, - Complete ICC Initialisation State

The purpose of this state is to await completion of the parallel processing identified in "Data Object List (DOL) Processing" in Chapter 7, "ICC Processing", after activation by State Type "+ - Begin ICC Initialisation State".

| Table Entry | Number of Characters | Contents | Description |
|----------------|---|---|--|
| 1 | 1 | State Type | · · · · · · · · · · · · · · · · · · · |
| 2 3 | 3 | Please Wait Screen Number (Range 000-999) | Optional screen to display while awaiting the possible completion of ICC initialisation. |
| | | | If no screen is to be displayed then the table entry is set to $^{\prime}000^{\prime}.$ |
| 3 | 3 | ICC Initialisation Successful Next State Number (Range 000-254 or 256-750) | Next state number if ICC initialisation was successfully performed. |
| 4 | 3 | Card Not Smart Next State Number (Range 000-254 or 256-750) | Next state number if the ICC was found not to be smart. |
| | | (runge ood 201 of 200 roo) | Note : This path could also be taken if a failure condition occurs which cannot be distinguished from 'IC not present on card', for example dirty ICC contacts. |
| 5 | 5 3 | No Usable Applications Next State Number (Range 000-254 or 256-750) | Next state number if ICC initialisation found no usable ICC applications for inclusion in the candidate list. |
| | | | If table entry 8 is set to non-zero, this next state number is only taken if none of the selected applications were blocked. |
| 6 | 3 | ICC Application Level Error Next State Number (Range 000-254 or 256-750) | Next state number if ICC initialisation failed as a result of an ICC application level error. |
| | If table entry 8 is set number is only taker | If table entry 8 is set to non-zero, this next state number is only taken if an ICC application level error occurred, but this error is not due to a blocked card. | |

| Table Entry | Number of Characters | Contents | Description |
|----------------|-------------------------|---|--|
| 7 | 3 | ICC Hardware Level Error Next State Number (Range 000-254 or 256-750) | Next state number if ICC initialisation failed as a result of an ICC hardware level error. |
| 8 | 3 | No Usable Applications (Fallback Forbidden) Next State Number | Next state number if there are no usable applications but fallback is forbidden. |
| | | (Range 000-254 or 256-750) | If this field is non-zero, it contains the next state number to take if the card was blocked, or if the ICC initiation found no usable ICC applications for inclusion in the candidate list, and one or more of the selected applications was blocked. |
| | | | If this field is zero, table entry 5 next state number will be taken when no usable applications were found, and table entry 6 next state number will be taken when a blocked card is discovered. |
| 9 | 3 | Must be 000 | Reserved. |

If this state is entered when the parallel processing in "Data Object List (DOL) Processing" in Chapter 7, "ICC Processing" has not been started, processing proceeds to the default close state.

If the parallel processing has been started but has not yet completed, and table entry 2 'Please Wait Screen Number' has a value other than '000', the screen number identified by table entry 2 is displayed to the cardholder. The completion of the ICC initialisation parallel processing is awaited.

When the parallel processing completes, or if ICC initialisation parallel processing has already completed, the appropriate exit path in the previous table is taken.

Note: If the Complete ICC Initialisation state is entered after automatic ICC application has been selected in the "+ - Begin ICC Initialisation State", then this state will exit to the default exit state.

- - Automatic Language SelectionState

Following the successful completion of State Type ',' (Complete ICC Initialisation) or State Type '/' (Complete ICC Application Selection & Initialisation), it may be possible to determine the language preference of the cardholder from ICC data.

The cardholder language preference can only be determined from the ICC data if the 'Language Preference' data object (0x5F2D) is obtained during ICC application search and selection processing.

| Table Entry | Number of Characters | Contents | Description |
|----------------|--|--|---|
| 1 | 1 | State Type | ·2· |
| 2 | 3 | Language Match Next State Number (Range 000-254 or 256-750) | Next state number if ICC language preference data matches one of those supported at the terminal. |
| Numbe | No Language Match Next State Number (Range 000-254 or 256-750) | Next state number if ICC language preference data did not match those supported at the terminal. | |
| | | (realize out to 1 or not to) | Note : Screen base, audio base and opcode buffers are unchanged. |
| 4-9 | 18 | Must be 000 | Reserved. |

The languages which Central supports at the terminal are indicated by the contents of the ICC Language Support Table; see "ICC Language Support Table" in Chapter 5, "Central to Terminal Messages".

Automatic language selection cannot be performed in the following conditions:

- The 'Language Preference' data object (0x5F2D) was not obtained from the ICC
- The 'ICC Language Support Table' has not been downloaded
- ICC parallel processing has not been completed via the execution of State Type ',' (Complete ICC Initialisation) or State Type '/' (Complete ICC Application Selection & Initialisation).

If one or more of these conditions occurs, processing proceeds to the state number identified in table entry 3 'No Language Match Next State Number'.

State Tables

- - Automatic Language Selection State

If the 'Language Preference' data object is obtained from the ICC, automatic language selection can be performed. The 'Language Preference' data object contains up to four two-character language codes in priority order. Each language code is taken in turn and compared to the language codes held in the 'ICC Language Support Table' entries.

If a language code from the 'Language Preference' data object finds a match against a language code in an 'ICC Language Support Table' entry, the opcode buffer, audio base and cardholder screen base are set to the settings held in the 'ICC Language Support Table' entry. Processing proceeds to the state number identified in table entry 2 'Language Match Next State Number'.

If no match is found between any of the language codes in the 'Language Preference' data object and a language code in the 'ICC Language Support Table', the opcode buffer, audio base and cardholder screen base remain unchanged. Processing proceeds to the state number identified in table entry 3 'No Language Match Next State Number'.

. - Begin ICC Application Selection & Initialisation State

The purpose of this state is to enable the appropriate interaction with the cardholder, to determine which ICC application is to be used for CAM processing.

This state must be preceded by the "+ - Begin ICC Initialisation State".

| Table Entry | Number of Characters | Contents | Description |
|----------------|--|--|---|
| 1 | 1 | State Type | |
| 2 3 | 3 Cardholder Selection Screen Number (Range 000-999) | Screen number of the cardholder screen to be used as the menu screen background. This screen is only displayed when the ICC application to be processed is being selected by the cardholder. | |
| | | | This table entry is used for the cardholder screen in all cases, except if there is a single application to be displayed and table entry 6 is non-zero, in which case table entry 6 is used instead. |
| 3 | 3 | FDK Template Screen Numbers Extension State Number (Range 000-254 or 256-750) | State number for the extension state that identifies which screen numbers hold the ICC application name templates for use against each FDK (and indirectly which of the FDKs are to be used). |
| 4 | 3 | Action Keys Extension State Number (Range 000-254 or 256-750) | State number for the extension state that identifies the FDK for each action key, and the numbers of the screens holding the text for each FDK used as an action key. |
| 5 | 3 | Exit Paths Extension State Number (Range 000-254 or 256-750) | State number for the extension state that identifies the next state numbers for the exit paths from this state. |
| 6 | 3 | Single Application Cardholder Selection Screen Number (Range 000-999) | Screen number of the cardholder screen to be used as the menu screen background when one application is displayed. If this entry is zero, the screen defined in state table entry 2 is used as the menu screen background in all cases. |
| 7-9 | 9 | Must be 000 | Reserved. |

FDK Template Screen Numbers Extension State

| Table Entry | Number Of Characters | Contents | Description |
|----------------|-------------------------|---|---|
| 1 | 1 | State Type | 'Z' |
| 2 3 | 3 | FDK A ICC Application Name Template Screen Number (Range 000-999) | Screen number to use as a template for the display of the ICC application name against FDK A. |
| | | (| A value of '000' indicates that this FDK is not used. |
| 3 | 3 | FDK B ICC Application Name Template Screen Number (Range 000-999) | Screen number to use as a template for the display of the ICC application name against FDK B. |
| | | (mange ood ood) | A value of '000' indicates that this FDK is not used. |
| 4 | 3 | FDK C ICC Application Name Template Screen Number (Range 000-999) | Screen number to use as a template for the display of the ICC application name against FDK C. |
| | | (ivalige ood ood) | A value of '000' indicates that this FDK is not used. |
| 5 | 3 | FDK D ICC Application Name Template Screen Number (Range 000-999) | Screen number to use as a template for the display of the ICC application name against FDK D. |
| | | (mange ood ood) | A value of '000' indicates that this FDK is not used. |
| 6 | 3 | FDK F ICC Application Name Template Screen Number (Range 000-999) | Screen number to use as a template for the display of the ICC application name against FDK F. |
| | | (ivalige 000-000) | A value of '000' indicates that this FDK is not used. |
| 7 | 3 | FDK G ICC Application Name Template Screen Number (Range 000-999) | Screen number to use as a template for the display of the ICC application name against FDK G. |
| | | (ivalige ood ood) | A value of '000' indicates that this FDK is not used. |
| 8 | 3 | FDK H ICC Application Name Template Screen Number | Screen number to use as a template for the display of the ICC application name against FDK H. |
| | | (Range 000-999) | A value of '000' indicates that this FDK is not used. |
| 9 | 3 | FDK I ICC Application Name Template Screen Number | Screen number to use as a template for the display of the ICC application name against FDK I. |
| | | (Range 000-999) | A value of '000' indicates that this FDK is not used. |

Action Keys Extension State

| Table Entry | Number Of Characters | Contents | Description | |
|----------------|-------------------------|---|---|--|
| 1 | 1 | State Type | 'Z' | |
| 2 | 3 | More Applications Screen Number (Range 000-999) | Screen number to be displayed when the FDK is activated, to enable the cardholder to access the next screen of ICC application names. | |
| 3 | 3 | FDK For More Applications (Range 001-008) | FDK to be used to allow the cardholder to access the next screen of ICC application names: | |
| | | | 008 - FDK I 001 - FDK A 007 - FDK H 002 - FDK B 006 - FDK G 003 - FDK C 005 - FDK F 004 - FDK D | |
| 4 | 3 | Back To Start of List Screen Number (Range 000-999) | Screen number to be displayed when the FDK is activated, to enable the cardholder to return to the first screen of ICC application names. | |
| 5 | 3 | FDK For Back To Start of List (Range 001-008) | FDK to be used to allow the cardholder to return to the first screen of ICC application names: | |
| | | | 008 - FDK I 001 - FDK A 007 - FDK H 002 - FDK B 006 - FDK G 003 - FDK C 005 - FDK F 004 - FDK D | |
| 6-9 | 12 | Must be 000 | Reserved. | |

Exit Paths Extension State

| Table Entry | Number Of Characters | Contents | Description |
|----------------|-------------------------|--|--|
| 1 | 1 | State Type | 'Z' |
| 2 | 3 | Time Out Next State Number (Range 000-254 or 256-750) | Next state if the cardholder does not respond in time when input is requested. |
| 3 | 3 | Cancel Key Next State Number (Range 000-254 or 256-750) | Next state if the cardholder selects cancel when input is requested. |
| 4 | 3 | Cardholder Selected Application Next State Number (Range 000-254 or 256-750) | Next state number if the cardholder selects an ICC application. |

. - Begin ICC Application Selection & Initialisation State

| Table Entry | Number Of Characters | Contents | Description |
|----------------|-------------------------|---|---|
| 5 | 3 | Application Selected Automatically Next State Number (Range 000-254 or 256-750) | Next state number if the ICC application selection is being performed automatically, because there is only one ICC application available. |
| 6 | 3 | No Usable Applications Next State Number (Range 000-254 or 256-750) | Next state number if there are no ICC applications for the cardholder to choose from. |
| 7 | 3 | No Usable Applications (Fallback Forbidden) Next State Number (Range 000-254 or 256-750) | Next state number if there are no usable applications, but fallback is forbidden. If this field is non-zero, it contains the next state number to take if the last application was successfully declined offline and fallback is not allowed. If this field is zero, table entry 6 next state number is taken in all cases when no usable application is found. |
| 8-9 | 6 | Must be 000 | Reserved. |

To ensure that processing can be performed successfully, the state parameters are validated to ensure that their values are within the ranges identified, and that at least two FDKs are available for displaying ICC application names. If these conditions are not met, processing proceeds to the default close state; otherwise processing continues.

If there are no ICC applications present in the candidate list maintained by the terminal, processing proceeds to the next state in the 'Exit Paths Extension State', table entry 6 'No Usable Applications Next State Number'.

If option digit 69 bit 4 is not set and there is only one ICC application present in the candidate list which does not require cardholder confirmation, and no previous application has been selected using this menu which was then found to be unusable, the "ICC Application Select & Initialise Processing" processing described in the following section is started, using the only ICC application in the list. Processing then proceeds to the next state identified in 'Exit Paths Extension State' table entry 5 'Application Selected Automatically Next State Number'.

If option digit 69 bit 4 is set and there is only one application, the "ICC Application Select & Initialise Processing" processing described in the following section is started, using the only ICC application in the list. Processing then proceeds to the next state identified in 'Exit Paths Extension State' table entry 5 'Application Selected Automatically Next State Number'.

If there is more than one ICC application present in the candidate list, or bit 4 of option 69 is not set and either there is only one ICC application present in the candidate list which requires cardholder confirmation, or there is now only one ICC application present in the candidate list and a previous application which was selected via this menu has been found to be unusable, the ICC application(s) are presented by name to the cardholder, to allow the cardholder to select the ICC application to be used for processing. To present the ICC applications to the cardholder, a menu screen is built up using the screen number identified in table entry 2 'Cardholder Selection Screen Number' as background. The ICC application names are overlaid based on the appropriate template screens identified in the 'FDK Template Screen Numbers Extension State'.

An FDK position on the menu screen is only used to display an ICC application name if all the following are true:

- There are sufficient ICC applications so that the FDK position is required for display of an ICC application name
- The screen number associated with the FDK in the 'FDK Template Screen Numbers Extension State' is not '000'
- The FDK position is not being used for an 'action key'.

FDK positions are prioritised for use in the order I, A, H, B, G, C, F, D, where FDK I has the highest priority and FDK D has the lowest priority. If an FDK position is not available for use, it is eliminated from the list without changing the precedence of the remaining FDK positions.

If an FDK position on the menu screen is to be used to display an ICC application name, the ICC name is overlaid onto the screen using the template screen number indicated as mapped to the FDK position by the 'FDK Template Screen Numbers Extension State'. The method used for processing the template screen is described in "ICC Application Name Display" in Chapter 7, "ICC Processing".

ICC applications are presented to the cardholder in priority order. The highest priority ICC application has its name displayed against the highest priority FDK position available.

If the candidate list contains more ICC applications than can be presented on a single screen with the available FDKs, multiple menu screens are used. This is achieved by using the menu screen as a window on the candidate list. The window is moved around the list by using action keys which are automatically introduced to the menu.

If the displayed menu is full of ICC applications and there are more to be displayed, the FDK identified in table entry 3 'FDK For More Applications' of the 'Action Keys Extension State' is activated, and

. - Begin ICC Application Selection & Initialisation State

the screen number identified in table entry 2 'More Applications Screen Number' of the same state is displayed.

If the cardholder selects the 'FDK For More Applications', the menu screen is redisplayed with the next set of ICC applications from the candidate list.

If the displayed menu does not contain the first entry from the candidate list, the FDK identified in table entry 5 'FDK For Back To Start of List' of the 'Action Keys Extension State' is activated, and the screen number identified in table entry 4 'Back To Start of List Screen Number' of the same state is displayed.

If the cardholder selects the 'FDK For Back To Start of List', the menu screen is redisplayed with the ICC applications from the top of the candidate list.

If the cardholder selects the 'FDK For More Applications', the menu screen is redisplayed with the next set of ICC applications from the candidate list.

If the cardholder selects an ICC application to be used from the displayed menu screen, the ICC Application Select & Initialise processing is started, using the selected ICC application. Processing proceeds to the next state identified in 'Exit Paths Extension State' table entry 4 'Cardholder Selected Application Next State Number'.

If the cardholder does not respond to the displayed menu screen in time, processing proceeds to the next state identified in 'Exit Paths Extension State' table entry 2 'Time Out Next State Number'.

If the cardholder selects cancel from a displayed menu screen, processing proceeds to the next state identified in 'Exit Paths Extension State' table entry 3 'Cancel Key Next State Number'.

Note: The screen base offset, used for foreign languages, is not applied to any screen number used from the 'FDK Screen Numbers Extension State'.

ICC Application Select & Initialise Processing

The ICC Application Select & Initialise processing consists of the following main steps.

Application Selection

The ICC application from the candidate list, which the terminal or cardholder has indicated to be used, is selected. If this fails or returns invalid data, the application is considered unusable.

Processing Options

The terminal issues a Get Processing Options command according to standard EMVCo rules.

Read Records

The terminal issues a set of Read Record commands and processes each response according to standard EMVCo rules.

In addition, if the AID of the current application begins 'A00000004' indicating it is a MasterCard application, the ICC Track 2 equivalent data object (tag 0x57) is checked for consistency with the ICC Application PAN data object (tag 0x5A) and the ICC application expiry date data object (tag 0x5F24). If the PAN object does not match the PAN contained within the Track 2 equivalent data, or the application expiry data object does not match the application expiry date encoded in the ICC Track 2 equivalent data, a fake ICC application level error 'part of returned data may be corrupted' (SW1 = 0x62, SW2 = 0x81) is generated.

For the purposes of this check, the location of the PAN encoded within the ICC Track 2 equivalent data is assumed to be from the first byte of data to the first field separator. The location of the application expiry date encoded within the ICC Track 2 equivalent data is assumed to be the first four characters after the first field separator.

If this consistency check is not required, create the registry DWORD \hkey_local_machine\software\ncr\aptra\emv exits\ disable_track_2_check with a non-zero value.

Processing Restrictions

The processing restriction checks performed at this point are the application version number, application expiry date and application effective date. The other checks which make up the EMV Processing Restrictions stage are performed later in the transaction; see "Processing Restrictions" in "Transaction Request Processing".

. - Begin ICC Application Selection & Initialisation State

Terminal Action Analysis

The terminal now performs the first of two Terminal Action Analysis checks. The IAC-Denial and TAC-Denial objects are verified against the Terminal Verification Results (TVR). If the result of this calculation is zero, the ICC Application Selection & Initialise processing has successfully completed.

If the result of this calculation is greater than zero, the ICC application is not usable, and the following actions are taken:

- **a** The offline denial journaling described in "Offline Decline Journal Message" is performed.
- b The 'Authorisation Response Code' (tag 0x8A) data object is created, set to a value of 'Z1' and stored.
- c An ICC 'GENERATE AC' command is used to generate an Application Authentication Cryptogram (AAC). This command is submitted with command data obtained by processing the CDOL1 data object (tag 0x8C).
- d The ICC application is removed from the candidate list. If the candidate list is now empty, a fake ICC application level error 'File Not Found' (SW1 = 0x6A, SW2 = 0x82) is generated and processed as though it resulted from the card.

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/ - Complete ICC Application Selection & Initialisation State

The purpose of this state is to await completion of the ICC Application Select & Initialise processing.

If this state is entered when the ICC Application Select & Initialise processing has not been activated, processing proceeds to the next state identified in 'Exit Paths Extension State' table entry 8 'Processing Not Performed Next State Number'.

| Table Entry | Number of Characters | Contents | Description |
|----------------|-------------------------|--|--|
| 1 | 1 | State Type | ·/' |
| 2 | 3 | Please Wait Screen Number (Range 000-999) | Screen to display while awaiting the possible completion of ICC application selection and initialisation parallel processing. |
| | | | If the screen number is set to '000' then no screen is displayed. |
| 3 | 3 | ICC Application Name Template Screen Number (Range 000-999) | Template screen which contains the template to use to generate the display data of the screen containing the selected ICC application name. |
| | | | If the screen number is set to '000' or is empty, the ICC application name is not stored, and the screen number referenced within table entry 4 (if not '000' is set to a single space character (0x20). |
| 4 | 3 | ICC Application Name Screen Number (Range 000-999) | Screen in which the output of processing the template screen is stored, containing the name of the selected ICC application. |
| | | | If the screen number is set to '000', the ICC application name is not stored. |
| | | | If an ICC application is not successfully selected and initialised upon execution of this state, the indicated screen is set to contain a single space character (0x20). |
| 5 | 3 | Exit Paths Extension State Number (Range 000-254 or 256-750) | State number for the extension state that identifies the next state numbers for the possible exit paths from this state. |
| 6-9 | 12 | Must be 000 | Reserved. |

Exit Paths Extension State

| Table Entry | Number Of Characters | Contents | Description |
|----------------|-------------------------|--|---|
| 1 | 1 | State Type | ´Z` |
| 2 | 3 | ICC Application Select & Initialisation Successful Next State Number (Range 000-254 or 256-750) | Next state number if the ICC application was successfully selected and initialised. |
| 3 | 3 | Card Not Smart Next State Number (Range 000-254 or 256-750) | Next state number if the card was found not to be a smart card (ICC). Note: This path could also be taken if a failure condition occurs which cannot be distinguished from 'IC not present on card', for example dirty |
| | | | ICC contacts. |
| 4 | 3 | ICC Application Not Usable Next State Number (Range 000-254 or 256-750) | Next state number if the selected ICC application was found not to be usable at the terminal. |
| 5 | 3 | No Suitable ICC Applications Next State Number (Range 000-254 or 256-750) | Next state number if automatic ICC application selection and initialisation was performed, but no suitable applications were found. |
| | | | This entry only applies if automatic ICC application selection was performed. |
| | | | If table entry 9 is non-zero, this next state number is only taken if none of the selected applications were blocked. |
| 6 | 3 | ICC Application Level Error Next State Number (Range 000-254 or 256-750) | Next state number if the ICC application selection and initialisation failed as a result of an ICC application level error. |
| | | | If table entry 9 is non-zero, this next state number is only taken if an ICC application level error occurred, but this error is not due to a blocked card |

| Table Entry | Number Of Characters | Contents | Description |
|----------------|-------------------------|---|--|
| 7 | 3 | ICC Hardware Level Error Next State Number (Range 000-254 or 256-750) | Next state number if the ICC application selection and initialisation failed as a result of an ICC hardware level error. |
| 8 | 3 | Processing Not Performed Next State Number (Range 000-254 or 256-750) | Next state number if ICC application selection and initialisation is not being performed, or if this is the second time the '/' state has been encountered for this transaction. |
| 9 | 3 | No Usable Applications (Fallback Forbidden) Next State Number (Range 000-254 or 256-750) | If this field is non-zero, it contains the next state number to take if the card was blocked, or if the ICC initiation found no usable ICC applications for inclusion in the candidate list, and one or more of the selected applications was blocked. |
| | | | If this field is zero, table entry 5 next state number is taken when no usable applications were found, and table entry 6 next state number is taken when a blocked card is discovered. |

If the ICC application selection and initialisation parallel processing has not completed, and table entry 2 'Please Wait Screen Number' has a value other than '000', the screen number identified by table entry 2 is displayed to the cardholder for a minimum of one second. The completion of the ICC initialisation parallel processing is awaited.

When the ICC application selection and initialisation parallel processing completes, or if ICC application selection and initialisation parallel processing has already completed, the appropriate exit path from this state is determined.

If the ICC application selection and initialisation parallel processing completes successfully, the ICC application name is placed in the screen number indicated by table entry 4 'ICC Application Name Screen Number'. Table entry 3 'ICC Application Name Template Screen Number' is used as a template, as described in "ICC Application Name Display" in Chapter 7, "ICC Processing".

If there is no name available for the ICC application, the screen number referenced within table entry 4 (if not '000') is set to contain a single space character (0x20). Processing proceeds to the next state identified in 'Exit Paths Extension State' table entry 2 'ICC Application Select & Initialisation Successful Next State Number'.

If the ICC application selection and initialisation parallel processing was activated as a result of processing State Type '.' (Begin ICC Application Selection & Initialisation) but failed because the chosen ICC application was not usable at the terminal, processing proceeds

to the next state identified in 'Exit Paths Extension State' table entry 4 'ICC Application Not Usable Next State Number'.

If the ICC application selection and initialisation parallel processing was activated by ICC initialisation parallel processing, but failed because there was no ICC application suitable for use at the terminal available and table entry 9 'No Usable Applications (Fallback Forbidden) Next State Number' is set to zero, processing proceeds to the next state identified in 'Exit Paths Extension State' table entry 5 'No Suitable ICC Applications Next State Number'.

If the ICC application selection and initialisation parallel processing was activated by ICC initialisation parallel processing, but failed due to a hardware error which occurred on ICC power up (indicating that the card is not an IC card), processing proceeds to the next state identified in 'Exit Paths Extension State' table entry 3 'Card Not Smart Next State Number'.

If the ICC application selection and initialisation parallel processing did not complete successfully, due to any hardware error other than that identified above, processing proceeds to the next state identified in 'Exit Paths Extension State' table entry 7 'ICC Hardware Level Error Next State Number'.

If the ICC application selection and initialisation parallel processing did not complete successfully, due to the ICC returning an unexpected status value (SW1 SW2) in an ICC command response, or as a result of a 'fake' error resulting in processing termination and table entry 9 'No Usable Applications (Fallback Forbidden) Next State Number' is set to zero, processing proceeds to the next state identified in 'Exit Paths Extension State' table entry 6 'ICC Application Level Error Next State Number'.

If the ICC application selection and initialisation parallel processing was activated by ICC initialisation parallel processing, but failed because there was no ICC application suitable for use at the terminal available, and table entry 9 'No Usable Applications (Fallback Forbidden) Next State Number' is set to non-zero, processing proceeds to either the next state identified in table entry 5 'No Usable Applications Next State Number' if no blocked applications were discovered, or the next state identified in table entry 9 'No Usable Applications (Fallback Forbidden) Next State Number' if one or more blocked applications were discovered.

If the ICC application selection and initialisation parallel processing did not complete successfully due to the ICC returning an unexpected status value (SW1 SW2) in an ICC command response, and table entry 9 'No Usable Applications (Fallback Forbidden) Next State Number' is set to non-zero, processing proceeds to either the next state identified in table entry 9 'No Usable Applications (Fallback Forbidden) Next State Number' if the error was due to the

card being blocked, or the next state identified in table entry 6 'ICC Application Level Error Next State Number' for all other errors.

Note: The screen base offset, used for foreign languages, is not applied to the screen numbers held in table entry 3 'ICC Application Name Template Screen Number' and table entry 4 'ICC Application Name Screen Number'.

? - Set ICC Transaction Data State

The purpose of this state is to selectively make transaction specific data available, for use as part of the ICC data available for ICC processing.

Note: With the 'EMV/CAM2 Exits for APTRA Advance NDC' product, you can use this state to set the amount authorised data objects to zero, and table entry 6 to specify another source.

| Table Entry | Number of Characters | Contents | Description |
|----------------|-------------------------|---|--|
| 1 | 1 | State Type | "?' |
| 2 | 3 | Next State Number (Range 000-254 or 256-750) | Next state to which processing proceeds. |
| | | | This path is also taken if the ICC is not currently powered up in the SCRW. In this case, all the other table entries in this state are ignored. |
| 3 | 3 | Currency Type (Range 000-255) | Indicates the reference currency type value for the ICC Currency Data Objects Table; see "ICC Currency Data Objects Table" in Chapter 5, "Central to Terminal Messages". |
| | | | The data objects mapped to the currency type are made known. |
| | | | If a value of '000' is used, or no mapping is found, then no action is taken. $ \\$ |
| 4 | 3 | Transaction Type (Range 000-255) | Indicates the reference transaction type value for the 'ICC Transaction Data Objects Table'; see "ICC Transaction Data Objects Table" in Chapter 5, "Central to Terminal Messages". |
| | | | The data objects mapped to the transaction type are made known. |
| | | | If a value of '000' is used, or no mapping is found, then no action is taken. $ \\$ |

| Table Entry | Number of Characters | Contents | Description |
|----------------|-------------------------|---|---|
| 5 | 3 | Amount Authorised Source (Range 000-041) | Identifies the source buffer from which the Amount Authorised data objects (tags 0x9F02 and 0x81) are derived, and indicates whether the amount in the buffer requires conversion from major to minor currency units before being placed in the Amount Authorised data objects. |
| | | | 00x - Do nothing (no source buffer) 01x - General Purpose Buffer B 02x - General Purpose Buffer C 03x - Amount Buffer 04x - Set Amount Authorised to 0. |
| | | | Where 'x' means the following: '0' - No conversion is required '1' - Conversion is required |
| | | | Note: Set this flag to '1' (convert major to minor currency units) only if this conversion has not already been performed in Advance NDC or NDC+ (for example, in FDK Information Entry state 'X'). For details of this state, see the <i>APTRA Advance NDC</i> , <i>Reference Manual</i> or the <i>NDC+ Programmer's Reference Manual</i> . |
| | | | If a conversion from major to minor currency units is required, the value held within the 'Transaction Currency Exponent' data object (tag 0x5F36) is used to indicate how many trailing zeroes are to be added to the amount in the buffer when placed in the Amount Authorised data objects. |
| | | | If the 'Transaction Currency Exponent' data object (tag 0x5F36) is not available or has no value field, no conversion is made. |
| | | | Table entry 3 is processed before this table entry to ensure the 'Transaction Currency Exponent' data object can be set, before it is required by the conversion processing. |
| | | | Note : The source buffer is not altered by this conversion. |
| | | | Amount Authorised data objects are only made known or changed when this state is executed within a transaction. |

? - Set ICC Transaction Data State

| Table Entry | Number of Characters | Contents | Description |
|----------------|-------------------------|--|--|
| 6 | 3 | Amount Other Source (Range 000-041) | Identifies the source buffer from which the 'Amount Other' data objects (tags 0x9F03 and 0x9F04) will be derived and indicates whether the amount in the buffer will require conversion, from major to minor currency units, before being placed in the 'Amount Other' data objects. |
| | | | 00x - Do nothing (no source buffer) 01x - General Purpose Buffer B 02x - General Purpose Buffer C 03x - Amount Buffer 04x - Set Amount Other to 0. |
| | | | Where 'x' means the following: '0' - No conversion is required '1' - Conversion is required |
| | | | Note: Set this flag to '1' (convert major to minor currency units) only if this conversion has not already been performed in Advance NDC or NDC+ (for example, in FDK Information Entry state 'X'). For details of this state, see the <i>APTRA Advance NDC</i> , <i>Reference Manual</i> or the <i>NDC+ Programmer's Reference Manual</i> . |
| | | | If a conversion from major to minor currency units is required, the value held within the 'Transaction Currency Exponent' data object (tag 0x5F36) is used to indicate how many trailing zeroes are to be added to the amount in the buffer when placed in the 'Amount Other' data objects. |
| | | | If the 'Transaction Currency Exponent' data object (tag 0x5F36) is not available, or has no value field, then no conversion is made. |
| | | | Table entry 3 is processed before this table entry to ensure the 'Transaction Currency Exponent' data object can be set before the conversion processing requires it. |
| | | | Note : The source buffer is not altered by this conversion. |
| | | | Amount Other data objects are only made known or changed when this state is executed within a transaction. |

| Table Entry | Number of Characters | Contents | Description |
|----------------|-------------------------|-------------|--------------------------------------|
| 7 | 3 | Must be 000 | Reserved. |
| 8 | 3 | Must be 000 | Reserved. |
| 9 | 3 | Must be 000 | Reserved for future extension state. |

Note: The Set ICC Transaction Data state will take the default close exit if:

- The amount authorised source parameter (table entry 5) is invalid, or
- The specified buffer cannot be converted to an amount.

; - ICC Re-initialise State

The purpose of this state is to enable the ICC application currently being used for processing to be re-initialised.

Re-initialisation of an ICC application can only be performed if the ICC is currently in the SCRW, powered on, with an ICC application selected, and with no parallel ICC processing currently being performed.

| Table Entry | Number of Characters | Contents | Description | |
|----------------|-------------------------|---|---|--|
| 1 | 1 | State Type | 5 | |
| 2 | 3 | Good Next State Number (Range 000-254 or 256-750) | Next state to which processing proceeds if re-initialisation of the ICC application can be performed. | |
| 3 | 3 | Processing Not Performed Next State Number (Range 000-254 or 256-750) | Next state to which processing proceeds if re-initialisation of the ICC application is not being performed. | |
| 4-9 | 18 | Must be 000 | Reserved | |

If re-initialisation cannot be performed, processing proceeds to the next state identified in table entry 3 'Processing Not Performed Next State Number'.

If re-initialisation can be performed, the processing identified in "Data Object List (DOL) Processing" in Chapter 7, "ICC Processing" is started in parallel, and is performed using the ICC application currently selected. Automatic selection of the ICC application is handled by the processing described in "Data Object List (DOL) Processing".

The result of this parallel processing is acted upon in State Type '/' (Complete ICC Application Selection & Initialisation) as appropriate, to give the final result of the re-initialisation processing.

Processing then proceeds to the next state identified in table entry 2 'Good Next State Number'.

Chapter 3

Configuration Parameters

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Configuration Parameters

Overview

This chapter describes how to use the following to support an ICC:

- Enhanced Configuration Parameters Load Message
- CAM/EMV Extended Status option 69
- CAM/EMV ICC (Smart Card) option 70

Enhanced Configuration Parameters Load Message

This message supports the configuration of options and timers, including available options that are not supported in the Configuration Parameters Load message.

For details of the format of the entire Configuration Parameters Load or Enhanced Configuration Parameters Load Message, refer to the relevant *NDC+ Programmer's Reference Manual* or *APTRA Advance NDC, Reference Manual*.

The options relevant to ICC use are the CAM/EMV Extended Status option 69, and the CAM/EMV ICC (Smart Card) option 70; these are shown below.

| | | | 0 5110 (| |
|--------|-------------------------|--------------------|--|---|
| Field | Number of Characters | Mandatory/Optional | Descript | ion |
| a to i | Var | - | See the relevant APTRA Advance NDC, Reference Manual or NDC+ Programmer's Reference Manual. | |
| j | 3 | 0 | • | n Code. Defines the option to be exercised for the above option er. Option number and option codes are defined below. |
| | | | Option | Description of Option |
| | | | 0 to 68 | See the relevant APTRA Advance NDC, Reference Manual or NDC+ Programmer's Reference Manual. |
| | | | 69 | CAM/EMV Extended Status option. The possible values are: |
| | | | | Not set/Bit 1 not set - the ICC command and response data is not included in ICC application error solicited/unsolicited error messages. This is the default. |
| | | | | Bit 1 set - ICC command data (field g4h/e4h) and response data (g4j/e4j) is included in ICC application error solicited/unsolicited error messages. |
| | | | | Bit 2 set - Software version numbers are included. |
| | | | | Bit 3 set - Solicited script errors are not included. |
| | | | | For additional information, see "ICC Application Solicited/ Unsolicited Error Message" in Chapter 4, "Terminal to Central Messages". |

| Field | Number of Characters | Mandatory/Optional | Description |
|--------------|-------------------------|--------------------|---|
| | | | Bit 4 not set – A single application may be displayed during cardholder application selection. See the processing described in "Exit Paths Extension State" in " Begin ICC Application Selection & Initialisation State". |
| | | | Bit 4 set – A single application is never displayed for cardholder application selection, but instead is automatically selected by the terminal. In this case, the " Begin ICC Application Selection & Initialisation State" processing is performed as in previous releases. |
| | | | 70 CAM/EMV ICC (Smart Card) Manipulation Flag. The possible values are: |
| | | | 000 - Disable Smart Card (ICC) manipulation by the 'EMV/CAM2 Exits for NDC+' product (default). Instead NDC+ performs any ICC processing. |
| | | | 001 - Enable Smart Card (ICC) manipulation by the 'EMV/CAM2 Exits for NDC+' product, instead of NDC+. |
| | | | This option has no effect in APTRA Advance NDC. |
| FS | 1 | See Note | Field Separator. |
| k to n | Var | 0 | See the relevant APTRA Advance NDC, Reference Manual or NDC+ Programmer's Reference Manual. |

Note: This field separator must be present if any of the later fields in the message are present.

Configuration Parameters

Enhanced Configuration Parameters Load Message

Chapter 4

Terminal to Central Messages

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Table of Contents **Terminal to Central Messages**

Overview

This chapter provides information on the following topics:

- Terminal Application Version Information
- Terminal Hardware Information
- Transaction Request Message Format
- Solicited Status Messages (Command Rejects)
- Unsolicited Status Messages
- SCRW/MCRW Hardware Error Reporting
- ICC Application Solicited/Unsolicited Error Message
- Issuer Script Results and Completion Data.

Terminal Application Version Information

To enable Central to identify terminals loaded with the CAM software, the terminal's response to a Terminal Command message with Command Code '7' (Send Configuration Information) with or without Command Modifier '5' (Send Software ID/Send Configuration Information) has the relevant field 'g2' or 'g7' formatted as follows:

| Field | Number of Characters | Mandatory/Optional | Description |
|-------------|-------------------------|-------------------------|--|
| g2/ g7 | - | - | Terminal Application Version Information - see following sub-fields: |
| g2a/ g7a | 6 | M | Advance NDC or NDC+ Release Number. ASCII decimal value. |
| 8 | | | For example, for Advance NDC 03.01.00, this field would be '030100'. For NDC+ release 07.01.00, this field would be '070100'. |
| GS | 1 | See Notes 1 & 2 | Group Separator. |
| g2b/ g7b | 3 | See Notes 1, 2 and 3 | Terminal Application Component Identifier. |
| | | | 'INT' - NDC Interface component present. |
| | | | 'ICC' - ICC Processing Core component present. |
| | | | 'CAM' - CAM ICC application component present. |
| | | | 'INT' is the EMV/CAM2 Exits for APTRA Advance NDC interface component, which links the EMV kernel components (ICC and CAM) to NDC. |
| g2c/ g7c | 6 | See Notes 1, 2 and 3 | Terminal Application Component Release Number. ASCII decimal value for release number of previous component. |
| | | | For example, for ICC version 02.01.00, this field would be '020100'. |
| | | | For CAM version 02.00.00, this field would be '020000'. |

Note 1: These fields are repeated for each terminal application component that is present in addition to Advance NDC or NDC+. If there are no additional terminal application components present, these fields are omitted.

Note 2: These fields are only included if 'Enhanced Configuration Parameters Load' option number '69' has a value in which bit 2 is set.

Note 3: The g7 field is only included in the message to Central if the appropriate message mode option is set. This is not applicable to the g2 field, which will always be present when Command Modifier '5' is used. The option digit number is 6c. For details, see the *APTRA Advance NDC*, Supervisor's Guide or the *NDC+ Supervisor's Reference Manual*.

For example, Advance NDC 03.01.00 with additional terminal application components for the NDC Interface coordination (version 02.02.00), ICC Processing Core handling (version 02.01.00) and CAM (version 02.00.00) would result in field $^{\prime}g7^{\prime}$ / $^{\prime}g2^{\prime}$ containing the following:

```
'030100' <GS> 'INT020200' <GS> 'ICC020100' <GS> 'CAM020000'
```

To enable local terminal operators to identify terminals loaded with the NDC CAM software, the version levels for the NDC software and additional terminal application components are printed to the journal at power up.

Note 4: If the message mode option is set, the g8 field (Software Identifier 'B' and Software ID Gxxx-xxx) will, by default, be included in the message.

The g8 field is only included in the message to Central if the appropriate message mode option is set. This is not applicable to the g3 field, which will always be present when Command Modifier '5' is used. The option digit number is 6c. For details, see the *APTRA Advance NDC*, Supervisor's Guide or the *NDC+ Supervisor's Reference Manual*.

Terminal Hardware Information

To enable Central to identify terminals configured with a Smart Card Reader Writer (SCRW), the terminal's response to a Terminal Command message with Command Code '7' (Send Configuration Information) with or without Command Modifier '1' (Send Hardware Configuration/Send Configuration Information) can indicate in field 'g4' that the SCRW is one of the following smart card variants:

| Value (Hex) | Variant Description | |
|-------------|---|--|
| 08 | Track 2 Smart Card Reader | |
| 09 | Track 1/2/3 Smart Card Reader | |
| 0A | 3 Track Write Smart Card Reader | |
| 1D | Dip And Smart Hardware (DASH) Card Reader | |
| 1F | Track 123 Smart Card Reader with MM | |
| 20 | Track 3 Smart Card Reader with MM | |

Note: The reported variant is dependent on the installed device.

For a complete list of all the possible MCRW/SCRW variants in APTRA Advance NDC or NDC+, including the non-smart card MCRW values, see the *APTRA Advance NDC, Reference Manual* or the *NDC+ Programmer's Reference Manual*.

Transaction Request Message Format

This section defines the format of the additional smart card 'bd1' data contained in the Transaction Request message. This message will then also contain the smart card data that Central needs in order to authorise a smart card cardholder transaction at the terminal.

The message is sent during a cardholder transaction, either on entry to the Transaction Request state or as part of an Interactive Transaction message sequence.

The smart card 'bd1' data is included in the Transaction Request message after the Last Transaction Status 'r' data, but following any other optional data for your system.

For full details of the Transaction Request Message Format, see the *APTRA Advance NDC, Reference Manual* or the *NDC+ Programmer's Reference Manual*.

For details of the issuer script results and completion data which can be included, see the "Issuer Script Results and Completion Data" section.

Message Format

| Field | Number of Characters | Mandatory/Optional | Description |
|-------|-------------------------|--------------------|---|
| FS | 1 | See Note 1 | Field Separator. |
| bd1 | 1 | See Note 1 | Buffer identifier. The value is fixed as '5' to indicate smart card data. |
| bd2 | - | - | Smart card data - see sub-fields: |
| bd2a | 3 | See Note 1 | Smart card data identifier. |
| | | | CAM - data in buffer is for CAM |

| Field | Number of Characters | Mandatory/Optional | Description | |
|-------|-------------------------|-------------------------|---|--|
| bd2b | 4 | See Note 1 | CAM Flags. | |
| | | | For values, see the following 'CAM Flags' section. | |
| bd2c | Var. | See Notes 1, 2 and 3 | ICC data objects requested by Central. | |
| | | | All the available data objects referenced in field f11 of the ICC Terminal Acceptable Application IDs Table entry, and for which the Full/Partial Primary Application ID Value matches the currently selected ICC Application AID, are included in this field as individ BER-TLV formatted data objects. For details, see "ICC Terminal Acceptable Application IDs Table" in Chapter 5, "Central to Term Messages". | |
| | | | As an example, with the following data: | |
| | | | Application Identifier (AID) | 0x9F06 |
| | | | Track 2 Equivalent Data | 0x57 |
| | | | Application PAN | 0x5A |
| | | | Application PAN Sequence Number | 0x5F34 |
| | | | Cryptogram Information Data | 0x9F27 |
| | | | Application Cryptogram | 0x9F26 |
| | | | Issuer Application Data | 0x9F10 |
| | | | Application Interchange Profile (AIP) | |
| | | | Application Transaction Counter (ATC) | |
| | | | CDOL1 | 0x8C |
| | | | PIN Retry Count | 0x9F17 |
| | | | This field would contain the following (actual value | ues will vary): |
| | | | '9F 06 07 A0 00 00 00 08 00 01 57 12 12 34 56 78 90 11 081 23 45 67 89 5A 0A 12 34 56 78 90 12 34 56 78 90 00 9F 26 08 12 34 56 78 90 12 34 56 9F 10 07 06 01 01 00 9F 36 02 01 23 8C 15 9F 02 06 9F 03 06 9F 1A 02 99C 01 9F 37 04 9F 17 01 03' | 0 5F 34 01 00 9F 27 01 03 A0 00 00 82 02 7C |

| Field | Number of Characters | Mandatory/Optional | Description | |
|-------|-------------------------|----------------------------|--|------------------------|
| bd2d | Var | See Notes 1, 2, 3 and 4 | Further ICC data objects requested by Central; s Data Objects Table" in Chapter 5, "Central to Te | |
| | | | All the available data objects referenced within Card Risk Management Data Object List 1 (CDOL1, tag 0x8C) are included in thi field as individual BER-TLV formatted data objects. | |
| | | | If a BER-TLV data object is referenced in CDOL present in field bd2c, it is not repeated in this fie | |
| | | | As an example, if CDOL1 references the followi Cryptogram Version Number 10): | ng tags (as per Visa |
| | | | Amount, Authorised | 0x9F02 |
| | | | Amount, Other | 0x9F03 |
| | | | Terminal Country Code | 0x9F1A |
| | | | Terminal Verification Results (TVR) | 0x95 |
| | | | Transaction Currency Code | 0x5F2A |
| | | | Transaction Date | 0x9A |
| | | | Transaction Type | 0x9C |
| | | | Unpredictable Number | 0x9F37 |
| | | | Then this field would contain the following (act | ual values will vary): |
| | | | '9F 02 06 00 00 00 00 20 00 9F 03 06 00 00 00 00 00 80 00 04 00 00 5F 2A 02 08 26 9A 03 00 07 11 9C 0 98' | |

Note 1: These fields are only included in the Transaction Request if all the following are true:

- The Transaction Request State identified that the optional CAM processing was to be performed
- An attempt has been made to select a CAM ICC application from the candidate list since the last execution of the transaction request state
- ICC processing is not still active (that is, the appropriate completion state has been processed).

Note 2: If no data objects are identified, none are present and effectively this field is absent.

Note 3: If a data object held in fields 'bd2c' and 'bd2d' is not available, the data object is not present.

Note 4: If CDOL1 has invalid content, as described in "Data Object List (DOL) Processing" in Chapter 7, "ICC Processing", no data

objects are present in field 'bd2d', effectively making this field absent.

CAM Flags

There are 16 available CAM flags. These are encoded as the bits in two bytes, and are converted to ASCII hex (four bytes) for transmission. Each can have the value 0x0 or 0x1, with the following meanings:

| Byte | Bit | Value | Description |
|------|-----|------------|---|
| 1 | 8 | - | Reserved. |
| | 7 | - | Reserved. |
| | 6 | - | Reserved. |
| | 5 | 0x0 or 0x1 | 0x0 - Transaction not declined offline. 0x1 - Transaction declined offline. |
| | 4 | 0x0 or 0x1 | 0x0 - Application data retrieval successful. 0x1 - Application data retrieval failed. |
| | 3 | 0x0 or 0x1 | 0x0 - Get processing options successful. 0x1 - Get processing options failed. |
| | 2 | 0x0 or 0x1 | 0x0 - Application selection successful. 0x1 - Application selection failed. |
| | 1 | - | Reserved. |
| 2 | 8 | 0x0 or 0x1 | 0x0 - Processing options Data Object List (PDOL) data valid. 0x1 - PDOL data invalid. |
| | 7 | 0x0 or 0x1 | 0x0 - Card risk management Data Object List 1 (CDOL1) data valid. 0x1 - CDOL1 data invalid. |
| | 6 | 0x0 or 0x1 | 0x0 - Generate Application Cryptogram (AC) successful. 0x1 - Generate AC failed. |
| | 5 | - | Reserved. |
| | 4 | 0x0 or 0x1 | 0x0 - CAM processing not yet successfully performed. 0x1 - CAM processing previously successfully performed. |
| | 3 | - | Reserved. |
| | 2 | - | Reserved. |
| | 1 | - | Reserved. |

If CAM processing was previously completed successfully in a transaction chain (for example, was completed on the first service, prior to the second service, and within the same card insertion), then byte 2 bit 4 indicates this.

The points of successful completion are:

- a when CAM processing performs the second ICC 'GENERATE APPLICATION CRYPTOGRAM' command requesting a Transaction Certificate (TC) and obtains a TC, or
- b when CAM processing performs the second ICC 'GENERATE APPLICATION CRYPTOGRAM' command requesting an Application Authorisation Cryptogram (AAC) and obtains an AAC.

If an unexpected failure occurs during processing, the point of failure is indicated by byte 1, bits 2 to 4 inclusive and byte 2, bit 6. Only one of these bits can be set to 0x1; all others will default to 0x0. These bits are independent of byte 2, bits 2 to 4 inclusive and byte 2, bits 7 and 8.

If an attempt is made to select an application from the candidate list and it fails, byte 1 bit 2 is set to 0x1.

If the PDOL is processed and is found to be invalid, due to contents not being correct or because the concatenated value length is greater than can be submitted to the ICC in an ICC 'GET PROCESSING OPTIONS' command, byte 2 bit 8 is set to 0x1.

If an application is selected and the ICC 'GET PROCESSING OPTIONS' command fails, byte 1 bit 3 is set to 0x1.

If the ICC 'GET PROCESSING OPTIONS' command was performed and was successful, the data returned is processed. If this processing fails, or the data required is not obtained, byte 1 bit 4 is set to 0x1.

If the CDOL1 is processed and is found to be invalid due to contents not being correct or because the concatenated value length is greater than can be submitted to the ICC in an ICC 'GENERATE APPLICATION CRYPTOGRAM' command, byte 2 bit 7 is set to 0x1.

If an ICC 'GENERATE APPLICATION CRYPTOGRAM' command is submitted with CDOL1 but fails, byte 2 bit 6 is set to 0x1.

If an ICC 'GENERATE APPLICATION CRYTOGRAM' command is submitted during ICC transaction request processing, and the card responds with an AAC indicating a decline, then byte 1 bit 5 is set to 0x1. For all other scenarios, byte 1 bit 5 is set to 0x0.

Solicited Status Messages

CAM introduces the possibility of new values in the solicited status messages, specifically as new command rejects.

Command Rejects

CAM includes the following new specific command reject values:

| Value | Meaning |
|-------|--|
| B91 | ICC Currency Data Objects Table data has invalid data/format. |
| B92 | ICC Transaction Data Objects Table data has invalid data/format. |
| B93 | ICC Language Support Table data has invalid data/format. |
| B94 | ICC Terminal Data Objects data has invalid data/format. |
| B95 | Reserved. |
| B96 | Reserved. |
| B97 | CAM data not received in Central responses when sent in Transaction Request, or was sent but had invalid data/format. |
| B98 | CAM data received in Central response when not sent in Transaction Request, or when already received in an earlier response corresponding to the same Transaction Request. |
| B99 | Reserved. |
| Wxx | ICC Terminal Acceptable Application IDs Table data has invalid data/format |
| | Where 'xx' is an ASCII hex value in the range '00' to 'FF' inclusive identifying which entry number failed. |
| | If the entry number is not available or is out of range, 'xx' defaults to 'FF'. |

Note: These specific command rejects will be replaced with a standard command reject ('A') if specific command reject processing has not been enabled. For the purpose of this document, it is assumed that specific command reject processing is enabled.

Unsolicited Status Messages

CAM introduces the possibility of new values in the unsolicited status messages, specifically in supervisor key messages.

Supervisor Keys (Unsolicited)

This message is sent to inform Central of the functions selected by the operator after entry to Supervisor mode.

| Field | Number of Characters | Content | |
|-------|-------------------------|-------------------|--------------------|
| e1 | 1 | Device Identifica | ation Graphic 'R'. |
| e2 | Var (4 max) | Device Status. | |
| | | Char Code | Description |

If option digit 0 = 0, the device status field will contain two characters:

1-2 '00' - '98' Key selection from Select menu.

or

If option digit 0 = 1, the device status field will contain three characters:

| 1 | ' 0' | Select menu |
|-----|-------------|---|
| | '1' | Replenishment menu |
| | '2' | Configure menu |
| | '3' | Access menu |
| | '4' | In Service Supervisor menu (NDC+ only) |
| | '7' | Exit menu. See Note 1. |
| | '8' | Exit menu. See Note 1. |
| | '9' | Miscellaneous Functions menu. |
| 2-3 | '00' - '98' | Menu item selected. For the permitted values for each menu, see the <i>APTRA Advance NDC</i> , <i>Supervisor's Guide</i> or the <i>NDC+ Supervisor's Reference Manual</i> . |

or

When option digit 0 = 2 or 3, the status field is variable length. Additional pairs of characters are added to show the selections of the key entry sub-menus.

| If '2', | 4-5 | '00' - '98' | Menu selection from sub-menu. |
|---------|-----|-------------|---|
| If '3', | 6-7 | '00' - '98' | Menu selection from sub-menu of sub-menu. |

Terminal to Central Messages **Unsolicited Status Messages**

Note: 1. Menu numbers 7 and 8 are reserved for Exits designers. You may also redefine these messages using the SUPCTR file. For further details, see the *Using NDC Exits* publication.

Note: 2. When the 'MISC FUNCS' menu is entered from the Select menu, the unsolicited supervisor keys message has field 'e2' set to '90' or '090', depending on the value of message mode option digit number 0.

Note: 3. When the 'PRNT CMPNT VERS' function is selected from the 'MISC FUNCS' menu, the unsolicited supervisor keys message has field 'e2' set to '800' or will not be sent, depending on the value of message mode option digit number 0.

Note: 4. When the 'PRNT SCRW VERS' function is selected from the 'MISC FUNCS' menu, the unsolicited supervisor keys message has field 'e2' set to '801' or will not be sent, depending on the value of message mode option digit number 0.

Note: 5. When a menu is longer than one screen, function '99' is used to switch between the screens. No message is transmitted for this selection (code '99' is not reported).

SCRW/MCRW Hardware Error Reporting

When an error at the hardware/physical level occurs while performing a SCRW command, Tcode values are reported in the Transaction Status field (field g2/e2) of the MCRW device status message.

For information on the SCRW errors which can be returned, see the *Programmer's Manual for the Smart Card Reader/Writer* (B006-3084).

ICC Application Solicited/ Unsolicited Error Message

Standard NDC solicited/unsolicited error message formats are used, with fields g1/e1 to g5/e5 inclusive used as identified in the following table.

For diagnostic purposes, the data transmitted is intended to help you identify as accurately as possible the point at which the command submitted to the ICC failed.

Note: Field g4/e4 normally contains binary values. These values are converted to ASCII hex for transmission; for example, the single byte value 0x9A would be transmitted as the two byte value '9A'. The table below shows the message formats as they would be transmitted by the terminal.

| Field | Number of Characters | Mandatory/Optional | Description |
|-------------|-------------------------|--------------------|--|
| g1/ e1 | 1 | M | Device Identifier Graphic 'c' (Smart card application level error) |
| g2/ e2 | 1 | M | Transaction Status. |
| | | | Always = 1. |
| FS | 1 | M | Field Separator. |
| g3/ e3 | 1 | M | Error Severity. |
| | | | Always = 2 . |
| FS | 1 | M | Field Separator. |
| g4/ e4 | Var. | M | Diagnostic Status - see sub-fields: |
| g4a/ e4a | 3 | M | ICC application type selected when command failed. |
| 0.14 | | | 'CAM' - CAM |
| | | | 'S&S' - No ICC application selected. |
| g4b/ e4b | Var. (up to 38) | See Note 1 | Application Identifier (AID) (tag 0x9F06). |
| | (- <u>r</u> | | AID of selected application when command failed in BER-TLV format. |
| g4c/ e4c | 2 | M | CLA - Class of instruction of command that failed. |
| g4d/ e4d | 2 | M | INS = Instruction of command that failed. |

| Field | Number of Characters | Mandatory/Optional | Description |
|-------------|-------------------------|--------------------|--|
| g4e/ e4e | 2 | M | P1 = Parameter 1 of command that failed. |
| g4f/ e4f | 2 | M | P2 = Parameter 2 of command that failed. |
| g4g/ e4g | 2 | M See Note 3 | Lc = Length of command data for command that failed. |
| g4h/ e4h | Var. (2 x Lc) | See Note 2 | CmdData = Command data for command that failed. |
| g4i/ e4i | 2 | M See Note 3 | Le = Length (expected) of response data for command that failed. |
| g4j/ e4j | Var. (2 x Le) | See Note 2 | RspData = Response data for command that failed. |
| g4k/ e4k | 2 | M | SW1 = Status word 1, indicating why command failed. |
| g4l/ e4l | 2 | M | SW2 = Status word 2, indicating why command failed. |
| FS | - | - | Field Separator. |
| | | | Not present, as field g5/e5 not used. |
| g5/ e5 | - | - | Not present, as not used. |

Note 1: This field is only present if an ICC application has been selected from the candidate list.

Note 2: These fields are only present if enhanced configuration option '69' is set, and has an option value in which bit 1 is set. If option number '69' has not been set, or is set but with an option value in which bit 1 is not set, these ICC command (g4h/e4h) and response (g4j/e4j) data fields are not included.

Note 3: These fields will show the length of the command and response data even if CmdData and RspData are not included.

Note 4: This error message can also be produced with invalid issuer script results and completion data; for more information, see the following "Issuer Script Results and Completion Data" section.

Issuer Script Results and Completion Data

When one or more issuer scripts are sent to the terminal, Central will require the results of the issuer script processing to be provided. Valid issuer scripts have been received by the terminal in the following conditions:

- A valid ITR (Interactive Transaction Response) has been received containing valid CAM data which included issuer scripts. A corresponding valid Transaction Reply, with no CAM data of its own, has also been received.
- A valid Transaction Reply has been received containing valid CAM data, which included issuer scripts.

If one or more issuer scripts have been received by the terminal, the issuer script processing results are sent to Central on the next solicited status message (except for command rejects or specific command rejects) sent in response to the Transaction Reply, appended to the end of field 'g4'/'f'. For the message format, see the table on the next page.

When Central requires data objects to be provided upon completion of ICC processing for a transaction ('Completion Data'), this is indicated through the settings in the 'ICC Terminal Acceptable AIDs Table' entry, whose 'Full/Partial Primary AID Value' matched the currently selected ICC application AID. See "ICC Terminal Acceptable Application IDs Table" in Chapter 5, "Central to Terminal Messages".

If available, the required data objects are provided to Central on the next solicited status message (except for command rejects or specific command rejects) sent in response to a valid Transaction Reply, where valid CAM data has been received either in the Transaction Reply or an earlier related valid ITR. If this condition is met, the required data objects (if available) are appended to the end of field 'g4'/'f'. For the message format, see the table on the next page.

Note: The additional data (Central required data objects and/or issuer script results) is attached to the end of field 'f' if the solicited status message is a Ready '9' or 'B'; otherwise, the data is attached to the end of field 'g4'.

To ensure that Central obtains the issuer script results and required data objects ('Completion Data'), the 'Last Transaction Status Information' buffer (buffer id '2') of the next Transaction Request message sent to Central has the same data appended to it as was sent in the solicited status message, unless another valid

Transaction Reply has been received since. The appended data corresponds to the transaction being performed when the last valid Transaction Reply was received by the terminal.

If a Transaction Reply has been received, but no issuer scripts have been received, no issuer script results will be present in the Last Transaction Status Information buffer.

The format for reporting the issuer script results is as follows:

| Field | Number of Characters | Mandatory/Optional | Description |
|-------|-------------------------|-------------------------|---|
| GS | 1 | M | Group Separator |
| a | 3 | See Note 1 | Smart card data identifier. |
| | | | 'CAM' - data is for CAM. |
| GS | 1 | See Note 2 | Group Separator |
| b | Var (up to 512) | See Notes 3, 4 and 6 | Central requested ICC data objects. |
| | | | All available data objects whose tag is referenced in field 'f13' of the 'ICC Terminal Acceptable AIDs Table' entry, whose 'Full/Partial Primary AID Value' matched the currently selected ICC application AID, will be included in this field as individual BER-TLV data objects See "ICC Terminal Acceptable Application IDs Table" in Chapter 5, "Central to Terminal Messages". |
| | | | For example, with: Cryptogram Information Data 0x9F27 Application Cryptogram 0x9F26 Issuer Application Data 0x9F10 Terminal Verification Results (TVR) 0x95 Transaction Status Indicator (TSI) 0x9B |
| | | | Then this field would contain the following (values will vary): |
| | | | '9F 27 01 00 9F 26 08 12 34 56 78 90 12 34 56 9F 10 07 06 01 01 03 A0 00 00 95 05 00 00 04 00 00 9B 02 74 00' |
| GS | 1 | See Note 5 | Group Separator |

| Field | Number of Characters | Mandatory/Optional | Description |
|-------|-------------------------|--------------------|---|
| С | 1 | M See Note 5 | Result of issuer script processing. |
| | | | '0' - script not performed. |
| | | | '1' - script processing failed. |
| | | | '2' - script processing successful. |
| d | 1 | M See Note 2 | Sequence number of script command. |
| | | | '0' - All commands successful or script not performed. |
| | | | '1' - 'E' - Sequence number from 1 to 14 for failed command. |
| | | | 'F' - Sequence number of 15 or over for command that failed. |
| | | | The sequence number of a command corresponds directly to its position within a script. For example, the first command will be assigned the sequence number '1', the third '3', the seventh '7' and so on. |
| e | Var. | M | Script Identifier (tag 0x9F18). |
| | (1 to 14) | l) See Note 2 | Identifier (ID) of the script to which the result relates, in BER-TLV format. |
| | | | The script identifier data object (tag $0x9F18$) is optionally provided as part of the script data. If it was not provided, a default value of $0x00000000$ (length of $0x04$) is used. This would be sent as '9F 18 04 00 00 00 00'. |
| | | | For example: |
| | | | 1 If the script ID sent as part of the script was '9F18049999999', the script results will have a script identified field of '9F180499999999' |
| | | | 2 If the script ID sent as part of the script was '9F1800', the script results will have a script identified field of '9F1800' |
| | | | 3 If no script ID was sent as part of the script, the script results will have a script identified field of '9F180400000000'. |

Note 1: The first group separator and field 'a' are omitted if the application type for the data has already been sent in the message to which it is being attached. For example, they would not be present in an 'ICC Application' device status message, but would be present in any other status message and the Transaction Request 'Last Transaction Status Information' buffer (buffer id '2').

Note 2: The second group separator is mandatory if field 'b', or fields 'c' through 'e' inclusive, are present.

Note 3: If a data object is identified, but not available, then the data object will not be present. If no data objects are identified or none are available, then none are present and effectively field 'b' will be absent.

Note 4: Only 512 bytes of ASCII hex data (256 bytes binary) can be transmitted. If it is found that a referenced data object will not fit into the remaining space available, then it will not be included in the data. Processing would continue from the next data object referenced. The list of referenced data objects is processed sequentially.

Note 5: Fields 'c' to 'e' inclusive are repeated for the number of scripts present in the ITR or Transaction Reply CAM data, and are configured to record the processing status of each script. If no scripts were present, the third group separator and fields 'c' through 'e' inclusive are omitted. If four scripts were present, the third group separator is present, and fields 'c' through 'e' inclusive are repeated four times.

Note 6: The values in fields 'b' and 'e' are normally binary, but are converted to ASCII hex for transmission. For example, the single byte value 0x9A would be transmitted as the two byte value '9A'. The table above shows the message format as it would be transmitted by the terminal.

Note 7: The Last Transaction Status Information buffer (buffer ID '2') is only sent in a Transaction Request if the enhanced configuration option '15' is set to '001', as for standard NDC.

Note 8: Issuer script results and transmission status are maintained over power failures.

Terminal to Central Messages
Issuer Script Results and Completion Data

Chapter 5

Central to Terminal Messages

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Introduction

This chapter provides information on the following topics:

- Customisation Data Commands
- EMV Configuration Message
 - ICC Currency Data Objects Table
 - ICC Transaction Data Objects Table
 - ICC Language Support Table
 - ICC Terminal Data Objects
 - ICC Terminal Acceptable Application IDs Table
- Transaction Reply (smart card data buffer)
 - Interactive Transaction Response.

Customisation Data Commands

Central can use various Customisation Data commands to download different types of data to the terminal. The commands are as follows:

- State Tables Load
- Screen/Keyboard Data Load
- Configuration Parameters Load
- Enhanced Configuration Parameters Load
- FIT Data Load
- Configuration ID Number Load
- MAC Field Selection Load
- Date and Time Load
- Encryption Key Load
- Initialise EKC
- Override Reserved Screens Command
- EMV Configuration
 - ICC Currency Data Objects Table
 - ICC Transaction Data Objects Table
 - ICC Language Support Table
 - ICC Terminal Data Objects Table
 - ICC Terminal Acceptable AIDs Table

The following table shows the message class, sub-class and identifier for each command.

| Message Class | Message Sub-Class | ldentifier | Command |
|------------------|----------------------|------------|---|
| 3 | 1 | 1 | Screen/Keyboard Data Load |
| 3 | 1 | 2 | State Tables Load |
| 3 | 1 | 3 | Configuration Parameters Load |
| 3 | 1 | 4 | Reserved |
| 3 | 1 | 5 | FIT Data Load |
| 3 | 1 | 6 | Configuration ID Number Load |
| 3 | 1 | A | Enhanced Configuration Parameters Load |
| 3 | 1 | В | MAC Field Selection Load |
| 3 | 1 | С | Date and Time Load |
| | | | |

| Message Class | Message Sub-Class | ldentifier | Command |
|------------------|----------------------|------------|---|
| 3 | 3 | 1-9 | Encryption Key Load |
| 3 | 1 | E | Dispenser Currency Cassette Mapping Table |
| 3 | 1 | F | Initialise EKC |
| 3 | 1 | G | Override Reserved Screens Command |
| 8 | 1 | - | EMV Configuration - ICC Currency Data Objects Table |
| 8 | 2 | - | EMV Configuration - ICC Transaction Data Objects Table |
| 8 | 3 | - | EMV Configuration - ICC Language Support Table |
| 8 | 4 | - | EMV Configuration - ICC Terminal Data Objects Table |
| 8 | 5 | - | EMV Configuration - ICC Terminal Acceptable AIDs Table |

For further details of the specific commands, except EMV Configuration, see the *APTRA Advance NDC*, *Reference Manual* or the *NDC+ Programmer's Reference Manual*.

The EMV Configuration message format is detailed in the following section.

EMV Configuration Message

To enable EMV ICC (Smart Card) configuration, a new message is required for Central to terminal communications. The format of this new message is as follows:

| Field | Number of Characters | Mandatory/ Optional | Description |
|-------|-------------------------|---------------------|--|
| a | Var. | M | Header. Protocol dependent. |
| b | 1 | M | Message Class. The value is fixed as '8' to indicate EMV configuration data. |
| С | 1 | 0 | Response Flag. Included for future use and ignored by the terminal. |
| FS | 1 | M | Field Separator. |
| d | 3 or 9 | 0 | Logical Unit Number (LUNO). |
| FS | 1 | M | Field Separator. |
| e | 1 | M | Message Sub-Class. '1' - 'ICC Currency Data Objects Table' data. '2' - 'ICC Transaction Data Objects Table' data. '3' - 'ICC Language Support Table' data. '4' - 'ICC Terminal Data Objects Table' data. '5' - 'ICC Terminal Acceptable AIDs Table' data. These are defined in the following sub-sections. |
| FS | 1 | M | Field Separator. |
| f | Var. | M | Configuration Data. |
| | | | See the following sections in this chapter for each message sub-class. |
| FS | 1 | See Note 1 | Field Separator |
| g | Var. | See Note 1 | Message Authentication Code (MAC) Data. |
| | | | Eight digit ASCII hex value used to authenticate the message data. |
| h | Var. | M | Trailer. Protocol dependent. |

The 'EMV Configuration Data' message is expected at the terminal only when the terminal is in out-of-service mode or supply/supervisor mode.

If Central transmits an 'EMV Configuration Data' message and it does not conform to the format above, or it is sent at a time when it is not expected, the NDC CAM application will generate a standard solicited error message. This error message will identify a standard NDC specific command reject value appropriate to the failure reason, or simply a 'Ready A' if specific command reject processing is not activated.

If a command reject or specific command reject is generated then the message content will be ignored.

Note: 1. The field separator and MAC Data field are only included if the flag settings are correct. For details, see the *APTRA Advance NDC*, *Supervisor's Guide* or the *NDC+ Supervisor's Reference Manual*.

ICC Currency Data Objects Table

This table is used to define the currency types which map to BER-TLV data objects, for use with the Set ICC Transaction Data '?' state type. For more details, see "? - Set ICC Transaction Data State" in Chapter 2, "State Tables".

The configuration data required for this table is provided via the EMV Configuration Message (sub-class of '1'). The data is held in field 'f' of the EMV Configuration Message as follows:

| Field | Number of Characters | Mandatory/ Optional | Description |
|-------|---|---|--|
| f | - | - | ICC Currency Data Objects Table data - see sub-fields: |
| f1 | 2 | M | Number of Currency Type Mapping Entries. |
| | | | Two-digit ASCII hex value in the range '01' to 'FF' inclusive. |
| f2 | 2 | See Note 1 | Currency Type. |
| | | | Two-digit ASCII hex value in the range '01' to 'FF' inclusive. |
| f3 | Var. | See Note 1 | BER-TLV Data Objects. |
| | data objects must be held within a single Res | Any BER-TLV formatted data object may be placed in this field, but all data objects must be held within a single Response Format 2 data object (tag 0x77). The data is sent in ASCII hex. | |
| | | | This field contains the Transaction Currency Code (tag 0x5F2A) and the Transaction Currency Exponent (tag 0x5F36) data objects. |
| | | | For example: '77 09 5F 2A 02 08 26 5F 36 01 02' |
| | | | Where: '77' - 'Response Format 2' data object tag '09' - 'Response Format 2' data object length '5F 2A' - 'Transaction Currency Code' data object tag '02' - 'Transaction Currency Code' data object length '08 26' - 'Transaction Currency Code' data object value '5F 36' - 'Transaction Currency Exponent' data object tag '01' - 'Transaction Currency Exponent' data object length '02' - 'Transaction Currency Exponent' data object value |

If Central downloads ICC Currency Data Objects Table data and it does not conform to the above format, the NDC CAM application generates a solicited error message identifying a Specific Command Reject (value 'B91'), and the downloaded data is ignored.

Note 1: If field 'f1' is greater than '01', the fields 'f2' and 'f3' are repeated for the number of times indicated by field 'f1'.

Note 2: The data contained within field 'f' is normally in binary. This field will be converted to ASCII hex for transmission. Therefore the single-byte value 0x9A would be transmitted as the two-byte value '9A'. The format description above shows the data field sizes as it would be sent to Central.

Note 3: If a specific 'Currency Type' is mapped to 'BER-TLV Data Objects' more than once within the message, then the later mapping will be used for processing.

Example Data

If there are two currencies to be supported by the terminal, for example Pounds Sterling and the Euro, the downloaded ICC Currency Data Objects Table data would be as follows:

'02 01 77 09 5F 2A 02 08 26 5F 36 01 02 02 77 09 5F 2A 02 09 78 5F 36 01 02'

Spaces are included for clarity, but do not appear in the actual message to the terminal.

ICC Transaction Data Objects Table

This table is used to provide the means by which transaction types can be mapped to BER-TLV data objects, for use with the Set ICC Transaction Data state type '?'. For more details, see "? - Set ICC Transaction Data State" in Chapter 2, "State Tables".

The configuration data required for this table is provided via the EMV Configuration Message (sub-class of '2'). The data is held in field 'f' of the EMV Configuration Message as follows:

| Field | Number of Characters | Mandatory/ Optional | Description |
|-------|-------------------------|---------------------|---|
| f | - | - | ICC Transaction Data Objects Table data - see sub-fields: |
| f1 | 2 | M | Number of Transaction Type Mapping Entries. |
| | | | Two-digit ASCII hex value in the range '01' to 'FF' inclusive. |
| f2 | 2 | See Note 1 | Transaction Type. |
| | | | Two-digit ASCII hex value in the range '01' to 'FF' inclusive. |
| f3 | Var. (000-255) | See Note 1 | BER-TLV Data Objects. |
| | (000-255) | | Any BER-TLV formatted data object may be placed in this field, but all data objects must be held within a single 'Response Format 2' data object (tag 0x77). The data is sent in ASCII hex. |
| | | | Note : Only primitive BER-TLV data objects of a type known to the terminal are stored for use in ICC processing. |
| | | | This field contains the 'Transaction Type' (tag 0x9C) data object and the MasterCard proprietary 'Transaction Category Code' (tag 0x9F53) data object. |
| | | | For example: '77 07 9C 01 01 9F53 01 5A' |
| | | | Where: '77' = 'Response Format 2' data object tag '07' = 'Response Format 2' data object length '9C' = 'Transaction Type' data object tag '01' = 'Transaction Type' data object length '01' = 'Transaction Type' data object value '9F53' = 'Transaction Category Code' data object tag '01' = 'Transaction Category Code' data object length '5A' = 'Transaction Category Code' data object value. |

If Central downloads ICC Transaction Data Objects Table data and it does not conform to the above format, the NDC CAM application generates a solicited error message identifying a Specific Command Reject (value 'B92'), and the downloaded data is ignored.

Note 1: If field 'f1' is greater than '01', the fields 'f2' and 'f3' are repeated for the number of times indicated by field 'f1'.

Note 2: If Specific Command Reject processing is not activated, rejects will be reported as a standard 'Ready A' reject.

Note 3: The data contained within field 'f' is normally in binary. This field will be converted to ASCII hex for transmission. Therefore the single-byte value 0x9A would be transmitted as the two-byte value '9A'. The format description above shows the data field sizes as it would be sent to Central.

Note 4: If a specific 'Transaction Type' is mapped to 'BER-TLV Data Objects' more than once within the message, then the later mapping will be used for processing.

Example Data

If there are two transaction types to be supported by the terminal, the downloaded 'ICC Transaction Data Objects Table' data would be similar to the following:

'02 01 77 07 9C 01 01 9F 53 01 5A 02 77 07 9C 01 02 9F 53 01 5B'

Spaces are included for clarity, but do not appear in the actual message to the terminal.

ICC Language Support Table

This table is used to provide a mapping between the languages preferences indicated by the ICC data and those supported by the terminal. The table is used in the Automatic Language Selection state type '-'. For more details, see "- - Automatic Language Selection State" in Chapter 2, "State Tables".

The configuration data required for this table is provided via the EMV Configuration Message (sub-class of '3'). The data is held in field 'f' of the EMV Configuration Message as follows:

| Field | Number of Characters | Mandatory/ Optional | Description |
|-------|-------------------------|---------------------|---|
| f | - | - | ICC Language Support Table data - see sub-fields: |
| f1 | 2 | M | Number of Language Mapping Entries. |
| | | | Two-digit ASCII hex value in the range '01' to 'FF' inclusive. |
| f2 | 2 | See Note 1 | Language Code. |
| | | | ASCII character value in the range 'aa' to 'zz' inclusive (that is, lower case alphabetic characters only, with no numerics). |
| | | | The language code must be a value as defined in ISO 639:1998. |
| f3 | 3 | See Note 1 | Screen Base. |
| | | | ASCII decimal value in the range '000' to '999' inclusive, where: $1 = 1000, 2 = 20009 = 9000.$ |
| | | | This value is used as the screen base, provided the ICC language preference finds a match against the language code in field 'f2'. |
| | | | Note : To enable larger screen groups, values 1 to 9 are now multiplied by 1000. For example, to set the screen base to 1000, set this value to 1. |

| Field | Number of Characters | Mandatory/ Optional | Description |
|-------|-------------------------|---------------------|--|
| f4 | 3 | See Note 1 | Audio Base. |
| | | | ASCII decimal value in the range '000' to '007' inclusive. |
| | | | This value is used to set the digital audio directory base, provided the ICC language preference finds a match against the language code in field 'f2'. |
| f5 | 3 | See Note 1 | Opcode Buffer Positions. |
| | | | Three different ASCII decimal values, each in the range '0' to '7' inclusive. No duplicate values should be present (that is, '001' is not acceptable). |
| | | | If the ICC language preference finds a match against the language code in field 'f2', the three opcode buffer positions indicated in this field are set to the corresponding values indicated in field 'f6'. |
| f6 | 3 | See Note 1 | Opcode Buffer Values. |
| | | | Three ASCII character values, each with a value in the range 'A' to 'D' or 'F' to 'I' inclusive, or '@'. |
| | | | If the ICC language preference finds a match against the language code in field 'f2', the three opcode values indicated in this field are set in the corresponding opcode positions indicated in field 'f5'. |
| | | | If the opcode value is '@', no change is made to the corresponding opcode positions. |

If Central downloads ICC Language Support Table data and it does not conform to the above format, the NDC CAM application will generate a solicited error message identifying a Specific Command Reject (value 'B93') and the downloaded data is ignored.

Note 1: If field 'f1' is greater than '01', the fields 'f2' through 'f6' inclusive are repeated for the number of times indicated by field 'f1'.

Note 2: If a specific 'Language Code' is mapped more than once within the message, then the later mapping will be used for processing.

Example Data

If English (en) [language 1], French (fr) [language 2], German (de) [language 3], Italian (it) [language 4], Spanish (es) [language 5] and Welsh (cy) [language 6] are to be supported, the data would be similar to the following:

Central to Terminal Messages **EMV Configuration Message**

06 en 000 000 012 AB@ fr 100 001 012 BB@ de 200 002 012 CB@ it 300 003 012 DB@ es 400 004 012 FB@ cy 500 005 012 GB@

Spaces are included for clarity, but do not appear in the actual message to the terminal.

Depending on the language preference indicated by the ICC, the following settings would be used during processing:

| Language Preference Code | Screen Base Value | Audio Base Value | Opcode Buffer Value |
|--------------------------------|----------------------|---------------------|---------------------|
| en | 000 | 000 | ABxxxxxx |
| fr | 100 | 001 | BBxxxxxx |
| de | 200 | 002 | CBxxxxxx |
| it | 300 | 003 | DBxxxxxx |
| es | 400 | 004 | FBxxxxxx |
| cy | 500 | 005 | GBxxxxxx |

Where 'xxxxxx' is the unchanged opcode buffer position.

ICC Terminal Data Objects Table

This table is used to provide the method by which terminal-specific data objects are defined by Central for use with ICC processing.

The configuration data required for this table is provided via the EMV Configuration Message (sub-class of '4'). The data is held in field 'f' of the EMV Configuration Message as follows:

| Field | Number of Characters | Mandatory/ Optional | Description |
|-------|-------------------------|---------------------|---|
| f | - | - | ICC Terminal Data Objects data - see sub-fields: |
| f1 | Var. (0-255) | M | BER-TLV Data Objects. |
| | (*, | | Any BER-TLV formatted data object may be placed in this field, but all data objects must be held within a single 'Response Format 2' data object (tag 0x77). The data is sent in ASCII hex. |
| | | | Note : Only 'primitive' BER-TLV data objects of a type known to the terminal are stored for use in ICC processing. |
| | | | This field contains the 'Terminal Country Code' (tag 0x9F1A) and 'Terminal Type' (tag 0x9F35) data objects. |
| | | | For example: |
| | | | '77 09 9F 1A 02 08 26 9F 35 01 14' |
| | | | Where: |
| | | | '77' - 'Response Format 2' data object tag |
| | | | '09' - 'Response Format 2' data object length |
| | | | '9F 1A' - 'Terminal Country Code' data object tag |
| | | | '02' - 'Terminal Country Code' data object length |
| | | | '08 26' - 'Terminal Country Code' data object value '9F 35' - 'Terminal Type' data object tag |
| | | | '01' - 'Terminal Type' data object length |
| | | | '14' - 'Terminal Type' data object religin '14' - 'Terminal Type' data object value |

If Central downloads ICC Terminal Data Objects data and it does not conform to the above format, the NDC CAM application generates a solicited error message with a Specific Command Reject (value 'B94') and the downloaded data is ignored.

Note: The data contained within field 'f' is normally in binary. This field is converted to ASCII hex for transmission; for example, the single-byte value 0x9A is transmitted as the two-byte value '9A'. The format description in the previous table shows the data field sizes as they are sent to Central.

ICC Terminal Acceptable Application IDs Table

The ICC Terminal Acceptable AIDs Table is obtained and used as summarised in "ICC Initialise and Candidate List Build" in Chapter 2, "State Tables".

The table is made up of entries which each define an acceptable AID (as a full or partial AID value) and a list of associated AIDs. These entries are used selectively, based on the application found on the ICC being processed. This makes the Terminal Acceptable AID List processing dynamic.

The configuration data required for this table is provided via the EMV Configuration Message (sub-class of '5'). Each table entry is held in field 'f' of the EMV Configuration Message as follows:

| Field | Number of Characters | Mandatory/ Optional | Description |
|-------|-------------------------|---------------------|--|
| f | - | - | ICC Terminal Acceptable AIDs Table data - see sub-fields: |
| f1 | 2 | M | Entry Number. |
| | | | Two-digit ASCII hex value in the range '00' to 'FF' inclusive. |
| f2 | 2 | See Note 1 | Length of Full/Partial Primary AID Value. |
| | | | ASCII hex value for the length of the AID. |
| | | | The length of the AID must be in the range ' $01H'$ to ' $10H'$ inclusive (1 to 16 decimal inclusive). |
| | | | Note : This length is also the number of ICC AID bytes that will be checked when compared to the Full/Partial Primary AID value (field 'f3'). |
| f3 | Var. | See Note 1 | Full/Partial Primary AID Value. |
| | (1-32) | | Binary value stored as ASCII hex. |
| | | | For example, an AID of 0xA000000026 is stored as the characterised value 'A000000026' and has length '05' (field 'f2'). |
| f4 | 2 | See Notes 1 & 5 | Length of Default Application Label. |
| | | | ASCII hex value for the length of the default Application Label data object (tag $0x50$). |
| | | | The length must be in the range '00' to '10' inclusive (0 to 16 decimal inclusive). The value corresponds to the content of field 'f5'. |

| Field | Number of Characters | Mandatory/ Optional | Description |
|-------|-------------------------|---------------------|---|
| f5 | Var. (1-16) | See Notes 1 & 5 | Default Application Label. |
| | , | | Default value to be used for the Application Label data object (tag $0x50$). |
| | | | The value is a text string of characters in the range $0x20$ to $0x7E$ inclusive. |
| | | | The default Application Label is 'Self Service', transmitted with length '0C' (field 'f4'). |
| f6 | 3 | See Note 1 | Primary AID ICC Application Type. |
| | | | 'CAM' = CAM ICC application |
| f7 | 4 | See Note 1 | Primary AID Lowest Application Version Number. |
| | | | A binary value stored as ASCII hex. |
| f8 | 4 | See Note 1 | Primary AID Highest Application Version Number. |
| | | | A binary value stored as ASCII hex. |
| f9 | 10 | See Note 1 | Primary AID Terminal Action Code - Denial. |
| | | | Binary value stored as ASCII hex. |
| f10 | 2 | See Notes 1 & 2 | Number of Data Object(s) for Transaction Request. |
| | | | ASCII hex value in range '00' through 'FF' inclusive. |
| f11 | Var. | See Notes 1 & 2 | Data Object(s) for Transaction Request. |
| | | | ASCII hex value. |
| | | | This contains the list of BER-TLV formatted tags to be sent in the Transaction Request (see "Transaction Request Message Format" in Chapter 4, "Terminal to Central Messages"). |
| | | | Note : No length is required for each tag value, as BER-TLV formatted tag values define their own length within the tag value itself. However, in line with implementation restrictions, a tag will not be acceptable if it is more than two bytes (four ASCII hex characters) long. |
| | | | Note : To include the PIN retry count in the transaction request, include the tag 0x9F17 in this object list. |
| f12 | 2 | See Notes 1 & 2 | Number of Data Object(s) for Completion Data. |
| | | | ASCII hex value in range '00' through 'FF' inclusive. |

| Field | Number of Characters | Mandatory/ Optional | Description |
|-------|-------------------------|---|--|
| f13 | Var. | See Notes 1 & 2 | Data Object(s) for Completion Data. |
| | | | ASCII hex value. |
| | | | Contains a list of BER-TLV formatted tags that are to be sent on the next solicited status message (except command rejects or specific command rejects), in response to a valid Transaction Reply containing valid CAM data. See "Issuer Script Results and Completion Data" in Chapter 4, "Terminal to Central Messages". |
| | | | Note : No length is required for each tag value as BER-TLV formatted tag values define their own length within the tag value itself. However, in line with implementation restrictions a tag will not be acceptable if it is more than two bytes (four ASCII hex characters) long. |
| f14 | 2 | See Notes 1 & 3 | Number of Secondary AIDs. |
| | | | ASCII hex value in range '00' through 'FF' inclusive. |
| f15 | 2 | See Notes 1 & 3 | Length of Full/Partial Secondary AID Value. |
| | | | ASCII hex value for the length of the AID. |
| | | | The length of the AID must be in the range '01' to '10' inclusive (1 to 16 decimal inclusive). |
| | | | Note : This length is also the number of 'Full/Partial Primary AID Value' field bytes that are checked when compared to the Full/Partial Secondary AID Value (field 'f16'). |
| f16 | Var. | See Notes 1 & 3 | Full/Partial Secondary AID Value. |
| | (1-32) | | Binary value stored as ASCII hex. For example, an AID of $0xA000000026$ is stored as the characterised value 'A000000026', and has a length of '05' (field 'f15'). |
| f17 | 2 | O | Application Selection Indicator |
| | | (M if any following fields are present) | (Default) During the candidate list build processing, any application which is a partial match will be added to the candidate list. |
| | | | Note : A partial match occurs when the DF Name (tag 0x84) returned by the ICC in response to a SELECT command exactly matches the length of the AID used in the select command, but the DF Name is longer in length. |

| Field | Number of Characters | Mandatory/ Optional | Descript | ion |
|-------|-------------------------|---|----------|---|
| | | | 01 | During the candidate list build processing, only add an application which is a full match to the candidate list. |
| | | | | Note : A full match occurs when the DF Name (tag 0x84) returned by the ICC in response to a SELECT command exactly matches the AID used in the SELECT command, that is both are identical in length and contain the same characters. |
| f18 | 2 | О | Track | 2 Data for Central |
| | | (M if any following fields are present) | 00 | (Default) Use the card's magnetic stripe data in the track 2 buffer field of the transaction request. |
| | | | 01 | Use the card's magnetic stripe data in the track 2 buffer field of the transaction request, unless there is no track 2 data available, in which case use the ICC track 2 data defined in field f19. |
| | | | 02 | Always place the ICC track 2 data defined in field f19 in the track 2 buffer field. |
| f19 | 2 | О | Track | 2 Data To Be Used During ICC Transaction |
| | | (M if any following fields are present) | 00 | (Default) Use the Track 2 Equivalent Data (tag 0x57) for all NDC processing, but if it is not supplied by the ICC, produce an ICC level fake error and terminate the ICC processing. |
| | | | 01 | Use the Track 2 Equivalent Data (tag 0x57) for all NDC processing, but if it is not supplied by the ICC, use the track 2 data from the magnetic card. |
| | | | 02 | Always use the track 2 data from the magnetic card. |
| | | | 03 | Use the Track 2 Equivalent Data (tag 0x57) for all NDC processing, but if it is not supplied by the ICC, construct simulated Track 2 data. For details of track 2 data simulation, see "Simulated Track 2 Data" on page 5-22. |
| | | | 04 | Always construct simulated track 2 data. For details, see "Simulated Track 2 Data" on page 5-22. |

| Field | Number of Characters | Mandatory/ Optional | Description |
|-------|-------------------------|-------------------------------------|---|
| f20 | 2 | O (M if f19 is set to 03 or 04) | Length Of Additional Track 2 Data in the following field (f21). |
| | | | Range 00 to 21 (ASCII Hexadecimal). |
| | | | For example, "21" hexadecimal means 33 characters to follow. |
| | | | For details of track 2 data simulation, see "Simulated Track 2 Data" on page 5-22. |
| f21 | 0 - 33 | O (M if f20 is a non-zero value) | Additional Track 2 Data |
| | | non-zero value) | The additional track 2 data to be used in the construction of the simulated track 2 data. |
| | | | Each byte of data to be used must be represented by 2 ASCII hexadecimal characters in the range '30' to '39'. |
| | | | For example, "1" would be transmitted as "31". |
| | | | For details of track 2 data simulation, see "Simulated Track 2 Data" on page 5-22. |

If Central downloads ICC Terminal Acceptable AIDs Table data and it does not conform to the above format, the NDC CAM application generates a solicited error message identifying a Specific Command Reject with value 'Wxx' (where 'xx' is the entry number identified by field 'f1') and the downloaded data is ignored.

Note 1: Fields 'f1' through 'f21' inclusive may be repeated as many times as will fit within a single message within field 'f', with a maximum total length of 256. Each iteration must be separated by a Group Separator (GS) character.

Note 2: Fields 'f11' and 'f13' are repeated as appropriate to the values in field 'f10' and 'f12' respectively. If field 'f12' is zero then field 'f13' is omitted.

Note 3: Fields 'f15' and 'f16' are repeated as appropriate to the value in field 'f14'. If field 'f14' is zero then fields 'f15' & 'f16' are omitted.

Note 4: If Specific Command Reject processing is not activated, rejects will be reported as standard 'Ready A' rejects.

Note 5: If field 'f4' is zero, field 'f5' is omitted.

Note 6: ICCs do not have to support selection of ICC applications by partial AID / 'DF Name' value; this is not mandatory. However, in case this becomes mandatory, it is advisable to use full AID

values in field 'f3', where the ICC application is not known to be always held on an ICC that supports selection of ICC applications by partial AID / 'DF Name' value.

Note 7: If field 'f1' is sent without fields 'f2' through 'f21', the entry to which field 'f1' refers is deleted from the table.

Note 8: If data for a specific Entry Number is supplied more than once within the message, the later mapping is used for processing.

For example:

```
00 07 A000000080001 00 CAM 0000 0001 0070000000
0A 9F06575A5F349F279F269F10829F368C
05 9F279F269F10959B
01 06 A00000000201
<GS>01 07 A0000000080002 00 CAM 0000 0001 0070000000
0A 9F06575A5F349F279F269F10829F368C
05 9F279F269F10959B
<GS>02 07 A000000070001 00 CAM 0000 0001 0070000000
0A 9F06575A5F349F279F269F10829F368C
05 9F279F269F10959B
02 07 A000000031010
  07 A0000000041010
<GS>03 07 A000000031010 04 Visa CAM 0000 0001 0010000000
0A 9F06575A5F349F279F269F10829F368C
05 9F279F269F10959B
02 07 A000000032010
  07 A000000033010
<GS>04 07 A000000032010 00 CAM 0000 0001 0010000000
OA 9F06575A5F349F279F269F10829F368C
05 9F279F269F10959B
<GS>05 07 A000000033010 00 CAM 0000 0001 0010000000
OA 9F06575A5F349F279F269F10829F368C
05 9F279F269F10959B
00
<GS>06 07 A000000041010 00 CAM 0000 0001 0010000000
0A 9F06575A5F349F279F269F10829F368C
05 9F279F269F10959B
02 07 A000000046000
   07 A000000043060
```

Where:

<GS> is a group separator.

Spaces and new lines are included for clarity, but do not appear in the actual message to the terminal.

This example has eleven CAM ICC application Primary AIDs, all with a version number in the range 0x0000 to 0x0001 inclusive.

All entries identify that the following are to be included in the transaction request:

- Application Identifier (AID) (tag 0x9F06)
- Track 2 Equivalent Data (tag 0x57)
- Application PAN (tag 0x5A)
- Application PAN Sequence Number (tag 0x5F34)
- Cryptogram Information Data (tag 0x9F27)
- Application Cryptogram (tag 0x9F26)
- Issuer Application Data (tag 0x9F10)
- Application Interchange Profile (AIP) (tag 0x82)
- Application Transaction Counter (ATC) (tag 0x9F36) and
- CDOL1 (tag 0x8C) data objects.

All entries identify that the following are to be included as Completion Data in the first solicited status message that concludes ICC processing for a transaction:

- Cryptogram Information Data (tag 0x9F27)
- Application Cryptogram (tag 0x9F26)
- Issuer Application Data (tag 0x9F10)
- Terminal Verification Results (TVR) (tag 0x95) and
- Transaction Status Indicator (TSI) (tag 0x9B) data objects.

Entries '00', '02', '03' and '06' have secondary AID values.

Entries '03' and '07' have Default Application Label values.

Entries '00', '01' and '02' have a 'Primary AID Terminal Action Code - Denial' value indicating that a transaction should be declined offline by the terminal when:

- Requested service is not allowed
- ICC application has expired
- ICC application is not yet effective.

Entries '03', '04', '05' and '06' have a 'Primary AID Terminal Action Code - Denial' value indicating that a transaction should be declined offline by the terminal only when the requested service is not allowed.

Entries '07', '08', '09' and '10' have a 'Primary AID Terminal Action Code - Denial' value indicating that a transaction should be declined offline by the terminal when:

- Offline static data authentication failed (not performed by terminal).
- Card is on the terminal exception file (not performed by terminal).
- Requested service is not allowed.
- Cardholder verification failed.
- Unrecognised CVM.
- PIN try limit exceeded.
- PIN entry required, PIN pad not present and working.
- PIN entry required, PIN pad present, PIN entered.

Simulated Track 2 Data

If simulated track 2 data is selected, the terminal will construct this data from the following ICC data objects:

- Primary Account Number (0x5A),
- Application Expiry Date (0x5F24) and
- additional track 2 data downloaded in field f21 of the "ICC Terminal Acceptable Application IDs Table".

The simulated track two data is constructed as follows:

| Additional Track 2 Data | End Sentinel |
|---------------------------------|-----------------|
| From AID table f21 (if | '?' |
| | (if present) |

If the simulated track 2 buffer would result in a length greater than 40 (inclusive of the Field Separators and Sentinels), then the leftmost 39 bytes of data are used, followed by the End Sentinel.

Example If the terminal acceptable AID table download for the selected application has the following values for f18 onwards:

```
....01030732323331373031
```

and the ICC application has returned the following objects:

```
5A 08 4916245531413011
```

and

5F24 03 050301

then the simulated Track 2 data used by NDC for the transaction would be:

```
;4916245531413011=05032231701?
```

As f18 is set to 01 in this example, this would only be sent to the host if there was no track 2 data read successfully from the card, when the data would be placed into the track 2 buffer of the transaction request message.

Impact on Central (host)

As the new "ICC Terminal Acceptable Application IDs Table" fields f17 to f21 are optional, and all the default settings support previous releases of EMV CAM2 Exits, there are no compatibility issues with existing host systems.

However, if the constructed track 2 buffer is enabled by a host, additional Financial Institution Tables (FITs) may be required to match against the simulated track 2 data derived from the selected ICC application.

Depending on the Track 2 Data for Central (f18) field setting, the simulated track 2 data may not be sent to the host system. However, the host can derive this track 2 data if it requests the inclusion of the Primary Account Number (ICC object 0x5A) and Application Expiry Date (0x5F24) in the CAM buffer of the transaction request message. Using these objects and the additional track 2 information (already supplied to the terminal by the host system), the host can reconstruct the simulated track 2 buffer.

Default EMV Customisation Data

At power-up, the terminal checks for the presence of the default EMV download data file 'C:\Program Files\NCR APTRA\APTRA ADVANCE\DATA\EMVDFLT.DAT' for an Advance NDC system, or 'C:\SYSTEM\EMVDFLT.DAT' for an NDC+ system.

During power-up, but prior to the normal Advance NDC or NDC+download reload, if this file is present and is formatted correctly, the data stored in this file is loaded into the system as the default values for the Advance NDC or NDC+ Option Digit number 69, and the various EMV download data.

This file is in addition to the normal reloading of the download following a power fail. In addition, any subsequent host downloads of this data will replace the default entries loaded from the file.

The recommended approach to create a valid default download file is :

- 1 Start with a terminal which contains no download data and no default EMV data file
- 2 Send the terminal the EMV data which is required to be set as the default
- 3 Send a non-zero configuration identifier to the terminal
- 4 Send a 'Go-In-Service' command to the terminal
- 5 Copy the file 'C:\Program Files\NCR APTRA\APTRA ADVANCE\DATA\EMVDATA.DAT' on an Advance NDC system, or 'C:\SYSTEM\EMVDATA.DAT' on NDC+, to the default EMV load file name.

Transaction Reply

The Transaction Reply message remains unaltered, apart from the addition of the 'as1' and 'as2' fields for NDC+, or the 'at1' and 'at2' fields for Advance NDC, immediately following field 'x'. These fields are identified below.

Note: Fields 'as2b/at2b', 'as2c/at2c' and 'as2d/at2d' are normally binary values. These values are converted to ASCII hex for transmission; for example, the single-byte value 0x9A would be transmitted as the two-byte value '9A'. The table below shows the data format as it would be transmitted by Central.

| Field | Number of Characters | Mandatory/ Optional | Description |
|-------------------|-------------------------|---------------------|---|
| FS | 1 | See Note 1 | Field Separator. |
| as1/ at1 | 1 | See Note 1 | Buffer Identifier. The value is fixed as '5' to indicate smart card data. |
| as2/ at2 | - | - | Smart Card Data - see sub-fields: |
| as2a / at2a | 3 | See Note 1 | Smart Card Data Identifier. 'CAM' - Data in buffer is for CAM. |

| Field | Number of Characters | Mandatory/ Optional | Description |
|-------------------|-----------------------------------|-------------------------|--|
| as2b / at2b | | See Note 2 | Issuer Authentication Data (up to 36 bytes) in BER-TLV format, as follows: |
| atzu | 2 | M | '91' for tag 0x91 |
| | 2 | M | Length, in hex, of the following Issuer Authentication Data. The length value must be in the range $0x08$ ('08') to $0x10$ ('10') inclusive. |
| | 16 | M | Authorisation Response Cryptogram (ARPC) |
| | up to 16 | O | Scheme specific/proprietary Issuer Authentication Data. |
| as2c | | See Note 3 | Authorisation Response Code (8 bytes) in BER-TLV format, as follows: |
| at2c | 2 | M | '8A' for tag 0x8A. |
| | 2 | M | Length, in hex, of the Authorisation Response Code ('02') |
| | 4 | M | Authorisation Response Code value. |
| as2d / at2d | Var. (up to 256) See Note 4 | See Notes 5, 6 and 7 | Issuer Script(s). Each script is in a BER-TLV formatted data object with a tag of 0x71 or 0x72. Each script data object may optionally contain a script ID data object |
| | | | (tag 0x9F18), but the value must not be more than four bytes. Script commands will be held within script data objects and will be identified with the tag value of 0x86. |
| | | | Example Script Data: '72 17 9F 18 04 12 34 56 78 86 0E 04 DA 9F 58 09 05 01 23 45 67 89 AB CD EF' |
| | | | Where: 72 = Issuer Script Tag 17 = Length of Data 9F 18 = Script ID Tag 04 = Length of Script ID 12 34 56 78 = Script ID 86 = Issuer Script Command Template Tag 0E = Issuer Script Command Template Tag length 04 DA 9F 58 09 05 01 23 45 67 89 AB CD EF = Issuer Script Command (PUT DATA) |

Note 1: The field separator, buffer identifier and smart card data identifier may only be omitted from the Transaction Reply or Interactive Transation Reply if CAM data is not expected.

Note 2: If the Issuer Authentication Data (ARPC) is not available, for example because the Issuer connection is unavailable or the Issuer does not respond with CAM data, this field may be omitted to avoid subsequent rejection of the host response. If this field is not omitted, the field separator, buffer identifier and smart card data identifier must also be present.

Note 3: If the Authorisation Response Code is not available, for example because the Issuer connection is unavailable or the Issuer does not respond with CAM data, this field may be omitted to avoid subsequent rejection of the host response; otherwise it must be present. If this field is not omitted, the field separator, buffer identifier and smart card data identifier must also be present.

If the Authorisation Response Code is received from the host and contains a value of '30 30', the terminal requests a Transaction Certification (Approval) from the card. If the Authorisation Response Code is not present or is not set to '30 30', an Application Authorisation Cryptogram (Decline) is requested from the card.

Note 4: If more than 256 bytes are received for the issuer script, any complete 0x71/0x72 tagged issuer scripts below this limit are attempted. Any issuer script commands beyond or continuing beyond this limit are not attempted and, for each, a fake unsolicited script error is sent to Central. The failure of the first command of each of these scripts is also reported in the Issuer Script Results.

Note 5: Issuer script(s) are optional and may be omitted. If this field is not omitted, the field separator, buffer identifier and smart card data identifier must also be present. For further details on Issuer Scripts, see "Issuer Script Results and Completion Data" in Chapter 4, "Terminal to Central Messages".

Note 6: If an Issuer Script ID (tag 0x9F18) has a value greater than four bytes in length, this is regarded as invalid data.

Note 7: An Issuer Script Command (tag 0x86) and therefore an Issuer Script are regarded as containing valid data only when:

- The value field of the Issuer Script Command data object (tag 0x86) is at least four bytes long (CLA, INS, P1 and P2)
- If the Lc command parameter is present, then the value field must have at least 'Lc' bytes of data following the Lc command parameter byte
- In the Lc & Le command parameters, there must be no data following the Le command parameter.

Central to Terminal Messages Transaction Reply

In effect, the validation verifies that the command is in one of the following ISO/EMV command formats:

- CLA INS P1 P2
- CLA INS P1 P2 Lc <command data> Lc can be zero
- CLA INS P1 P2 Le
- CLA INS P1 P2 Lc <command data> Le Lc can be zero

When only the Lc or Le parameter is present (second and third cases above) it is not possible for the terminal to distinguish between them. In this situation, validation assumes that if there are only five bytes in the data object value field, then the fifth byte is the Le parameter. If there are more than five bytes in the data object value field, then the fifth byte is treated as the Lc parameter.

User Defined Functions

To use your own user defined functions in the Transaction Reply with Advance NDC (not NDC+), you will need to create a text file containing the user function IDs.

The text file must be called TransFuncIds.txt and be copied to the directory c:\emvdata on the terminal.

The TransFuncIds.txt file must contain a character for each of the user function IDs being used. For example, for IDs A, B, and C the file would simply contain the text:

ABC

This simply identifies that these user defined functions are being used.

For further details, see the 'New Function IDs in a Transaction Reply' section under 'Transaction Request/Reply' in Chapter 6 of the *APTRA Advance NDC, Developer's Guide*.

Interactive Transaction Response

The Interactive Transaction Response also remains unaltered, with the exception that the fields previously identified immediately follow field 'j'.

Chapter 6

Supervisor Menus/Functions

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Supervisor Menus/Functions

Overview

This chapter provides a brief overview of the Supervisor menus and functions which are relevant to using an ICC with APTRA Advance NDC and NDC+. In particular, the following Supervisor functions and sub-functions are included:

- 90 MISC FUNCS
 - 0 PRNT CMPNT VERS
 - 1 PRNT SCRW VERS.

For further details of the other Supervisor menus in APTRA Advance NDC or NDC+, see the relevant *APTRA Advance NDC, Supervisor's Guide* or *NDC+ Supervisor's Reference Manual* respectively.

The reserved screens associated with the 'EMV/CAM2 Exits for APTRA Advance NDC' and 'EMV/CAM2 Exits for NDC+' products are grouped as 'U' reserved screens. For details of the 'U' reserved screens, see Appendix E, "EMV ICC Reserved Screens".

For details of the other Reserved Screens used in APTRA Advance NDC or NDC+, see the *APTRA Advance NDC, Reference Manual* or the *NDC+ Programmer's Reference Manual* respectively.

Supervisor Menus/Functions

To give a local terminal operator access to information on the ICC/CAM software components and hardware, a new supervisor menu and supervisor functions have been introduced to APTRA Advance NDC and NDC+.

The Select menus in APTRA Advance NDC and NDC+ now have a Miscellaneous Functions ('90 MISC FUNCS') option, which is described in the following sub-sections.

Note: For details of all the Advance NDC Select menu options, see the *APTRA Advance NDC*, *Supervisor's Guide*. For details of all the NDC+ Select menu options, see the *NDC+*, *Supervisor's Reference Manual*.

90 MISC FUNCS

The new supervisor menu 'MISC FUNCS' is accessed via function '90' ('MISC FUNCS') on the supervisor Select menu, and displays the following Supervisor functions:

MISC FUNCS

O PRNT CMPNT VERS
1 PRNT SCRW VERS

SELECT FUNCTION-

When the 'MISC FUNCS' menu is entered from the Select menu, the unsolicited supervisor keys message has field 'e2' set to '90' or '090', depending on the value of message mode option digit number 0.

0 PRNT CMPNT VERS

Supervisor function '0' ('PRNT CMPNT VERS') prints the smart card processing application component versions to the journal; for example:

COMPONENT VERSIONS ICC 02.01.00 CAM 02.00.00

The NDC Interface component version number is not printed by this supervisor menu option.

The 'COMPONENT VERSIONS' text is obtained from reserved screen 'U0071'.

If the print operation is unsuccessful (for example, due to a print failure or the device not being present) the relevant error message is displayed.

When the 'PRNT CMPNT VERS' function is selected from the 'MISC FUNCS' menu, the unsolicited supervisor keys message has field 'e2' set to '800' or will not be sent, depending on the value of message mode option digit number 0.

1 PRNT SCRW VERS

Supervisor function '1' ('PRNT SCRW VERS') prints the Smart Card Reader/Writer (SCRW) firmware version information to the journal; for example:

SCRW VERSION 009001621450000000

The 'SCRW VERSION' text is obtained from reserved screen 'U0072'.

If the print operation is unsuccessful (for example, due to a print failure or the device not being present) the relevant error message is displayed.

When the 'PRNT SCRW VERS' function is selected from the 'MISC FUNCS' menu, the unsolicited supervisor keys message has field 'e2' set to '801' or will not be sent, depending on the value of message mode option digit number 0.

Supervisor Menus/Functions
Supervisor Menus/Functions

Chapter 7

ICC Processing

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Overview

This chapter provides an overview of the following ICC processing functions:

- EMV Data Validation
- Issuer Script Processing
- Data Object List (DOL) Processing
- Basic Encoding Rules Tag Length Value (BER-TLV) Data Object Processing
 - BER-TLV Data Object Padding
 - Terminal Specified BER-TLV Data Objects
- Transaction Data Object List (TDOL) Processing
- MAC Configuration
- Terminal Verification Results (TVR) Processing
- Transaction Status Information (TSI) Processing
- PIN Encryption and Verification
- ICC Application Name Display
- Error Handling
- ICC Application Journal Error Message.

Application ID (AID) processing is assumed to have been already performed, as summarised in "ICC Initialise and Candidate List Build" in Chapter 2, "State Tables".

EMV Data Validation

The validation of the EMV Configuration messages is performed by the NDC C-Exits interface.

Each incoming message is parsed by the EMV Exits to extract and process the EMV related data, before being passed on to NDC (Advance NDC or NDC+).

If there is an error in the EMV related data in an incoming message, the appropriate error message is generated by the EMV Exits, and the message is rejected before being passed on to NDC.

Similarly, for each outgoing message, the EMV data is processed and appended to by the EMV Exits.

Issuer Script Processing

There are two types of issuer scripts which may be sent in the response from Central, both of which are distinguished by their tag. If the issuer script has a tag of 0x71, the issuer script is to be submitted to the ICC immediately *before* the second GENERATE AC command. If the issuer script has a tag of 0x72, the issuer script is to be submitted to the ICC *after* the second GENERATE AC command.

If the issuer script processing is being performed before the second GENERATE AC command, all the scripts beginning with tag 0x71 are executed sequentially as they are found in the Central response. Similarly, each command within each script is also executed sequentially as found.

If the issuer script processing is being performed after the second GENERATE AC command, all the scripts beginning with tag 0x72 are executed sequentially as they are found in the Central response. Similarly, each command within each script is also executed sequentially as found.

Script processing results are sent to Central on the first available solicited status message to be transmitted, following receipt of the transaction reply currently being processed.

In the 'EMV/CAM2 Exits for APTRA Advance NDC' product, invalidly formatted issuer script data is not rejected during transaction reply validation, prior to issuer script processing. Instead, an attempt to process each script is made until the script is complete, an ICC level error occurs, or a formatted error is discovered. A formatting error will result in a fake script unsolicited error message being sent to the host (Central). The formatted failure is also reported in the Issuer Script Results.

Data Object List (DOL) Processing

All Data Object List (DOL) objects are processed in accordance with the rules defined by the EMV standards. For the purpose of processing objects identified by a DOL, the object type is also as defined in the EMV standard.

In addition, the MasterCard proprietary Transaction Category Code data object (tag 0x9F53) is defined as having the type 'alphanumeric' (ASCII encoded).

The DOL is validated during processing as follows:

- The object tag and object length fields must be of valid BER-TLV format.
- For this implementation, the object tag must not be more than two bytes long.
- The object length field must not be more than one byte long.
- The total length of the output from processing the DOL must not exceed 255 bytes.

If the DOL data stored (PDOL, TDOL, CDOL1 or CDOL2) has invalid contents, the DOL output will have zero length.

The DOL output will then be submitted to the card via the command requiring it as input.

The lack of input data to the command will cause an ICC application error, which will be handled in the normal manner; see "Error Handling".

BER-TLV Data Object Processing

All object data is checked to ensure that it is in Basic Encoding Rules - Tag Length Value (BER-TLV) format as defined by the EMV standard.

Additionally, the object tag must not be more than two bytes long.

Any data returned by a command that does not comply to the BER-TLV format, or exceeds the previous restrictions, results in the fake ICC application level error 'Part of the returned data may be corrupted' (SW1 = 0x62, SW2 = 0x81) being generated to indicate that the data is corrupt or not as expected.

BER-TLV Data Object Padding

ISO 7816-4 indicates that one or more padding bytes, of the value 0xFF or 0x00, may precede or trail BER-TLV formatted data objects. This padding is to allow for data deletion and modification on the ICC.

ISO 7816-4 also indicates that BER-TLV data objects cannot have a tag starting with 0x00 or 0xFF.

Although padding is supported for BER-TLV data obtained from the ICC, all messages to the terminal from Central must *not* include padding in BER-TLV formatted message fields. If padding is included in a message, an appropriate reject response will be sent to Central.

The messages from the terminal to Central do not include any padding in BER-TLV formatted fields.

Terminal Specified BER-TLV Data Objects

The following table defines the Terminal Specified BER-TLV Data Objects in alphabetical order. These are the only objects that the terminal automatically populates. All the other EMV objects are also supported by the terminal, but must first be downloaded from the host in one of the three object download messages.

| Element Name | Description | Tag | No. of bytes | Value |
|-----------------------------------|--|--------|--------------|---|
| AID | Application ID as selected by the terminal. | 0x9F06 | 5 - 16 | AID of application selected in Binary Coded Decimal (BCD). |
| Amount Authorised (Numeric) | Authorised amount of the transactions (excluding adjustments). | 0x9F02 | 6 | Value of transaction in minor currency units, formatted in BCD. |
| | | | | Value set through State Type '?' - Set ICC Transaction Data. For details, see "? - Set ICC Transaction Data State" in Chapter 2, "State Tables". |
| Amount Authorised (Binary) | Authorised amount of the transactions (excluding adjustments). | 0x81 | 4 | Value of transaction in minor currency units, as a binary value. |
| | | | | Value set through State Type '?' - Set ICC Transaction Data For details, see "? - Set ICC Transaction Data State" in Chapter 2, "State Tables". |
| Application Version Number | Application version supported by the terminal. | 0x9F09 | 2 | Value taken from the 'Primary AID Highest Application Version Number field in the selected ICC application's corresponding 'ICC Terminal Acceptable AID Table' entry. See "ICC Terminal Acceptable Application IDs Table" in Chapter 5, "Central to Terminal Messages". |

| Element Name | Description | Tag | No. of bytes | Value |
|--|---|--------|-----------------|---|
| Terminal Capabilities | Indicates the card data input, CVM and security capabilities of the terminal. | 0x9F33 | 3 | 0x60 0x40 0x20 |
| | 0x60 - Magnetic stripe and ICC with contacts capabilities. | | | |
| | 0x40 - On-line enciphered PIN is used for CVM. | | | |
| | 0x20 - Card capture can be performed. | | | |
| Terminal Capabilities (Additional) | Indicates the data input and output capabilities of the terminal. | 0x9F40 | 5 | 0xEE (cash)/0x6E (non-cash) 0x00 0xB0 0x53 (receipt)/ |
| (Additional) | 0xEE/0x6E - payment, transfer, enquiry, | | | 0x13 (no receipt) 0xFF |
| | goods, services and (if cash dispenser is | | | |
| | present) cash transactions can be | | | |
| | performed on this terminal. | | | |
| | 0x00 - reserved for future use. | | | |
| | 0xB0 - terminal has numeric, command and function keys. | | | |
| | 0x53/0x13 - data can be output to a cardholder display and cardholder receipt (if receipt printer present). ISO 8859 parts 9 and 10 character sets are supported. | | | |
| | 0xFF - Character sets from ISO 8859 parts 1 to 8 inclusive are supported. | | | |
| | The supported ISO 8859 character sets and their font IDs are listed in Appendix F, "ISO 8859 Character Sets". | | | |
| Terminal Verification Results | Status of the different functions as seen from the terminal. | 0x95 | 5 | See "Terminal Verification Results (TVR) Processing". |
| Transaction Date | Local date that the transaction was authorised. | 0x9A | 3 | YYMMDD. |
| | autioniseu. | | | Date from terminal clock in BCD, taken at start of transaction. |

| Element Name | Description | Tag | No. of bytes | Value |
|--------------------------------------|---|--------|-----------------|--|
| Transaction Sequence Counter | Counter maintained by the terminal that is incremented by one for each successful initialisation of an ICC application. | 0x9F41 | 2 | Value in the range 0001 to 9999 (decimal) inclusive, encoded in BCD. |
| | аррисация. | | | The counter is cyclic, and defaults to 0001 (decimal) on power up. |
| Transaction Status Information | Status of authentication transaction as seen from the terminal. | 0x9B | 2 | See "Transaction Status Information (TSI) Processing". |
| Transaction Time | Local time that the transaction was authorised. | 0x9F21 | 3 | HHMMSS. |
| | | | | Time from the terminal clock in BCD taken at the start of the transaction. |
| Unpredictable Number | Value to provide variability and uniqueness to the generation of the application cryptogram. | 0x9F37 | 4 | Random number in binary. |

Note 1: Any objects not known by the terminal (that is, not in the list above), not retrieved from the ICC and not made known through processing in State Type '?' Set ICC Transaction Data, but referenced by a DOL, are processed following the DOL processing rules identified in "Data Object List (DOL) Processing".

Note 2: Terminal Verification Results (tag 0x95) and Transaction Status Information (tag 0x9B) data objects are made known to the terminal, with each value byte set to 0x00.

Note 3: Data object tags 0x9F06, 0x9F09, 0x9F33, 0x9F40, 0x9A, 0x9F21 and 0x9F37 are set and made known to the terminal. Additional terminal data objects can be made known after these data objects using ICC Terminal Data Objects. For more details, see "ICC Terminal Data Objects Table" in Chapter 5, "Central to Terminal Messages".

Note 4: Data object tag 0x8A is made known, but only if the Issuer Authentication Data (tag 0x91) has been provided by a response from Central in the appropriate Transaction Reply/Interactive Transaction Response for the transaction being processed.

Note 5: Other data objects can be made known to the terminal through the use of processing in State Type '?' Set ICC Transaction Data. For more details, see "? - Set ICC Transaction Data State" in Chapter 2, "State Tables".

Transaction Data Object List (TDOL) Processing

If the Transaction Certificate (TC) Hash Value (tag 0x98) data object is requested by a DOL (principally CDOL1 or CDOL2), then Advance NDC or NDC+ CAM needs to calculate the value for the data object so that it can be output as part of the DOL data.

Processing the output of the TDOL with this algorithm provides a checksum/signature which is 20 bytes long.

Note: If the TC Hash Value data object is referenced in TDOL, this is regarded as invalid content for the purposes of DOL processing.

The TDOL data object is optionally returned by the ICC application during processing. If the TDOL data object has not been obtained, a default value for TDOL is used. The default is defined as follows:

| Object Name | Tag | Length (bytes) |
|-------------------------------|--------|----------------|
| Amount Authorised | 0x9F02 | 6 |
| Transaction Currency Code | 0x5F2A | 2 |
| Transaction Date | 0x9A | 3 |
| Transaction Type | 0x9C | 1 |
| Terminal Verification Results | 0x95 | 5 |
| Unpredictable Number | 0x9F37 | 4 |
| | | |

MAC Configuration

To enable message authentication to be performed on the new Transaction Request and Transaction Reply message fields and the new messages introduced with NDC CAM, the MAC processing has been extended to enable the MAC value calculation processing to take account of these changes.

The standard Message Authentication Field Selection Load message has also been extended to cover the new fields and messages.

For the Smart Card Data buffer (data ID '5', fields 'bd1' and 'bd2') extension in the Transaction Request message, the Message Authentication Field Selection Load message field 'h' (Transaction Request Field) has an additional flag appended at offset 46. This flag contains a value of '0' if the Smart Card Data buffer is not to be used in the MAC value calculation, or a value of '1' if it is to be used. For more details, see "Transaction Request Message Format" in Chapter 4, "Terminal to Central Messages".

For the Smart Card Data buffer (data ID '5', fields 'at1', 'at2' for Advance NDC or 'as1', 'as2' for NDC+) extension in the Transaction Reply message, the Message Authentication Field Selection Load message field 'i' (Transaction Reply Field) has an additional flag appended at offset 36 for Advance NDC, or 35 for NDC+. This flag contains a value of '0' if the Smart Card Data buffer is not to be used in the MAC value calculation, or a value of '1' if it is to be used. For more details, see "Transaction Reply" and "Interactive Transaction Response" in Chapter 5, "Central to Terminal Messages".

For the Dispenser Currency Cassette Mapping Table message, the Message Authentication Field Selection Load message field 'k' (Other Messages Field) has an additional flag appended at offset 3. This flag contains a value of '0' if the Dispenser Currency Cassette Mapping Table message is not to have a MAC value, or a value of '1' if it is.

For details of the Dispenser Currency Cassette Mapping Table, see the relevant *APTRA Advance NDC*, *Reference Manual* or the *NDC+ Programmer's Reference Manual*.

For the new messages which form the new EMV Configuration message class, an additional field 'o' has been added immediately following the Message Authentication Field Selection Load message field 'n' (Track 3 Field). Field 'o' is formatted as follows:

| Field | Number of Characters | Mandatory/ Optional | Description | 1 |
|-------|-------------------------|----------------------|-------------|--|
| FS | 1 | О | Field Sep | parator. |
| | | | , | present if field 'o' is included in the message. ot being included, this field separator is omitted. |
| 0 | 5 | See Notes 1 and 2 | | offset position, if the field contains '0', no MAC is added to the indicated. If it contains '1', a MAC is added to the message. |
| | | | Offset | Description |
| | | | 0 | ICC Currency Data Objects Table message |
| | | | 1 | ICC Transaction Data Objects Table message |
| | | | 2 | ICC Language Support Table message |
| | | | 3 | ICC Terminal Data Objects message |
| | | | 4 | ICC Terminal Acceptable AIDs Table message |

Note 1: This field may be truncated, that is, trailing characters may be omitted. The omitted characters have the value zero.

Note 2: If this new field is included, its value is used in the calculation of the MAC value in the Message Authentication Field Selection Load message field 'p' (previously 'o') Message Authentication Code Data.

Terminal Verification Results (TVR) Processing

The relevant fields within the Terminal Verification Results (TVR) data object are updated by Advance NDC or NDC+ (see "Terminal Specified BER-TLV Data Objects"), depending on the status of the ICC and the transaction. All other fields have a fixed value. The elements of the TVR data object are as follows:

| Byte | Bit | Value | Description |
|------|-----|-------|--|
| 1 | 8 | 0x0/1 | Initial value set to 0x0 for PDOL processing. Then set to 0x1 to indicate that off-line data authentication was not performed. |
| | 7 | 0x0 | Off-line static data authentication has not failed. |
| | 6 | 0x0/1 | ICC Data Missing/Not Missing Flag. |
| | | | Initially set to 0x0 (ICC Data Missing) for PDOL processing. |
| | | | May be set to $0x1$ (ICC Data Not Missing) as a result of CVM processing in "I - Transaction Request State". |
| | 5 | 0x0 | Card does not appear on terminal exception file. |
| | 4 | 0x0 | Off-line dynamic data authentication has not failed. |
| | 3 | 0x0 | Reserved. |
| | 2 | 0x0 | Reserved. |
| | 1 | 0x0 | Reserved. |
| 2 | 8 | 0x0/1 | ICC Application Version Out of Range Flag |
| | | | If the version number returned from the Application Version Number (tag $0x9F08$) data object during ICC application processing is not within the specified range for the matching ICC Terminal Acceptable AIDs Table entry (that is, whose Full/Partial Primary AID Value matched the ICC AID for the ICC application being processed), this bit is set to $0x1$. |
| | | | For more details, see "ICC Terminal Acceptable Application IDs Table" in Chapter 5, "Central to Terminal Messages". |
| | | | If the version number is in range, or if the Application Version Number data object was not obtained from the ICC, or has no value field, this bit is set to 0x0. |

| Byte | Bit | Value | Description |
|------|-----|-------|---|
| 2 | 7 | 0x0/1 | Application Expired Flag |
| | | | If the date from the Transaction Date (tag 0x9A) data object is after the expiry date returned from the Application Expiration Date (tag 0x5F24) data object during ICC Application processing, this bit is set to 0x1. |
| | | | Otherwise, if the date is not after the expiry date, or if the Application Expiration Date data object is not available, this bit is set to $0x0$. |
| | | | Note : If either data object two-digit year value is in the range 00 to 49, the corresponding full year value is 2000 to 2049. However, if the data object two-digit year value is in the range 50 to 99, the full year value is 1950 to 1999. |
| | 6 | 0x0/1 | Application Not Yet Effective Flag |
| | | | If the date from the Transaction Date (tag $0x9A$) data object is before the effective date returned from the Application Effective Date (tag $0x5F25$) data object during ICC application processing, this bit is set to $0x1$. |
| | | | Otherwise, if the date is not before the effective date, or if the Application Effective Date data object is not available, this bit is set to $0x0$. |
| | | | Note : If either data object two-digit year value is in the range 00 to 49, the corresponding full year value is 2000 to 2049. However, if the data object two-digit year value is in the range 50 to 99, the full year value is 1950 to 1999. |
| | 5 | 0x0/1 | Requested Service Permitted Flag |
| | | | Initially set to 0x0 (Requested Service Not Permitted) for PDOL processing. |
| | | | May be set to 0x1 (Requested Service Permitted) as a result of AUC processing in "I - Transaction Request State" or "ICC Application Select & Initialise Processing". |
| | 4 | 0x0 | This card is not new. |
| | 3 | 0x0 | Reserved |
| | 2 | 0x0 | Reserved |
| | 1 | 0x0 | Reserved |

| Byte | Bit | Value | Description | | | | | |
|------|-----|-------|---|--|--|--|--|--|
| 3 | 8 | 0x0/1 | Cardholder Verification Successful Flag | | | | | |
| | | | Initially set to 0x0 (Cardholder Verification Successful) for PDOL processing. | | | | | |
| | | | May be set to $0x1$ (Cardholder Verification Not Successful) as a result of CVM processing in "I - Transaction Request State". | | | | | |
| | 7 | 0x0/1 | Cardholder Verification Method (CVM) Recognised Flag | | | | | |
| | | | Initially set to 0x0 (CVM Recognised) for PDOL processing. | | | | | |
| | | | May be set to $0x1$ (CVM Not Recognised) as a result of CVM processing in "I - Transaction Request State". | | | | | |
| | 6 | 0x0 | PIN Try Limit was not exceeded. | | | | | |
| | 5 | 0x0/1 | PIN Entry Required But PIN Pad Not Present/Not Working Flag | | | | | |
| | | | Initially set to 0x0 for PDOL processing. | | | | | |
| | | | May be set to 0x1 (PIN Entry Required But PIN Pad Not Present/Not Working) as a result of CVM processing in "I - Transaction Request State". | | | | | |
| | 4 | 0x0 | PIN entry required, PIN Pad present and PIN was entered. | | | | | |
| | 3 | 0x0/1 | On-line PIN Entered Flag | | | | | |
| | | | If the PIN block is being included in the Transaction Request message, and the CVM list includes an On-line PIN condition, this bit is set to $0x1$. Otherwise, it is set to $0x0$. | | | | | |
| | 2 | 0x0 | Reserved | | | | | |
| | 1 | 0x0 | Reserved | | | | | |
| 4 | 8 | 0x0/1 | Transaction Exceeds Floor Limit Flag | | | | | |
| | | | If floor limit checking was performed and the amount was equal to or above the floor limit, this bit is set to $0x1$. Otherwise, it is set to $0x0$. | | | | | |
| | 7 | 0x0 | Lower consecutive off-line limit not exceeded. | | | | | |
| | 6 | 0x0 | Upper consecutive off-line limit not exceeded. | | | | | |
| | 5 | 0x0 | Transaction not selected randomly for on-line processing. | | | | | |
| | 4 | 0x0 | Merchant did not force transaction on-line. | | | | | |
| | 3 | 0x0 | Reserved | | | | | |
| | 2 | 0x0 | Reserved | | | | | |
| | 1 | 0x0 | Reserved | | | | | |

| Byte | Bit | Value | Description |
|------|-----|-------|--|
| 5 | 8 | 0x0/1 | Default TDOL Used Flag |
| | | | If the TC Hash Value (tag $0x98$) was requested during DOL processing and the default value for the TDOL (tag $0x97$) data object was used, this bit is set to $0x1$. Otherwise, it is set to $0x0$. |
| | 7 | 0x0/1 | Issuer Authentication Success/Fail Flag |
| | | | If the ICC command EXTERNAL AUTHENTICATE fails, this bit is set to 0x1. |
| | | | Otherwise, if the ICC command EXTERNAL AUTHENTICATE is successful, or is yet to be performed, it is set to $0x0$. |
| | 6 | 0x0/1 | Script Processing Before Final Generate AC Success/Fail Flag |
| | | | If any tag $0x71$ issuer scripts fail (returned in a Central response to the Transaction Request), this bit is set to $0x1$. |
| | | | Otherwise, this bit is set to $0x0$. |
| | 5 | 0x0/1 | Script Processing After Final Generate AC Success/Fail Flag |
| | | | If any tag $0x72$ issuer scripts fail (returned in a Central response to the Transaction Request), this bit is set to $0x1$. |
| | | | Otherwise, this bit is set to $0x0$. |
| | 4 | 0x0 | Reserved |
| | 3 | 0x0 | Reserved |
| | 2 | 0x0 | Reserved |
| | 1 | 0x0 | Reserved |

Transaction Status Information (TSI) Processing

The relevant fields within the Transaction Status Information (TSI) data object are updated by Advance NDC or NDC+ (see "Terminal Specified BER-TLV Data Objects"), depending on the status of the ICC and the transaction. All other fields have a fixed value. The elements of the TSI are as follows:

| Byte | Bit | Value | Description |
|------|-----|-------|---|
| 1 | 8 | 0x0 | Off-line data authentication was not performed. |
| | 7 | 0x0/1 | Cardholder Verification Performed Flag |
| | | | Initially set to 0x0 (Cardholder Verification Not Performed) for PDOL processing. |
| | | | May be set to $0x1$ (Cardholder Verification Performed) as a result of CVM processing in "I - Transaction Request State". |
| | 6 | 0x0/1 | Card Risk Management Performed Flag |
| | | | If the ICC responds with an ARQC to the first GENERATE APPLICATION CRYPTOGRAM command, this bit is set to 0x1 (Card Risk Management Performed). |
| | | | Otherwise, this bit is set to 0x0 (Card Risk Management Not Performed). |
| | 5 | 0x0/1 | Issuer Authentication Performed Flag |
| | | | If the ICC command EXTERNAL AUTHENTICATE has been submitted to the ICC, this bit is set to $0x1$. Otherwise, it is set to $0x0$. |
| | 4 | 0x0/1 | Terminal Risk Management Performed Flag |
| | | | If the Terminal Floor Limit is downloaded from the host, terminal risk management is performed and this bit is set to $0x1$. Otherwise, it is set to $0x0$. |
| | 3 | 0x0/1 | Script Processing Performed Flag |
| | | | If an attempt is made to process one or more issuer scripts (tag $0x71$ or tag $0x72$), this bit is set to $0x1$. Otherwise, it is set to $0x0$. |
| | 2 | 0x0 | Reserved |
| | 1 | 0x0 | Reserved |
| 2 | 8 | 0x0 | Reserved |
| | 7 | 0x0 | Reserved |
| | 6 | 0x0 | Reserved |
| | | | |

| Byte | Bit | Value | Description |
|------|-----|-------|-------------|
| | 5 | 0x0 | Reserved |
| | 4 | 0x0 | Reserved |
| | 3 | 0x0 | Reserved |
| | 2 | 0x0 | Reserved |
| | 1 | 0x0 | Reserved |

PIN Encryption and Verification

For ICC applications, you should be aware of the following:

- Each ICC application present on a card may have a unique PIN value, which may also differ from the cardholder PIN value used if performing a magnetic stripe based transaction.
- Each ICC application present on a card may have unique track 2 equivalent data, which may also differ from the track 2 data present on the magnetic stripe.

These facts become very important when Central is performing cardholder PIN verification using track 2 data. This is because when a cardholder PIN is to be sent from the terminal to Central for verification, it is encrypted into a block. The encryption process uses both the cardholder entered PIN and the track 2 PAN as input to create the encrypted PIN block.

On receipt of the encrypted PIN block, Central verifies the cardholder PIN value using the track 2 PAN and the track 2 PIN Offset Data (also called the PIN Verification Field).

In order to successfully verify the PIN, Central needs to be sent (or be able to derive) the track 2 data used by the terminal to construct the encrypted PIN block. The track 2 data used by the terminal is configured using the "ICC Terminal Acceptable Application IDs Table" fields f18 to f21.

The state flow downloaded to the terminal from Central must be configured to ensure that the completion of the ICC application selection and initialisation takes place before the point in the state flow where the PIN is encrypted.

Note: The above processing is also relevant to PIN change processing, where the new PIN value and new PIN confirmation value are encrypted for transmission to Central.

ICC Application Name Display

The ICC application name displayed to the cardholder is dependent on the availability of data objects and the validity of their values, as follows:

- If the 'Issuer Code Table Index' data object (tag 0x9F11) is available and has a value in the range 0x01 to 0x10 (BCD) inclusive, the 'Application Preferred Name' data object (tag 0x9F12) is used as the ICC application name.
- If the 'Issuer Code Table Index' data object (tag 0x9F11) is available but does not have a value, or the value is outside the range 0x01 to 0x10 (BCD) inclusive, the 'Application Label' data object (tag 0x50) is used.
- If the 'Application Preferred Name' data object (tag 0x9F12) is not available, the 'Application Label' data object (tag 0x50) is used.
- If the 'Application Label' data object (tag 0x50) is not available, the default 'Application Label' from the current 'ICC Terminal Acceptable AIDs Table' entry is used.
- If the 'Application Label' data object (tag 0x50) is not available, and the default 'Application Label' from the current 'ICC Terminal Acceptable AIDs Table' entry is also not available, the ICC application name is blank.

To enable Central flexibility in the way in which the ICC application name is displayed, the following system has been applied to the interpretation of screen data in screens holding the ICC application name:

- To indicate the start position where the ICC application name can be inserted into the screen data, the value '&&S' is used.
- To indicate the end position where the ICC application name can be inserted into the screen data, the value '&&E' is used.
- The ICC application name is formatted to replace any character positions, between the start and end point marker values, which contain an asterisk ('*') character.

For the purposes of formatting, the following rules are applied:

- If the value '&&LJ' is found after the start point, the ICC application name is left justified within any assigned space (marked by asterisks) following this formatting value.
- If the value '&&RJ' is found after the start point, the ICC application name is right justified within any assigned space (marked by asterisks) following this formatting value.

- If the value '&&CD' is found after the start point, the ICC application name is centred within any assigned space (marked by asterisks) following this formatting value.
- Formatting is applied within each uninterrupted string of asterisks.
- If a formatting value ('&&LJ', '&&RJ' or '&&CD') is not found after the start point before a string of asterisks are encountered, the formatting within the assigned space (marked by the asterisks) defaults to being left justified, as if the value '&&LJ' had been found.
- If the asterisk characters are grouped such that the ICC application name has to be broken up, space characters in the ICC application name are used where possible, but failing this hyphenation is used.
- If the ICC application name will not fit within the total space indicated by the asterisks, it is truncated from the right.
- Any asterisk characters which are unused after the ICC application name is inserted are replaced by spaces (0x20).
- Any character between the start and end point marker values which is not an asterisk ('*') is unchanged.
- All characters before and after the start and end point marker values are unchanged.

In addition to the formatting, the characters in the ICC application name are also processed.

The ICC application name is made up of characters from an ISO 8859 character set, which can potentially have binary values in the range 0x00 to 0xFF, although a number of values are not used.

The terminal fonts can only hold characters in the binary range 0x00 to 0x7F; therefore, two fonts are required for each ISO 8859 character set. Support is present for the character sets in ISO 8859 parts 1 to 10 inclusive.

ISO 8859 parts 1 to 10 are also supported to allow maximum use of the 'Application Preferred Name' data object (tag 0x9F12) as the ICC application name, when acquiring transactions for cards that could have been issued anywhere in the world.

The supported ISO 8859 character sets and their font IDs are listed in Appendix F, "ISO 8859 Character Sets".

The common characters use the font designators '`' (0x60, single size) and 'a' (0x61, double size).

When processing asterisk '*' characters in the template, if the font '`' or 'a' (the common character set) is selected within the template, and remains the currently selected font for the asterisk block being processed, then the correct font for displaying language specific

characters (0x80 to 0xFF) is determined from the 'Issuer Code Table Index' data object (tag 0x9F11) as follows:

- 1 If the 'Issuer Code Table Index' data object (tag 0x9F11) was retrieved during processing, and has a value field with the first byte containing a value in the range 0x01 to 0x10 (BCD) inclusive, the value (converted to a normal decimal value) is used as an offset to calculate the font identifier required.
- 2 If the 'Issuer Code Table Index' data object (tag 0x9F11) was not available, did not have a value, or the value was not in the range 0x01 to 0x10 (BCD) inclusive, the offset is taken as 0x01.
- 3 If the currently selected font is $\$ '', the base font identifier index is 0x60.
- 4 If the currently selected font is 'a', the base font identifier index is 0x61.
- 5 The font to be used is calculated as:

```
Font Identifier =
base font identifier index + (offset x 2).
```

- 6 If the currently selected font was not '`' or 'a', the current font is used for all characters, and the above does not apply.
- 7 The individual character(s) in the range 0x80 to 0xFF are shifted to the range 0x00 to 0x7F (by setting bit 8 to 0x0) and are then displayed by switching the font to that identified by the above processing.
- 8 After display of the character(s), the font is reverted back to '`' or 'a' as appropriate.

Note: ISO 8859 Part 8 (Latin/Hebrew) **bi-directional** text formatting is not supported, so LRM and RLM formatting characters are ignored and nothing is displayed in their place.

The supported ISO 8859 character sets and their font IDs are listed in Appendix F, "ISO 8859 Character Sets".

Example Display

If Central requires FDK A to be used to select an ICC application name, the ICC application name may be displayed on two lines, right justified, with an 'arrow' against the FDK (that is, '>').

The screen data to achieve this may contain the following:

```
<ESC>(` &&S &&RJ <SI>E1 ********* <SI>F1 ********* <SI>F? > &&E <ESC>(1
```

The screen data is taken as a template and, given an ICC application name of 'CURRENT ACCOUNT' with 'Issuer Code Table Index' data object (tag 0x9F11) value of 0x02, would be interpreted as the following data for display on the cardholder screen:

```
<ESC>(` <SI>E1 ~~~CURRENT <SI>F1 ~~~ACCOUNT <SI>F? > <ESC>(1
```

If the ICC application name was 'CURRENT ACCOUNT' but with an accent on the 'E', with the same 'Issuer Code Table Index' data object (tag 0x9F11) value of 0x02, then the template would be interpreted as the following data for display on the cardholder screen:

```
<ESC>(` <SI>E1 ~~~CURR<ESC>(dL<ESC>('NT <SI>F1 ~~~ACCOUNT <SI>F? > <ESC>(1
```

Where:

<SI> is 'Shift In' (0x0F)

 $\langle ESC \rangle$ is 'Escape' (0x1B)

'~' is a displayed space character (0x20).

Note: Other spaces are included above for clarity, but are not actually present.

Error Handling

If the error being reported is due to a hardware-based failure, standard NDC error processing is applied for error reporting to Central and the journal.

Note: A reported hardware fault may not always be due to a fault with the terminal, as the error may correspond to a terminal to ICC interaction where the card hardware is faulty (for example, dirty chip contacts).

When a fatal hardware fault occurs, the SCRW hardware is reinitialised and the card is returned to the MCRW. If the reinitialisation fails, error handling is performed again.

When a non-fatal hardware fault occurs, the ICC is powered down and returned to the MCRW.

All ICC processing errors (hardware and application errors) are reported to Central in solicited/unsolicited status messages.

For the ICC application error message format, see "ICC Application Solicited/ Unsolicited Error Message" in Chapter 4, "Terminal to Central Messages". For the journalled error format, see "ICC Application Journal Error Message" in this chapter.

Additional ICC application data may also be sent when a solicited device status message is sent. See "Issuer Script Results and Completion Data" in Chapter 4, "Terminal to Central Messages".

Fake ICC Application Errors

Fake ICC application errors can be generated in the following circumstances.

General Command Errors

A fake ICC application error can result if:

- BER-TLV formatting is not correct on any data returned from the card
- mandatory objects are not returned in response to a card, unless EMV allows the transaction to continue
- the incorrect template is returned by the card
- some returned objects, such as the Application File Locator (AFL) data object, have illegal values or are incorrectly formatted.

These errors contain the command and response data relating to the command, but with the Status Words changed to 82 81, to mean 'Part of returned data may be corrupted'.

Specific Command Errors

If the Answer To Reset (ATR) following a power-up attempt is a fake, an MCRW hardware error is generated with Transaction/Device Status = 0x09, Error Severity = 0x02, MStatus = 0x54 and MData = 0x70 0x20 0x00 0x0C 0x03.

If one of the Generate Application Cryptograms (GENACs) returns either an Application Authorisation Referral (AAR) or a cryptogram higher than that requested, a fake error is generated containing the command and response data relating to the command, but with the Status Words set to 63 00 to mean 'Authentication failure'.

Higher Level Errors

The following errors do not relate to any specific EMV command, but relate to a stage in the EMV Processing.

Error During Search for Usable Applications If no usable applications can be found on the card then a fake 'File not found' error is generated, with CLA = 0x00, INS = 0xA4, P1 = 0x04, P2 = 0x00, Lc = 0x00, Le = 0x00, SW1 = 0x6A and SW2 = 0x82.

If subsequent removal of applications from the candidate list causes the list to become empty, the same fake 'File not found' error is sent.

Generic Fake Read Record Error If any of the following conditions occur:

- Application Expiry/Effective Date is incorrectly formatted or an invalid date, for example 30 February
- a mandatory object (for example, CDOL1, CDOL2, Application PAN, Application Expiry date) is missing from the card, or has a length of zero
- the Track 2 equivalent data object has not been returned by the card, depending on the version of the EMV software and configuration
- incorrect formatting of any of the following objects: Application currency code, Application version number, CVM list, IAC-denial, Issuer Code table Index, Issuer Country code, Language Preference
- the Track 2 consistency check is enabled, there is a MasterCard AID and the ICC PAN or ICC Expiry date does not match the encoded ICC Track 2 equivalent data

then a 'Part of returned data may be corrupted' fake error is generated, with CLA = 0x00, INS = 0xB2, P1 = 0x00, P2 = 0x04, Lc = 0x00, Le = 0x00, SW1 = 0x62 and SW2 = 0x81.

Script Processing Errors/GENAC2 Errors If any of the following events occur while processing the host (Central) response:

- issuer script processing suffers an ICC application level error which results in a script failing to complete successfully, and the 'Enhanced Configuration Parameter Load' option number '69' either has no value or has a value in which bit 3 is not set, or
- issuer script processing encounters an incorrectly formatted script template, command or identifier, and the 'Enhanced Configuration Parameter Load' option number '69' either has no value or has a value in which bit 3 is not set, or
- the ICC 'GENERATE AC' command requests a 'TC' (Transaction Certificate), but does not get a 'TC' in the command response

then, if no solicited status message has been sent to the host since these events, a fake solicited ICC application level error is generated with CLA = 0xFF, INS = 0xFF, P1 = 0xFF, P2 = 0xFF, P3 = 0xFF, P4 = 0xFF, P5 = 0xFF,

Error processing is performed, causing the fake ICC application level error to be sent as a solicited status message to the host. A new response without CAM data is awaited.

ICC Application Journal Error Message

When an ICC application level error occurs, an error message is printed to the journal in the format given in the table below. This enables diagnostic analysis of the error that occurred.

| Field | Number of Characters | Value | Description |
|-------|-------------------------|----------------|---|
| 1 | 5 | 'SMART' | Identifier that this is a smart card error print (Reserved screen U0073). |
| | 1 | 0x20 | ASCII space character. |
| 2 | 3 | 'CAM' or 'S&S' | Application ID (AID) of application selected when command failed. 'CAM' - CAM 'S&S' - AID not selected. |
| | 1 | 0x20 | ASCII space character. |
| 3 | 8 | dd/mm/yy | Transaction start date in day/month/year format. |
| | 1 | 0x20 | ASCII space character. |
| 4 | 5 | hh:mm | Transaction start time in hours:minutes format. |
| | 1 | 0x20 | ASCII space character. |
| 5 | 5 | nnnn+ or nnnn | Transaction Sequence Number in ASCII decimal format (nnnn). |
| | | | If no Transaction Request has been sent since state number '000' was processed, an ASCII plus sign ('+', 0x2B) is appended to the end of the sequence number. Otherwise, an ASCII space (0x20) is appended. |
| | 1 | 0x0D | ASCII new line. |
| 6 | Var. (up to 31) | ASCII | Track 2 data, taken from within the start and end sentinels, minus the last three digits. The Track 2 data may be taken from the magnetic stripe or from the ICC, depending on the Track 2 source established when the card was inserted. |
| | | | For security reasons all data is replaced by a "*" character, with the exception of the first 4 digits, and the 4 digits prior to the first field separator (if found) or the last 4 digits (if not found). |
| | | | If this field is not available, the text '**** CARD DETAILS UNKNOWN ****' is used. This text is held in reserved screen 'U0074'. |
| | 1 | 0x0D | ASCII new line. |

| Field | Number of Characters | Value | Description |
|-------|-------------------------|-------|--|
| 7 | Var. (up to 32) | ASCII | AID of the selected application when the command failed. |
| | (up to 02) | | 32 characters of ASCII hex (16-byte AID value). |
| | | | If an AID was not selected, this field will contain the text '**** AID NOT SELECTED ****'. This text is held in reserved screen 'U0075'. |
| | 1 | 0x0D | ASCII new line. |
| 8 | 2 | nn | CLA = Class of instruction of the command that failed, in ASCII hex. |
| | 1 | 0x20 | ASCII space character. |
| 9 | 2 | nn | INS = Instruction of the command that failed, in ASCII hex. |
| | 1 | 0x20 | ASCII space character. |
| 10 | 2 | nn | P1 = Parameter 1 of the command that failed, in ASCII hex. |
| | 1 | 0x20 | ASCII space character. |
| 11 | 2 | nn | P2 = Parameter 2 of the command that failed, in ASCII hex. |
| | 1 | 0x20 | ASCII space character. |
| 12 | 2 | nn | Lc = Length of the command data for the command that failed, in ASCII hex. |
| | 1 | 0x20 | ASCII space character. |
| 13 | 2 | nn | Le = Length of the expected response for the command that failed, in ASCII hex. |
| | 1 | 0x20 | ASCII space character. |
| 14 | 2 | nn | SW1 = Status word 1 indicating why the command failed, in ASCII hex. |
| | 1 | 0x20 | ASCII space character. |
| 15 | 2 | nn | SW2 = Status word 2 indicating why the command failed, in ASCII hex. |

Journal Print Examples

When a card is inserted and fails during CAM processing due to an error SW1 = 0x62, SW2 = 0x81 on a Get Processing Options command, an error similar to the following would be printed to the journal:

When a card is inserted and fails during ICC initialisation processing due to an error SW1 = 0x62, SW2 = 0x81 on a Select command, using an AID 5 bytes long and performed because of a 'Bad Read', an error similar to the following would be printed to the journal:

```
SMART S&S 01/02/07 12:00 1234+
**** CARD DETAILS UNKNOWN ****
**** AID NOT SELECTED ****
00 A4 04 00 05 00 62 81
```

Reserved Screens

The reserved screens associated with the 'EMV/CAM2 Exits for APTRA Advance NDC' and 'EMV/CAM2 Exits for NDC+' products are grouped as 'U' reserved screens. For details of the 'U' reserved screens, see Appendix E, "EMV ICC Reserved Screens".

For a list of the other reserved screens used by APTRA Advance NDC or NDC+, see the relevant appendix in the *APTRA Advance NDC*, *Reference Manual* or the *NDC+ Programmer's Reference Manual*.

Offline Decline Journal Message

When an application is declined by either the terminal requesting or receiving an Application Authentication Cryptogram (AAC) from the first Generate Application Cryptogram command, the following information is traced to the journal.

| Field | Number of Characters | Value | Description |
|-------|-------------------------|---------------|---|
| 1 | 5 | 'SMART' | Identifier that this is a smart card error print (Reserved screen U0073). |
| | 1 | 0x20 | ASCII space character. |
| 2 | 3 | 'CAM' | Application ID (AID) of application selected when command failed. Always CAM. |
| | 1 | 0x20 | ASCII space character. |
| 3 | 8 | dd/mm/yy | Transaction start date in day/month/year format. |
| | 1 | 0x20 | ASCII space character. |
| 4 | 5 | hh:mm | Transaction start time in hours:minutes format. |
| | 1 | 0x20 | ASCII space character. |
| 5 | 5 | nnnn+ or nnnn | Transaction Sequence Number in ASCII decimal format (nnnn). |
| | | | If no Transaction Request has been sent since state number '000' was processed, an ASCII plus sign ('+', 0x2B) is appended to the end of the sequence number. Otherwise, an ASCII space (0x20) is appended. |
| | 1 | 0x0D | ASCII new line. |
| 6 | Var. (up to 31) | ASCII | Track 2 data, taken from within the start and end sentinels, minus the last three digits. The Track 2 data may be taken from the magnetic stripe or from the ICC, depending on the Track 2 source established when the card was inserted. |
| | | | For security reasons all data is replaced by a "*" character, with the exception of the first 4 digits, and the 4 digits prior to the first field separator (if found) or the last 4 digits (if not found). |
| | 1 | 0x0D | ASCII new line. |
| 7 | Var. | ASCII | AID of the selected application when the command failed. |
| | (up to 32) | | Up to 32 characters of ASCII hex (16-byte AID value). |
| | 1 | 0x0D | ASCII new line. |

Offline Decline Journal Message

| Field | Number of Characters | Value | Description |
|-------|-------------------------|-----------------------|--|
| 8 | Var. | 'DECLINED OFFLINE' | Identifies that this is a denied offline print, using text from reserved screen 'U0076'. If 'U0076' does not exist or its contents are empty, the default string 'DECLINED OFFLINE' is used. |
| | 1 | 0x0D | ASCII new line. |
| 9 | Var. | ASCII | Hex ASCII representation of EMV tag. See Notes 1 and 2. |
| | 1 | 0x20 | ASCII space character. |
| 10 | Var. | ASCII | Hex ASCII representation of object length. See Notes 1 and 2. |
| | 1 | 0x20 | ASCII space character. |
| 11 | Var. | ASCII | Hex ASCII representation of object value. See Notes 1 and 2. |
| | 1 | 0x20 | ASCII space character. |

Note 1: Fields 9, 10, 11 are repeated for each data object which has been requested to be printed, and is present in the system.

Note 2: The total length of fields 9, 10, and 11 are restricted to 40 characters. Only the first 40 characters are printed.

Example Journal Trace

An example offline decline journal trace is shown below.

SMART CAM 01/02/07 12:00 1234+
1239************
A000000000000012
DECLINED OFFLINE
5A 09 1239*********32491
5F34 01 02
95 05 80108000
9F0E 05 0050000040
TAC-D 05 0000000000
9B 02 0840
82 02 5C00
5F24 03 060606
9F10 07 06010A03A0B800

Default Traced Objects

The default objects which are printed are listed below.

| Object | Tag |
|--|------|
| Primary Application Number - See Note 1 | 5A |
| Application PAN Sequence Number | 5F34 |
| Terminal Verification Results | 95 |
| Issuer Action Code Denial | 9F0E |
| Terminal Action Code Denial - See Note 2 | N/A |
| Transaction Status Indicator | 9B |
| Application Interchange Profile | 82 |
| Application Expiry Date | 5F24 |
| Application Effective Date | 5F25 |
| Transaction Type | 9C |
| Application Usage Control | 9F07 |
| Amount Authorised | 9F02 |
| CVM Results | 9F34 |
| Application Cryptogram | 9F26 |
| Application Cryptogram Information Data | 9F27 |
| Application Transaction Counter | 9F36 |
| Issuer Application Data | 9F10 |
| | |

Note 1: For security reasons, all but the first and last 4 characters within the PAN are replaced with an asterisk '*'.

Note 2: 'TAC-D 05 XXXXXXXXXX' is printed, where XX is the value the host downloaded in the Terminal Acceptable AID table.

Changing Traced Objects

These objects can be overridden with the registry key \HKEY_LOCAL_MACHINE\SOFTWARE\NCR\APTRA\EMV EXITS \Offline Decline\Tag list. The registry entry should be a STRING value and contain a comma-separated list of tags for printing.

Any object which is not known by the terminal is not printed. If the registry key is present but contains an empty string, the trace header is printed on its own without any objects.

If the Terminal Action Code Denial object is required, the string 'TAC-D' should be used in the comma-separated list.

ICC Processing Offline Decline Journal Message

If the PAN is requested, all but the first four and last four data values are replaced with an asterisk '*' for security reasons.

If the Track 2 equivalent data object is requested, all but the first four characters at the start, and the four characters before the first field separator, are replaced with a '*' character. Should no field separator exist, the last four characters of the data value remain unchanged.

Disabling Offline Decline Journal Tracing

This tracing is enabled by default; however, it can be disabled using the registry. If the registry key \HKEY_LOCAL_MACHINE\
SOFTWARE\NCR\APTRA\EMV EXITS\Offline Decline\
Disable Print is created as a DWORD with a non-zero value, the offline decline journal trace will not take place.

ICC Processing Termination

When the NDC processing indicates that a card is to be returned to the cardholder or captured, then if ICC initialisation processing is being performed in parallel it is terminated at the earliest opportunity.

Once ICC application completion processing is concluded, the card is returned to the MCRW so that the capture/eject can be performed.

ICC Processing

ICC Processing Termination

Appendix A

Example Configuration Data

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Table of Contents **Example Configuration Data**

Overview

This appendix provides example configuration data, showing the types of data you may include in the download to the terminal.

The example data listed here consists of the following:

- State Table
- Financial Institution Table (FIT)
- Dispenser Currency Cassette Mapping Table
- Enhanced Configuration Option Digits
- Enhanced Configuration Timers
- ICC Currency Data Objects Table
- ICC Transaction Data Objects Table
- ICC Language Support Table
- ICC Terminal Data Objects Table
- ICC Terminal Acceptable Application IDs (AIDs) Table
- Cardholder Screens.

Note: The configuration data you use in your download will invariably be different from that shown. The following example data is provided simply to illustrate the types of data which can be included in the download. This example configuration data does not necessarily reflect the data used in the base configuration state flow in Appendix G, "State Flow Diagram".

Configuration Data

State Table

| State | Туре | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|-------|------|-----|-----|-----|-----|-----|-----|-----|-----|
| 000 | A | 010 | 005 | 013 | 002 | 002 | 008 | 001 | 035 |
| 005 | K | 010 | 015 | 015 | 015 | 020 | 015 | 255 | 255 |
| 010 | + | 025 | 055 | 001 | 001 | 000 | 000 | 000 | 000 |
| 015 | + | 040 | 055 | 001 | 000 | 000 | 000 | 000 | 000 |
| 020 | J | 000 | 000 | 014 | 054 | 000 | 000 | 000 | 000 |
| 025 | D | 240 | 000 | 002 | 001 | 000 | 000 | 000 | 000 |
| 035 | + | 040 | 055 | 000 | 000 | 000 | 000 | 000 | 000 |
| 040 | , | 015 | 100 | 050 | 050 | 045 | 045 | 000 | 000 |
| 045 | J | 000 | 000 | 016 | 054 | 000 | 000 | 000 | 000 |
| 050 | J | 000 | 000 | 017 | 054 | 000 | 000 | 000 | 000 |
| 055 | D | 085 | 000 | 003 | 000 | 000 | 000 | 000 | 000 |
| 065 | Y | 018 | 110 | 080 | 240 | 070 | 111 | 102 | 075 |
| 070 | Z | 000 | 001 | 002 | 000 | 000 | 003 | 004 | 000 |
| 075 | Z | 000 | 000 | 100 | 000 | 000 | 200 | 300 | 000 |
| 080 | J | 000 | 000 | 019 | 054 | 000 | 000 | 000 | 000 |
| 085 | K | 240 | 240 | 240 | 065 | 255 | 065 | 255 | 255 |
| 100 | - | 120 | 105 | 000 | 000 | 000 | 000 | 000 | 000 |
| 105 | Y | 018 | 110 | 080 | 120 | 070 | 111 | 102 | 075 |
| 110 | J | 000 | 000 | 020 | 054 | 000 | 000 | 000 | 000 |
| 120 | | 021 | 125 | 130 | 135 | 000 | 000 | 000 | 000 |
| 125 | Z | 022 | 023 | 024 | 025 | 000 | 000 | 000 | 000 |
| 130 | Z | 026 | 004 | 027 | 005 | 000 | 000 | 000 | 000 |
| 135 | Z | 110 | 080 | 155 | 145 | 050 | 000 | 000 | 000 |
| 145 | D | 165 | 002 | 000 | 000 | 000 | 001 | 000 | 000 |
| 155 | D | 165 | 002 | 000 | 000 | 001 | 000 | 000 | 000 |
| 165 | / | 015 | 028 | 029 | 170 | 000 | 000 | 000 | 000 |
| 170 | Z | 200 | 255 | 180 | 255 | 045 | 045 | 000 | 000 |
| 180 | | 030 | 125 | 130 | 135 | 000 | 000 | 000 | 000 |
| 200 | k | 000 | 205 | 000 | 002 | 002 | 002 | 001 | 255 |
| 205 | K | 220 | 220 | 220 | 220 | 020 | 220 | 255 | 255 |
| 220 | В | 031 | 110 | 080 | 255 | 235 | 032 | 245 | 003 |
| 230 | Z | 000 | 000 | 012 | 011 | 000 | 000 | 000 | 000 |
| 235 | J | 000 | 000 | 033 | 054 | 000 | 000 | 000 | 000 |
| 240 | В | 034 | 110 | 080 | 255 | 235 | 035 | 245 | 003 |
| 245 | K | 280 | 280 | 260 | 250 | 255 | 250 | 255 | 255 |
| 250 | Y | 036 | 110 | 080 | 295 | 230 | 023 | 012 | 000 |
| 260 | Y | 037 | 110 | 080 | 290 | 265 | 002 | 006 | 000 |

| 265 | Z | 000 | 001 | 002 | 000 | 000 | 000 | 000 | 000 |
|-----|---|-----|-----|-----|-----|-----|-----|-----|-----|
| 280 | Y | 038 | 110 | 080 | 290 | 285 | 002 | 014 | 000 |
| 285 | Z | 000 | 001 | 002 | 003 | 000 | 000 | 000 | 000 |
| 290 | W | 255 | 250 | 300 | 300 | 255 | 255 | 255 | 255 |
| 295 | W | 255 | 255 | 335 | 340 | 255 | 255 | 255 | 255 |
| 300 | / | 015 | 028 | 029 | 305 | 000 | 000 | 000 | 000 |
| 305 | Z | 310 | 310 | 310 | 310 | 310 | 310 | 310 | 000 |
| 310 | ? | 330 | 000 | 001 | 000 | 000 | 000 | 000 | 000 |
| 315 | / | 015 | 028 | 029 | 320 | 000 | 000 | 000 | 000 |
| 320 | Z | 325 | 325 | 325 | 325 | 325 | 325 | 325 | 000 |
| 325 | ? | 330 | 001 | 002 | 030 | 000 | 000 | 000 | 000 |
| 330 | I | 015 | 350 | 001 | 000 | 001 | 001 | 129 | 345 |
| 335 | F | 039 | 110 | 080 | 355 | 255 | 255 | 255 | 040 |
| 340 | F | 042 | 110 | 080 | 375 | 255 | 255 | 255 | 043 |
| 345 | Z | 000 | 000 | 000 | 000 | 000 | 000 | 001 | 000 |
| 350 | J | 000 | 000 | 016 | 054 | 000 | 000 | 000 | 000 |
| 355 | G | 315 | 360 | 000 | 000 | 002 | 001 | 003 | 000 |
| 360 | F | 041 | 110 | 080 | 355 | 255 | 255 | 255 | 040 |
| 375 | G | 385 | 380 | 000 | 000 | 002 | 002 | 003 | 000 |
| 380 | F | 044 | 110 | 080 | 375 | 255 | 255 | 255 | 043 |
| 385 | / | 015 | 028 | 029 | 390 | 000 | 000 | 000 | 000 |
| 390 | Z | 395 | 395 | 395 | 395 | 395 | 395 | 395 | 000 |
| 395 | ? | 330 | 002 | 002 | 030 | 000 | 000 | 000 | 000 |
| 400 | Y | 045 | 110 | 080 | 440 | 405 | 000 | 012 | 000 |
| 405 | Z | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 |
| 420 | Y | 045 | 110 | 080 | 430 | 425 | 000 | 012 | 000 |
| 425 | Z | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 |
| 430 | W | 255 | 255 | 460 | 435 | 255 | 255 | 255 | 255 |
| 435 | J | 000 | 000 | 047 | 054 | 000 | 000 | 000 | 000 |
| 440 | W | 000 | 000 | 445 | 435 | 255 | 255 | 255 | 255 |
| 445 | Y | 046 | 110 | 080 | 455 | 450 | 000 | 012 | 000 |
| 450 | Z | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 |
| 455 | W | 255 | 255 | 460 | 120 | 255 | 255 | 255 | 255 |
| 460 | ; | 245 | 245 | 000 | 000 | 000 | 000 | 000 | 000 |
| 465 | J | 000 | 000 | 048 | 054 | 000 | 000 | 000 | 000 |
| 470 | J | 052 | 000 | 053 | 054 | 000 | 000 | 000 | 000 |

Financial Institution Table (FIT)

| FIT | PIDDX | PFIID | PSTDX | PAGDX | PMXPN | PCKLN | PINPD | PANDX | PANLN |
|-----|-------|-----------------|-------|-------|-------|-------|-------|-------|-------|
| 000 | 000 | 015255255255 | 000 | 000 | 132 | 000 | 015 | 000 | 176 |
| 001 | 000 | 031255255255255 | 001 | 000 | 132 | 000 | 015 | 000 | 176 |
| 002 | 000 | 047255255255255 | 002 | 000 | 132 | 000 | 015 | 000 | 176 |
| 003 | 000 | 063255255255 | 003 | 000 | 132 | 000 | 015 | 000 | 176 |
| 004 | 000 | 070255255255 | 004 | 000 | 132 | 000 | 015 | 000 | 176 |
| 005 | 000 | 255255255255 | 005 | 000 | 132 | 000 | 015 | 000 | 176 |

Dispenser Currency Cassette Mapping Table

| | CURR | TYPE | VALUE |
|----|------|------|-------|------|------|-------|------|------|-------|------|------|-------|
| 04 | 01 | 3 | 00005 | 01 | 4 | 00010 | 02 | 1 | 00005 | 02 | 2 | 00010 |

Enhanced Configuration - Option Numbers



Enhanced Configuration - Timers

| 00 | 010 | 01 | 010 | 02 | 003 | 03 | 255 | 05 | 005 | 07 | 005 | 09 | 005 | |
|----|-----|----|-----|----|-----|----|-----|----|-----|----|-----|----|-----|--|
|----|-----|----|-----|----|-----|----|-----|----|-----|----|-----|----|-----|--|

ICC Currency Data Objects Table

| | | T | L | T | L | V | T | L | V | | T | L | T | L | V | T | L | V |
|----|----|----|----|------|----|------|------|----|----|----|----|----|------|----|------|------|----|----|
| 02 | 01 | 77 | 09 | 5F2A | 02 | 0978 | 5F36 | 01 | 02 | 02 | 77 | 09 | 5F2A | 02 | 0826 | 5F36 | 01 | 02 |

ICC Transaction Data Objects Table

| | | | T | L | T | L | V | | T | L | T | L | V |
|---|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Ī | 02 | 01 | 77 | 03 | 9C | 01 | 01 | 02 | 77 | 03 | 9C | 01 | 02 |

ICC Language Support Table

| | | SCR | AUD | OPC | OPC | | SCR | AUD | OPC | OPC | | SCR | AUD | OPC | OPC | | SCR | AUD | OPC | OPC |
|----|----|-----|-----|-----|-----|----|-----|-----|-----|-----|----|-----|-----|-----|-----|----|-----|-----|-----|-----|
| 04 | en | 000 | 001 | 012 | @A@ | cy | 100 | 002 | 012 | @B@ | de | 200 | 005 | 012 | @C@ | fr | 300 | 006 | 012 | @D@ |

ICC Terminal Data Objects Table

| T | L | T | L | V | Т | L | V | T | L | V |
|----|----|------|----|------|------|----|----|------|----|------|
| 77 | 0E | 9F1A | 02 | 0826 | 9F35 | 01 | 14 | 9F53 | 02 | 6566 |

ICC Terminal Acceptable Application IDs (AIDs) Table

| | Primary | AID | | | | | | Transac Reques | | Solicited Messag | d Status e | Secon | dary Al | D(s) |
|-----|---------|--------------------|-------------------------|------|--------------|--------------|----------------|-------------------|--|---------------------|---------------|-------|---------|---------------------------------|
| No. | Length | Value | Default Lbl. Len. | Туре | Min. Ver. | Max. Ver. | TAC Denial | No. of Obj. | Obj. | No. of Obj. | Obj. | Qty. | Len. | Value |
| 00 | 07 | A0000000 080001 | 00 | CAM | 0000 | 0001 | 0000000 | 0A | 9F065 75A5F 349F2 79F26 9F108 29F36 8C | 00 | - | 01 | 06 | A0000 00002 01 |
| 01 | 07 | A0000000 080002 | 00 | CAM | 0000 | 0001 | 0000000 | 0A | 9F065 75A5F 349F2 79F26 9F108 29F36 8C | 00 | - | 00 | - | - |
| 02 | 07 | A0000000 070001 | 00 | CAM | 0000 | 0001 | 0000000 | 0A | 9F065 75A5F 349F2 79F26 | 00 | - | 02 | 07 | A0000 00003 1010 A0000 |
| | | | | | | | | | 9F108 29F36 8C | | | | 07 | 00004 1010 |
| 03 | 07 | A0000000 031010 | 00 | CAM | 0000 | 0001 | 0000000 000 | 0A | 9F065 75A5F 349F2 79F26 | 00 | - | 02 | 07 | A0000 00003 2010 |
| | | | | | | | | | 9F108 29F36 8C | | | | 07 | A0000 00003 3010 |
| 04 | 07 | A0000000 032010 | 00 | CAM | 0000 | 0001 | 0000000 | 0A | 9F065 75A5F 349F2 79F26 9F108 29F36 8C | 00 | - | 00 | - | - |
| 05 | 07 | A0000000 033010 | 00 | CAM | 0000 | 0001 | 0000000 | 0A | 9F065 75A5F 349F2 79F26 9F108 29F36 8C | 00 | - | 00 | - | - |

| | Primary | AID | | | | | | Transac Reques | | Solicite Messag | d Status e | Secon | dary Al | D(s) |
|-----|---------|--------------------|-------------------------|------|--------------|--------------|---------------|-------------------|--|--------------------|---------------|-------|---------|------------------------|
| No. | Length | Value | Default Lbl. Len. | Туре | Min. Ver. | Max. Ver. | TAC Denial | No. of Obj. | Obj. | No. of Obj. | Obj. | Qty. | Len. | Value |
| 06 | 07 | A0000000 041010 | 00 | CAM | 0000 | 0001 | 0000000 | 0A | 9F065 75A5F 349F2 | 00 | - | 02 | 07 | A0000 00004 6000 |
| | | | | | | | | | 79F26 9F108 29F36 8C | | | | 07 | A0000 00004 3060 |
| 07 | 07 | A0000000 046000 | 00 | CAM | 0000 | 0001 | 0000000 | 0A | 9F065 75A5F 349F2 79F26 9F108 29F36 8C | 00 | - | 00 | - | - |
| 08 | 07 | A0000000 043060 | 00 | CAM | 0000 | 0001 | 0000000 | 0A | 9F065 75A5F 349F2 79F26 9F108 29F36 8C | 00 | - | 00 | - | - |
| 09 | 07 | A0000000 041030 | 00 | CAM | 0000 | 0001 | 0000000 | 0A | 9F065 75A5F 349F2 79F26 9F108 29F36 8C | 00 | - | 00 | - | - |
| 10 | 08 | A0000000 0201 | 00 | CAM | 0000 | 0001 | 0000000 | 0A | 9F065 75A5F 349F2 79F26 9F108 29F36 8C | 00 | - | 00 | - | - |

Cardholder Screens

```
0006000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000 = 000
001<FF><SI>@D001EN<SI>GIOUT OF SERVICE
002<ff><si>@D002EN<si>EIDUE TO A FAULT<si>GGUNABLE TO CONTINUE<si>IHPLEASE TAKE CARD
010<SO>011<ESC>[100z<SO>012<ESC>[100z
011<FF>011EN<SI>EFWELCOME TO NCR BANK!<SI>GGPLEASE INSERT CARD
012<FF>012EN<SI>DKNCR BANK<SI>FDHOME OF ICC ENABLED ATMS<SI>HGPLEASE INSERT CARD
013<FF>013EN<SI>EDBAD READ - INVALID CARD!<SI>GHPLEASE TAKE CARD
01460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014601460146014
015<FF>015EN<SI>EJPLEASE WAIT
0166750166750166750166750166750166750166750166750166750166750166750166750166750166750166750166750166750166750166750166750166750166750166750166750166750166750166750166750166750166750166750166750166750166750166750166750166750166750166750166750166750166750166750166750166750160166750166750166750166750166750166750166750160166750166750166750166750166750166750166750160166750166750166750166750166750166750166750160166750166750166750166750166750166750166750160166750166750166750166750166750166750166750160166750166750166750166750166750166750166750160166750166750166750166750166750166750166750160166750166750166750166750166750166750166750160166750166750166750166750166750166750166750160166750166750166750166750166750166750166750
017<FF>017EN<SI>EEUNABLE TO PROCESS CARD<SI>GHPLEASE TAKE CARD<SI>IBSEEK ASSISTANCE FROM
018<ff>018En<sbbpplease choose a language<sbpl@ < french<sbploading ><sbpl@< german<sbploading
019<FF>019EN<SI>EETRANSACTION CANCELLED<SI>GHPLEASE TAKE CARD
020<FF>020EN<SI>EKTIMED OUT!<SI>GHPLEASE TAKE CARD
021<FF>021EN<SI>BAPLEASE SELECT PRODUCT/ACCOUNT:
022<SI>FN&&S&&RJ*********** >&&E
023<SI>IN&&S&&RJ************ >&&E
024<SI>LN&&S&&RJ************ >&&E
025<SI>ON&&S&&RJ*********** >&&E
026<SI>O:MORE >
027<SI>O@< BACK
028&&S&&CD************
030<ff>030EN<SI>ADSORRY CANNOT ACCESS YOUR<SI>BECHOSEN PRODUCT/ACCOUNT<SI>DBPLEASE SELECT AN
ALTERNATIVE
031<FF>031EN<SI>ECPLEASE ENTER YOUR PIN FOR:<SI>GH<SO>029<SI>JN
032<FF>032EN<SI>CIPIN INCORRECT!<SI>ECPLEASE ENTER YOUR PIN FOR:<SI>GH<SO>029<SI>JN
033<ff>033EN<si>DATOO MANY INCORRECT PIN ENTRIES<SI>GHPLEASE TAKE CARD<SI>JBSEEK ASSISTANCE
034<FF>034EN<SI>EHPLEASE ENTER PIN<SI>JN
035<FF>035EN<SI>CIPIN INCORRECT!<SI>EHPLEASE ENTER PIN<SI>JN
036<FF>036EN<SI>ABPLEASE CHOOSE THE CURRENCY FOR<SI>CFTHIS CASH WITHDRAWAL<SI>L:EURO
><SI>O6STERLING >
03760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037603760376037
038<FF>038EN<SI>CDPLEASE CHOOSE A SERVICE<SI>I:CASH ><SI>L7BALANCE ><SI>N9MINI-<SI>O5STATEMENT >
039<FF>039EN<SI>DFPLEASE ENTER AMOUNT:
040<SI>IJE *****0.00
041<FF>041EN<SI>BIINVALID AMOUNT<SI>DFPLEASE ENTER AMOUNT:
042<FF>042EN<SI>DFPLEASE ENTER AMOUNT:
043<SI>IJ` *****0.00
044<FF>044EN<SI>BIINVALID AMOUNT<SI>DFPLEASE ENTER AMOUNT:
046<ff>046EN<SI>BGDO YOU WISH TO USE<SI>DDTHE SAME PRODUCT/ACCOUNT<SI>L;YES ><SI>O<NO >
047647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647647<pr
049<SO>050<SO>051
050<FF>050EN<SI>EHPLEASE TAKE CARD<SI>I5AND WAIT FOR YOUR CASH
051<FF>051EN<SI>EHPLEASE TAKE CASH<SI>I6AND WAIT FOR RECEIPT
052<FF>052EN<SI>EDPLEASE TAKE YOUR RECEIPT<SI>IBTHANK YOU FOR USING NCR BANK
053<ff>053EN<sI>CMSORRY!<sI>EAUNABLE TO PROVIDE YOUR RECEIPT<SI>HBTHANK YOU FOR USING NCR BANK
054<FF>054EN<SD>CMSORRY!<SD>EBYOUR CARD HAS BEEN RETAINED,<SD>GEPLEASE SEEK ASSISTANCE
100 < SO > 000 < SI > @D100CY
101<SO>001<SI>@D101CY
102<SO>002<SI>@D102CY
114<SO>014<SI>@@114CY
115<SO>015<SI>@@115CY
116<SO>016<SI>@@116CY
117<SO>017<SI>@@117CY
119<SO>019<SI>@@119CY
120<SO>020<SI>@@120CY
121<SO>021<SI>@@121CY
126<SO>026<SI>07CY
127<SO>027<SI>OGCY
130<SO>030<SI>@@130CY
131<SO>031<SI>@@131CY<SI>JN
```

Appendix B

Processing Restrictions

| Overview | B-1 |
|---------------------------------------|-----|
| Restrictions | B-2 |
| Extended Lc and Le | B-2 |
| BER-TLV Field Size | B-2 |
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| Communications Protocols | B-3 |
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Table of Contents **Processing Restrictions**

Overview

This appendix summarises some of the restrictions you should be aware of when performing ICC processing. These include the following:

- Extended length of command data (Lc)
- Expected length of response data (Le)
- BER-TLV Field Size
- Candidate List Size
- Number of Application IDs in Download
- Reading/Writing Magnetic Stripes
- Smart Card Reader/Writer (SCRW)
- Communications Protocols
- Immediate Smart Card Eject

Restrictions

To enable this NDC CAM implementation to be flexible enough to be used by many financial institutions, the application has been designed so that major hardware upgrades are not required.

Consequently, the restrictions described in the following sections apply.

Extended Lc and Le

No support is provided for ICCs that use extended length of command data (Lc) or expected response data (Le). If such a card is inserted into an Advance NDC or NDC+ CAM terminal, the ICC processing is aborted.

Under non-extended Lc and Le processing, the maximum amount of data that can be provided in response to an ICC command is 255 bytes plus Status Words SW1 and SW2.

BER-TLV Field Size

The following restrictions apply to various BER-TLV field sizes:

- The object tag field cannot be bigger than two bytes.
- The object length field can have any length, provided the other restrictions are met.
- The object value field cannot be more than 255 bytes.

Candidate List Size

The ICC Initialisation task searches the ICC to find applications, in conjunction with the list of terminal acceptable Application IDs (AIDs).

The resultant candidate list size is dependent on the number of terminal acceptable AIDs in the "ICC Terminal Acceptable Application IDs Table" in Chapter 5, "Central to Terminal Messages".

The more searching that the terminal has to perform to find applications on the ICC, the greater the increase in transaction time.

Number of Application IDs in Download

The maximum number of Application ID (AID) values that the terminal can support as acceptable AIDs is 256. For more details, see "ICC Terminal Acceptable Application IDs Table" in Chapter 5, "Central to Terminal Messages".

Note: Each of these terminal AID values may have more than one corresponding ICC AID value during processing. This is because the terminal AID value may be a partial AID value.

Reading/Writing Magnetic Stripes

For an MCRW, but not DASH card reader, it is a requirement that *all* cards that are to be used within the system have a valid magnetic stripe encoded with at least a start sentinel.

The magnetic stripe must not be updated when the card is staged in the SCRW as this will result in the terminal resetting.

Smart Card Reader/Writer (SCRW)

The application requires an MCRW with an EMV-type approved SCRW unit to be installed in the terminal.

Communications Protocols

Some messages within NDC CAM, in particular the Transaction Request message, have the potential to be longer than some communications protocols can handle. This depends upon the communications protocol used, terminal configuration settings and ICC data values.

NCR strongly advises users to check that the communications protocol used in their terminal environment meets their implementation needs, taking into account the terminal configuration settings and potential ICC data values.

Immediate Smart Card Eject

If ICC processing is to be performed during a transaction, state type 'A' (Card Read) and state type 'k' (Smart FIT Check state) must not be configured via table entry 8 (Card Return Flag) to immediately eject the card ('000').

If either of the states is configured to eject the card immediately as part of their respective processing, the terminal will reset when ICC processing is performed.

Although a DASH card reader will not cause a terminal reset, the card will still be released, preventing ICC processing completion.

Processing Restrictions **Restrictions**

Appendix C

Related Documentation

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Table of Contents

Related Documentation

Overview

This appendix identifies the related NCR and non-NCR documentation which this manual supplements, and which you may find useful when developing your Advance NDC or NDC+ application.

The APTRA Advance NDC documentation is a combination of on-line help files and Adobe Portable Document Format (PDF) files. To read the PDF documentation, you need Adobe Reader installed on your PC. Adobe Reader can be downloaded from http://www.adobe.com.

In general, documentation is provided with its respective product.

Advance NDC Documentation

| Product | Title | Format | Description |
|----------------------|---|-----------------|---|
| APTRA Advance NDC | APTRA Advance NDC, General Description (B006-6045) | PDF | Provides a brief and general description of Advance NDC. |
| | APTRA Advance NDC Package document (Advance NDC Package.htm) | HTML | Provides summary information, and links to the release documents and setup programs included on the Advance NDC Package CD. |
| | APTRA Advance NDC, Developer's Guide (B006-6046) | PDF | Describes how to migrate to Advance NDC. It also identifies the functionality offered by Advance NDC and describes how to enhance it. |
| | APTRA Advance NDC, Multi-Vendor Support Reference Manual (B006-6344) | PDF | Describes the differences between creating an Advance NDC application that runs only on NCR SSTs (single-vendor) and one which runs on any vendor's SST (multi-vendor). |
| | APTRA Advance NDC, Reference Manual (B006-6180) | PDF | Provides application programmers with reference information for Advance NDC, including States, Screens, and the message formats between Central and the terminal. |
| | APTRA Advance NDC, Supervisor's Guide (B006-6062) | PDF | Describes how to set up the terminal's local configuration parameters, and how to replenish the terminal. |
| | Advance NDC Help | Windows Help | Context-sensitive help for the Advance NDC Authoring components (excluding Application Core components). |
| | Advance NDC Application Core Help | Windows Help | Context-sensitive help for the Application Core Authoring components. |

Advance Application Development Environment

If you are unfamiliar with the Advance Application Development Environment (ADE), you may also find the following documentation provided with Advance NDC useful:

| Product | Title | Format | Description |
|----------------------|---|-----------------|--|
| APTRA Advance NDC | APTRA Advance ADE, User's Guide (B006-6038) | PDF | Describes how to install and use the APTRA Author and Runtime Components to design, develop and maintain a self-service application. |
| | APTRA Author Help | Windows Help | Context-sensitive help for the Author user interface and authoring errors. |
| | Runtime Core Help | Windows Help | Context-sensitive help for the Runtime Core Authoring components and runtime errors, which are part of Advance Core Self-Service. |
| | GUI Help | Windows Help | Context-sensitive help for the GUI Authoring components, which are part of Advance Core Self-Service. |
| | Self-Service Core Help | Windows Help | Context-sensitive help for the Self-Service Core Authoring components, which are part of Advance Core Self-Service. |
| | ActiveX Help | Windows Help | Context-sensitive help for the ActiveX Authoring components and runtime errors, which are part of Advance Core Self-Service. |
| | Basic Self-Service Help | Windows Help | Context-sensitive help for the Authoring components provided with Advance Basic Self-Service. |
| | ATM Help | Windows Help | Context-sensitive help for the Authoring components and runtime errors provided with Advance ATM. |
| | Special Self-Service Help | Windows Help | Context-sensitive help for the Authoring components and runtime errors provided with Advance Special Self-Service. |

NDC+ Documentation

| Product | Title | Format | Description |
|---------|--|--------|--|
| NDC+ | NDC, Programmer's Overview (B006-2485) | PDF | Provides an introduction to, and overview of, the NDC software. |
| | NDC+, Programmer's Reference Manual (B006-2486) | PDF | Aimed at programmers who write Central control applications to support NDC+ terminals, or who create the terminal configuration that customises NDC+. |
| | NDC, Message Formats For Host Application Developers (B006-4201) | PDF | Designed for Central control application developers working with NDC RMX, NDCxa or NDC+. Intended to help in creating a control program that handles all the NDC variants. |
| | NDC, Using NDC Exits (B006-5102) | PDF | Introduces NDC Exits to experienced NDC programmers intending to develop customised terminal applications. |
| | NDC+, Supervisor's Reference Manual (B006-2487) | PDF | Designed for anyone who is responsible for setting up the terminal's local configuration parameters, or for routine replenishment of the terminal. |

Other Documentation

| Supplier | Title & Version | Format | Description |
|---|--|---------------|--|
| EMVCo All the EMV specifications are available from EMVCo at emvco.com. | EMV 2004 ICC Specification for Payment Systems (Book 1) - Application Independent ICC to Terminal Interface Requirements 4.1 | PDF | Book 1 describes the minimum functionality required for ICCs and terminals to ensure correct operation and interoperability, independent of the application to be used. |
| | EMV 2004 ICC Application Specification for Payment Systems (Book 2) - Security and Key Management 4.1 | PDF | Book 2 describes the minimum functionality required for ICCs and terminals to ensure correct operation and interoperability. Additional requirements and recommendations are provided for communication between ICC and issuer, and the management of cryptographic keys at terminal, issuer and payment system level. |
| | EMV 2004 ICC Terminal Specification for Payment Systems (Book 3) - Application Specification 4.1 | PDF | Book 3 defines the terminal and ICC procedures necessary for a payment system transaction in an international interchange environment. |
| | EMV 2004 ICC Terminal Specification for Payment Systems (Book 4) - Cardholder, Attendant, and Acquirer Interface Requirements 4.1 | PDF | Book 4 defines the mandatory, recommended and optional terminal requirements necessary to support the acceptance of ICCs in accordance with the Application Independent ICC to Terminal Interface Requirements (Book 1), the Security and Key Management (Book 2) and the Application Specification (Book 3). |
| | EMV '96 ICC Specification for Payment Systems 3.1.1 | PDF | Specifies the EMV ICC functions for payment systems version 3.1.1. |
| | EMV '96 ICC Application Specification for Payment Systems 3.1.1 | PDF | Specifies the EMV ICC application functions for payment systems version 3.1.1. |
| | EMV '96 ICC Terminal Specification for Payment Systems 3.1.1 | PDF | Specifies the EMV ICC terminal functions for payment systems version 3.1.1. |
| Comité Européen de Normalisation (CEN) | Extensions for Financial Services (XFS) Interface Specification 2.0 (CWA 13449) | PDF or DOC | Provides reference information for the CEN XFS specifications. Available from CEN at www.cen.eu. |

Related Documentation **Other Documentation**

| Supplier | Title & Version | Format | Description |
|---|---|--------|--|
| Visa International | Visa Integrated Circuit Card - Terminal Specification 1.3.2 | Paper | Specifies the Visa ICC terminal functions. |
| | Visa Integrated Circuit Card - Card (ICC) Specification 1.3.2 | Paper | Specifies the Visa ICC card functions. |
| | Visa Integrated Circuit Card - Application Overview 1.3.2 | Paper | Provides an overview of the Visa ICC application functions. |
| MasterCard International | Integrated Circuit Card (ICC) Application Specification for Pay Now (Debit) and Pay Later (Credit) Cards 2.0 | Paper | Specifies the ICC application functions for debit and credit cards. |
| | Integrated Circuit Card (ICC) Terminal Requirements for Pay Now (Debit) and Pay Later (Credit) Cards 2.0 | Paper | Specifies the ICC terminal requirements for debit and credit cards. |
| | Minimum Card Requirements for issuance of Chip Pay Now (Debit) and Pay Later (Credit) Cards 2.0 | Paper | Specifies the minimum card requirements for the issue of ICC debit and credit cards. |
| National Institute of Standards and Technology | Federal Information Processing Standards Publication (FIPS PUB) 180-1 'Secure Hash Standard'. | Paper | Specifies the Secure Hashing Algorithm (SHA-1). |
| International Standards Organisation | ISO 7811-1: Identification Cards - Recording Technique - Part 1: Embossing | Paper | Specifies the ISO standard embossing for cards. |
| | ISO 7811-2: Identification Cards - Recording Technique - Part 2: Magnetic Stripe | Paper | Specifies the ISO standard magnetic stripes for cards. |
| | ISO 7811-3: Identification Cards - Recording Technique - Part 3: Location of Embossed Characters on ID-1 Cards | Paper | Specifies the ISO standard for embossed characters on cards. |
| | ISO 7811-4: Identification Cards - Recording Technique - Part 4: Location of Read-Only Magnetic Tracks - Tracks 1 and 2 | Paper | Specifies the ISO standard for read only magnetic tracks (tracks 1 and 2) on cards. |
| | ISO 7811-5: Identification Cards - Recording Technique - Part 5: Location of Read-Write Magnetic Tracks - Track 3 | Paper | Specifies the ISO standard for read/write magnetic tracks (track 3) on cards. |

| Supplier | Title & Version | Format | Description |
|----------|--|--------|---|
| | ISO 7811-6: Identification Cards - Part 6: Physical Characteristics | Paper | Specifies the ISO standard for the physical characteristics of cards. |
| | ISO 7816-1 to 5: Identification Cards - Integrated Circuit(s) with Contacts - Part 1 through Part 5 | Paper | Specifies the ISO standard for Integrated Circuit Cards. |

Related Documentation
Other Documentation

Appendix D

Installation

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Table of Contents **Installation**

Overview

This appendix provides brief instructions on how to install the EMV/CAM2 Exits products for the following NDC types:

- APTRA Advance NDC
- NDC+.

Advance NDC Installation

Before installing the 'EMV/CAM2 Exits for APTRA Advance NDC' product, and for the latest and more detailed information, refer to the Release Bulletin provided on the CD.

You must install the 'EMV/CAM2 Exits for APTRA Advance NDC' product on the development PC and then the Self Service Terminal (SST) in that order, as follows.

Development PC Installation

Ensure you have installed the prerequisite software, as stated in the Advance NDC Package document (Advance NDC Package.htm) on the Advance NDC Package CD.

Multi-Vendor Installation with Advance NDC 3.x

This installation assumes you have Advance NDC 3.x or later and its prerequisite software installed.

For a multi-vendor installation, perform the following steps:

- 1 Insert the 'EMV/CAM2 Exits for APTRA Advance NDC' (Release 2.x and above) CD into the CD drive of the required PC.
- 2 Run the 'EMVExMV.msi' file provided on the CD.
- 3 Select 'Development PC' installation.
- 4 Ensure the PC and Documentation components are selected, and not the SST component.
- 5 Select 'Install'.

If you wish, you can then use the Aggregate Builder Tool (ABT) to create a combined aggregate by importing and exporting aggregates, as follows:

- 1 To import the multi-vendor EMV Exits aggregate, select File, Import and import <CD drive>:\Component - MultiVendor EMV Exits For AANDC 2.x.
- 2 To export as a combined aggregate, select the 'APTRA Advance NDC SST (MV) Package' aggregate, and select Contents. Tick 'MultiVendor EMV Exits For AANDC' and then Export to the required directory. (If you cannot see this item, select View, and ensure 'All Available Items in Archive' is ticked first).

Example MISCONT, STCONT, VCCONT and Startapps.vbs files are installed into the \Program Files\NCR APTRA\EMV_CAM2 Exits For AANDC directory. Cut and paste the content of the example files to your corresponding files. For example, the STCONT file contains EMV related information which should be cut and pasted into your STCONT file. For further information on the MISCONT, STCONT and VCCONT files, see the APTRA Advance NDC, Developer's Guide.

To create your Startapps.vbs file, open the Startapps.vbs supplied with EMV Exits, and the one supplied with your Advance NDC version. Add the relevant entries from the EMV Exits Startapps.vbs **before** the Advance NDC Startapps.vbs entries, and save as your Startapps.vbs.

After you have created your MISCONT, STCONT, VCCONT and Startapps.vbs files, copy them to the *supportfiles* directory of the exported aggregate archive, to be included in the aggregate when you export it from the Aggregate Builder Tool for installation on an SST.

Single-Vendor Installation with Advance NDC 3.x, or Advance NDC 2.06 and Higher

This installation assumes you have Advance NDC and its prerequisite software installed.

For a single-vendor installation, perform the following steps:

- 1 Insert the 'EMV/CAM2 Exits for APTRA Advance NDC' (Release 1.x) CD into the CD drive of the required PC.
- 2 Run the 'EMVExSV.msi' file provided on the CD.
- 3 Select 'Development PC' installation.
- 4 Ensure the PC and Documentation components are selected, and not the SST component.
- 5 Select 'Install'.

If you wish, you can then use the Aggregate Builder Tool (ABT) to create a combined aggregate by importing and exporting aggregates, as follows:

1 To import the multi-vendor EMV Exits aggregate, select File, Import and import <CD drive>:\Component - SingleVendor EMV Exits For AANDC 1.x.

2 To export as a combined aggregate, select the 'APTRA Advance NDC SST (SV) Package' aggregate, and select Contents. Tick 'SingleVendor EMV Exits For AANDC' and then Export to the required directory. (If you cannot see this item, select View, and ensure 'All Available Items in Archive' is ticked first).

Example MISCONT, STCONT, VCCONT and Startapps.vbs files are installed into the \Program Files\NCR APTRA\EMV_CAM2 Exits For AANDC directory. Cut and paste the content of the example files to your corresponding files. For example, the STCONT file contains EMV related information which should be cut and pasted into your STCONT file. For further information on the MISCONT, STCONT and VCCONT files, see the APTRA Advance NDC, Developer's Guide.

To create your Startapps.vbs file, open the Startapps.vbs supplied with EMV Exits, and the one supplied with your Advance NDC version. Add the relevant entries from the EMV Exits Startapps.vbs **before** the Advance NDC Startapps.vbs entries, and save as your Startapps.vbs.

After you have created your MISCONT, STCONT, VCCONT and Startapps.vbs files, copy them to the *supportfiles* directory of the exported aggregate archive, to be included in the aggregate when you export it from the Aggregate Builder Tool for installation on an SST.

Single-Vendor Installation with Advance NDC 2.05

This installation assumes you have Advance NDC 2.05 and its prerequisite software installed.

Perform the following steps:

- 1 Insert the 'EMV/CAM2 Exits for APTRA Advance NDC' (Release 1.x) CD into the CD drive of the required PC.
- 2 Open the "EMV Using AANDC 2.05" directory.
- 3 Run the 'Setup.exe' file provided on the CD.
- 4 Select 'Development PC' installation.
- 5 Ensure the PC and Documentation components are selected, and not the SST component.
- 6 Select 'Install'.

Example MISCONT, STCONT, VCCONT and Startapps.vbs files are installed into the *<global>\emvexits* directory. **Back up your files in the** *<global>\test\ulysses\dll* **and** *<global>\final\ulysses\dll*

directories to another location. Then cut and paste the content of the example files to the corresponding files in the <global>\test\ulysses\dll\ directories. For example, the STCONT file contains EMV related information which should be cut and pasted into your STCONT file.

To create your Startapps.vbs file, open the Startapps.vbs supplied with EMV Exits, and the one supplied with your Advance NDC version. Add the relevant entries from the EMV Exits Startapps.vbs **before** the Advance NDC Startapps.vbs entries, and save as your Startapps.vbs.

Using the Component Definition Tool (CDT) or other mechanism, you should then include your modified files in the Advance NDC component for installation onto the SST. In the CDT this is performed by editing the 'APTRA Advance ADE' component 'SSDSNDC' sub-component. Select 'Files', delete MISCONT, STCONT, VCCONT and Startapps.vbs and add your files, ensuring that the destination is C:\SSDS\DLL. Then export the normal Advance NDC component.

Terminal Installation

Ensure you have installed the prerequisite software (Advance NDC and its prerequisite software) as stated in the Advance NDC Package document (Advance NDC Package.htm) on the Advance NDC Package CD.

Multi-Vendor Installation with Advance NDC 3.x

- With an Exported Aggregate We recommend you install the combined aggregate previously created with the Aggregate Builder Tool, by running the *setup.exe* you have created.
- **Without an Exported Aggregate** Alternatively, with Advance NDC already installed, you can perform a multi-vendor installation by the following steps:
- 1 Insert the 'EMV/CAM2 Exits for APTRA Advance NDC' (Release 2.x and above) CD into the CD drive of the required terminal.
- 2 Run the 'EMVExMV.msi' file provided on the CD.
- 3 Select 'SST Runtime'.
- 4 Ensure that only the 'EMV/CAM2 Exits files for SST' component is selected, and not the PC or Documentation components.
- 5 Select 'Install'.

The EMV Exits DLLs and EXEs are installed on the terminal in the \SSDS\DLL directory.

Copy your modified MISCONT, STCONT, VCCONT and Startapps.vbs files to the \SSDS\DLL directory.

To start the applications, run the 'Startapps.vbs' file previously created for the development PC.

Single-Vendor Installation with Advance NDC 3.x or Advance NDC 2.06 and Higher

For a single-vendor installation with Advance NDC 3.x, or 2.06 and higher, installed, perform the following steps:

- 1 Insert the 'EMV/CAM2 Exits for APTRA Advance NDC' (Release 1.x) CD into the CD drive of the required terminal.
- 2 Run the 'EMVExSV.msi' file provided on the CD.
- 3 Select 'SST Runtime'.
- 4 Ensure that only the SST component is selected, and not the PC or Documentation components.
- 5 Select 'Install'.

The EMV Exits DLLs and EXEs are installed on the terminal in the \SSDS\DLL directory.

To start the applications, run the 'Startapps.vbs' file previously created for the development PC.

Single-Vendor Installation with Advance NDC 2.05

For a single-vendor installation with Advance NDC 2.05 installed, perform the following steps:

- 1 Insert the 'EMV/CAM2 Exits for APTRA Advance NDC' (Release 1.x) CD into the CD drive of the required terminal.
- 2 Run the 'Setup.exe' file provided on the CD.
- 3 Select 'SST Runtime'.
- 4 Ensure that only the SST component is selected, and not the PC or Documentation components.
- 5 Select 'Install'.

The EMV Exits DLLs and EXEs are installed on the terminal in the \SSDS\DLL directory.

Copy your modified MISCONT, STCONT, VCCONT and Startapps.vbs files to the \SSDS\DLL directory.

To start the applications, run the 'Startapps.vbs' file previously created for the development PC.

Silent Installation

You can install EMV Exits silently by adding the provided files to your existing Advance NDC aggregate, as described in the previous "Development PC Installation" section. The created aggregate can then be installed using the silent flag, as in the command 'Setup.exe /u:Silent'.

Silent Installation with Advance NDC Already Installed

Due to the need to intelligently merge the EMV Exits control files with the existing Advance NDC control files, we do not recommend silently installing just EMV Exits for Advance NDC onto a system which already has Advance NDC installed. In this case, a combined Advance NDC and and EMV Exits aggregate should be used instead.

Terminal De-Installation

If you decide to de-install 'EMV/CAM2 Exits for APTRA Advance NDC' from the terminal using Add/Remove Programs, note that the MISCONT, STCONT, VCCONT and Startapps.vbs files you have modified will then need to be restored to their original state.

NDC+ Installation

Before installing the 'EMV/CAM2 Exits for NDC+' product, and for the latest and more detailed information, refer to the Release Bulletin provided on Disk 1 of the installation diskettes.

To install the 'EMV/CAM2 Exits for NDC+' product on your Diskbuild PC, use the following steps:

- 1 Install S4I release 05.02.03 or later.
- 2 Install NDC+ 06.05.01 or later.
- 3 If you are using NDC+ 06.05.01 (not later), copy the NDC.FCS file in the NDCADI directory as NDC.ORG. Edit the NDC.FCS file and increase the stack size to 12000, by adding to the NDCIA.EXE command line parameter the text COMMAND_LINE_PARAM = "STACK=12000"
- 4 Insert Disk 1 of the 'EMV/CAM2 Exits for NDC+' installation diskettes in the flex disk drive (drive A:\).
- 5 Run the batch file Install.bat on Disk 1 of the installation diskettes.
- 6 Verify that the EMV directory is created on your Diskbuild PC.
- 7 Verify that the EMV.FCS file is in the NDCADI directory of NDC+ on the Diskbuild PC.
- 8 Verify all the files defined in the EMV.FCS file (except MISCONT and VCCONT, which are on Disk 2) are present in the EMV directory of the Diskbuild PC.
- 9 Verify that the MISCMULT.DLL is in the EMV directory of the Diskbuild PC.
- 10 Insert Disk 2 of the 'EMV/CAM2 Exits for NDC+' installation diskettes in drive A:\.
- 11 Run the batch file Install.bat on Disk 2 of the installation diskettes.

- 12 Verify that the EMV_SYS directory is created on the Diskbuild PC, containing the NDC+ system files STCONT, VCCONT, MISCONT, SUPCTR, CONFIG.CON and RESRVD.DEF.
- 13 Copy the existing STCONT and SUPCTR files within the NDC+ SYSTEM directory to the filenames STCONT.NDC and SUPCTR.NDC. This is done to back up the original NDC+ files.
- 14 If the STCONT and SUPCTR files in the SYSTEM directory of NDC+ have **not** been modified, the STCONT and SUPCTR files in the EMV_SYS directory can be safely copied to the SYSTEM directory. If these NDC+ SYSTEM files have been modified, compare each file to identify the EMV differences, and merge all the differences into your current SYSTEM files.
- 15 If the VCCONT and MISCONT files already exist in the NDC+ SYSTEM directory then copy these files into VCCONT.NDC and MISCONT.NDC. This is done to back up any original definitions of the customer written virtual control exits and hook exits.
- 16 If you are not using any virtual controllers or exit hooks, then you can directly copy the VCCONT and MISCONT files from the EMV_SYS directory to the NDC+ SYSTEM directory. If you are using virtual controllers or exit hooks, do not copy these files.
- 17 If other virtual controllers are being used, then the VCCONT file will already exist in the NDC+ SYSTEM directory. In this case, add on the EMV related information from the VCCONT file in the EMV_SYS directory to the VCCONT file in the NDC+ SYSTEM directory of the Diskbuild PC.
- 18 If other hook exits are being used, then the MISCONT file will already exist in the \SYSTEM directory. In this case, update your MISCONT file as required for the MISCMULT.DLL file, and include the definitions of the EMV hooks. Further information on the required format/names is provided in the *Using NDC Exits* publication (B006-5102).

Note: NDC+ 07.01.00 onwards supports multiple hook points without the need to use the MISCMULT.DLL file. However, MISCMULT.DLL is still provided with 'EMV/CAM2 Exits for NDC+', and you can continue to use MISCMULT.DLL if you wish.

19 Copy the NDC+ RESRVD file in the NDC+ SYSTEM directory to RESRVD.NDC as a backup.

- 20 Update the RESRVD file in the NDC+ SYSTEM directory with all the EMV related information from the RESRVD.DEF file in the EMV_SYS directory.
- 21 If you have already defined a CONFIG.CON file to include other sets of graphic and font files, update this file by defining the ISO character sets, which comprise 22 sets of new font files. Ensure the new set of font files are added in exactly the same way as given in the sample CONFIG.CON file in the EMV_SYS directory, with the font files starting at font identifier 96 and in the same order.
- 22 Your CONFIG.CON file with the ISO character sets should then be included in the Diskbuild using the Files Menu Utility. In the Files Definition Menu, use the 'Other Files' file type to transfer the CONFIG.CON file to the SST root directory (C:\).
- 23 The MISCMULT.DLL file (if used) and the Definition Files should also be included in the Diskbuild using the Files Menu Utility. Transfer the MISCMULT.DLL file to the SST directory C:\S4DLL, and the Definition Files to the SST directory C:\SYSTEM.

Building Without EMV Exits

If you want to make an NDC+ build without including EMV exits, but after the installation of the 'EMV/CAM2 Exits for NDC+' product onto the Diskbuild PC, then use the following procedure:

- 1 Rename the EMV.FCS file in the NDCADI directory of the Diskbuild PC to EMV.ORG.
- 2 Rename the system files STCONT, VCCONT, SUPCTR, RESRVD and MISCONT within the SYSTEM directory as STCONT.EMV, VCCONT.EMV, SUPCTR.EMV, RESRVD.EMV and MISCONT.EMV.
- 3 If you have created MISCONT as per the requirements of MISCMULT.DLL for EMV, then all other MISCMULT.DLL related system files included in the system directory must also be renamed with the same extension. For details of the MISCMULT.DLL definition files, refer to the release bulletin.
- 4 Rename the previously saved STCONT.NDC, SUPCTR.NDC and RESRVD.NDC files in the NDC+ SYSTEM directory to STCONT, SUPCTR and RESRVD.
- 5 If you were using any virtual controllers or hook exits, then the previously saved MISCONT.NDC and VCCONT.NDC have to be renamed to MISCONT and VCCONT.
- **6** Revert to your original CONFIG.CON file, if you were using one.

Appendix E EMV ICC Reserved Screens

Overview E-1

'U' EMV Smart Card E-2

Table of Contents **EMV ICC Reserved Screens**

Overview

The following table shows the default text for the reserved screens associated with the 'EMV/CAM2 Exits for APTRA Advance NDC' and 'EMV/CAM2 Exits for NDC+' products.

'x' represents those positions that are edited by the terminal before the screen is displayed or printed.

For each reserved screen, the table identifies the screen number and the position of the text within the screen data. Text position is calculated by the row and column positions for each screen.

For the other reserved screens used by Advance NDC or NDC+, see the relevant appendix in the *APTRA Advance NDC*, *Reference Manual* or the *NDC+ Programmer's Reference Manual* respectively.

'U' EMV Smart Card

The EMV Smart Card 'U' screens are as follows:

Table E-1 EMV Smart Card Screens

| _ | Column Position | |
|------------------|-----------------|---|
| Screen Number | Row Position | 1 2 3 12345678901234567890123456789012 |
| U067 | 1 | EXTERNAL AUTHENTICATE: NO ARPC |
| U068 | 1 | EXTERNAL AUTHENTICATE: INVALID ARPC |
| U069 | 1 | SMART CARD READER NOT PRESENT |
| U070 | 1 | CARD INITIALISE ATTEMPT = x |
| U071 | 1 | COMPONENT VERSIONS |
| U072 | 1 | SCRW VERSION |
| U073 | 1 | SMART |
| U074 | 1 | **** CARD DETAILS UNKNOWN **** |
| U075 | 1 | **** AID NOT SELECTED **** |
| U076 | 1 | DECLINED OFFLINE |

Appendix F ISO 8859 Character Sets

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Table of Contents ISO 8859 Character Sets

Overview

This appendix lists the ISO 8859 character sets and font IDs supported by the 'EMV/CAM2 Exits for APTRA Advance NDC' and 'EMV/CAM2 Exits for NDC+' products.

In addition to the common characters previously provided, ISO 8859 parts 1 to 10 are also supported to enable international EMV ICC usage. This also enables full use of the 'Application Preferred Name' data object (tag 0x9F12) when acquiring transactions. For details of how the 'Application Preferred Name' data object is used, see "Data Object List (DOL) Processing" and "ICC Application Name Display" in Chapter 7, "ICC Processing".

Advance NDC

As Advance NDC supports the ISO 8859 character sets, no additional font files are needed.

NDC+

For NDC+, a set of font files have been provided to support the ISO 8859 character sets. NCR fonts allow only 96 characters per font, so common characters are provided in a separate font to the language-specific characters.

A font is provided for each of the 640 x 350 and 640 x 480 screen resolutions, with single- and double-size character sets per resolution. Hence four font files are provided for each part.

These fonts should be referenced with the appropriate designator (font ID) and NDC+ font filename in the CONFIG.CON file. The font IDs and filenames are included in the table on the next page.

An example CONFIG.CON file is provided with the 'EMV/CAM2 Exits for NDC+' product.

Font ID Mapping Table

The following table maps the ISO 8859 character sets to the font IDs supported by the 'EMV/CAM2 Exits for APTRA Advance NDC' and 'EMV/CAM2 Exits for NDC+' products.

For NDC+, the font filename to use in the CONFIG.CON file for each font size and screen resolution is also given:

| ISO 8859 Character Set | Font Size | Font ID (decimal value) | NDC+ Font Filename (640 x 350 Resolution) | NDC+ Font Filename (640 x 480 Resolution) |
|---------------------------|-----------|-------------------------------|--|--|
| Common | Single | ` (96) | 350S4D00 | 480S4D00 |
| Characters | Double | a (97) | 350D4E00 | 480D4E00 |
| Part 1 - Latin 1 | Single | b (98) | 350S4F01 | 480S4F01 |
| (West European) | Double | c (99) | 350D5001 | 480D5001 |
| Part 2 - Latin 2 | Single | d (100) | 350S5102 | 480S5102 |
| (East European) | Double | e (101) | 350D5202 | 480D5202 |
| Part 3 - Latin 3 | Single | f (102) | 350S5303 | 480S5303 |
| (South European) | Double | g (103) | 350D5403 | 480D5403 |
| Part 4 - Latin 4 | Single | h (104) | 350S5504 | 480S5504 |
| (North European) | Double | i (105) | 350D5604 | 480D5604 |
| Part 5 - | Single | j (106) | 350S5705 | 480S5705 |
| Latin/Cyrillic | Double | k (107) | 350D5805 | 480D5805 |
| Part 6 - | Single | l (108) | 350S5906 | 480S5906 |
| Latin/Arabic | Double | m (109) | 350D5A06 | 480D5A06 |
| Part 7 - | Single | n (110) | 350S5B07 | 480S5B07 |
| Latin/Greek | Double | o (111) | 350D5C07 | 480D5C07 |
| Part 8 - | Single | p (112) | 350S5D08 | 480S5D08 |
| Latin/Hebrew | Double | q (113) | 350D5E08 | 480D5E08 |

| ISO 8859 Character Set | Font Size | Font ID (decimal value) | NDC+ Font Filename (640 x 350 Resolution) | NDC+ Font Filename (640 x 480 Resolution) |
|---------------------------|-----------|-------------------------------|--|--|
| Part 9 - Latin 5 | Single | r (114) | 350S5F09 | 480S5F09 |
| (Turkish) | Double | s (115) | 350D6009 | 480D6009 |
| Part 10 - Latin 6 | Single | t (116) | 350S6110 | 480S6110 |
| (Nordic) | Double | u (117) | 350D6210 | 480D6210 |

ISO 8859 Character Sets Font ID Mapping Table

Appendix G State Flow Diagram

Overview G-1 State Flow Diagram G-2 State Flow Diagram - Part 1 G-2 Key G-2 State Flow Diagram - Part 2 G-3 State Flow Diagram - Part 3 G-4

Table of Contents **State Flow Diagram**

Overview

This appendix includes a diagram of the base configuration state flow.

This diagram is provided for illustration purposes only; you will need to develop your own state flow as you require.

For an example of the configuration data you will need to define, see Appendix A, "Example Configuration Data".

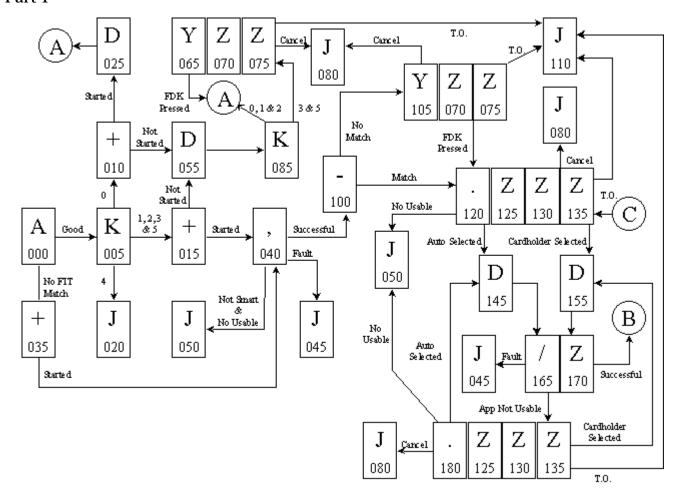
In the following diagram, the state flow between states may be labelled with the numbers 0 to 5 according to the type of card inserted, as follows:

- FIT switch path 0 Banks own card, single usable application, UK only, full function.
- FIT switch path 1 Banks own card, multiple usable application, UK only, full function.
- FIT switch path 2 Known other bank card, potentially multiple usable applications, potentially one, cash and balance.
- FIT switch path 3 Known other bank card, potentially multiple usable applications, potentially one, cash only.
- FIT switch path 4 Known other bank card, targeted for card rejection.
- FIT switch path 5 Unknown bank card, potentially multiple usable applications, potentially one, cash only.

State Flow Diagram

The following diagram illustrates the base configuration state flow:

State Flow Diagram -Part 1



Key

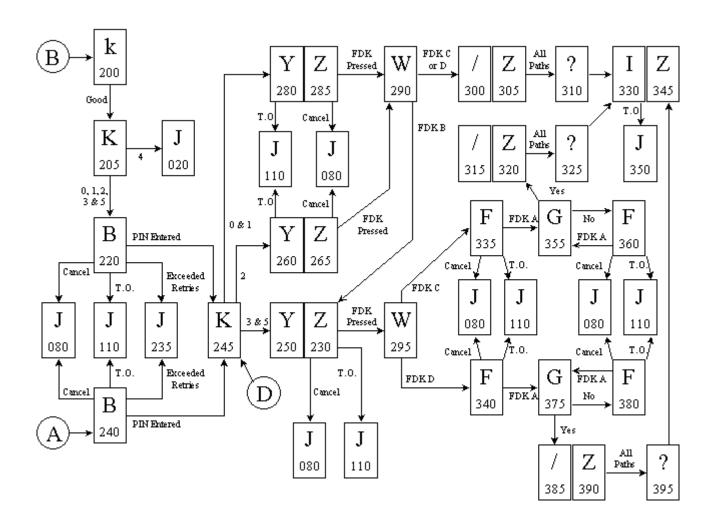
Each state is represented by a rectangle which includes the state identifier (for example, D) and state number (for example, 25).

Each state flow arrow between states is labelled (for example, T.O. = Time Out, Cancel or values 0, 1 & 2).

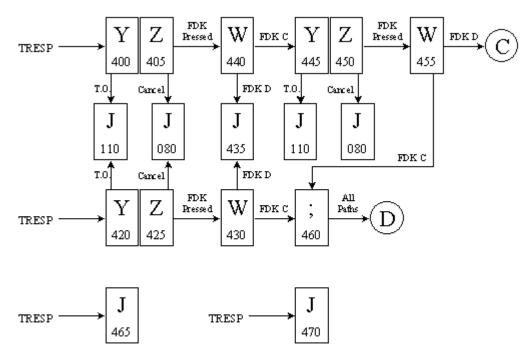
Flow to/from subsequent parts of this diagram are represented by a letter in a circle (for example, A, B, C or D).

TRESP = Transaction Response.

State Flow Diagram -Part 2



State Flow Diagram - Part 3



Glossary

Α

AAC Application Authentication Cryptogram. An ICC application cryptogram produced for unsuccessful CAM transactions. *See also* Cryptogram.

AAR Application Authorisation Referral.

AC Application Cryptogram. A cryptogram produced by the ICC application. *See also* Cryptogram.

ADF Application Definition File. A file held in the ICC to describe the attributes of an ICC application.

ADI Application Device Interface. The interface between the application and a device driver.

AFL Application File Locator. A data object returned as a result of the Get Processing Options command, which indicates a list of files and records to be read to obtain additional data for use during CAM processing.

AID Application Identifier. The identity or name of a specific ICC application.

AIP Application Interchange Profile. A set of flags in the ICC application that define which EMV features the card supports.

API Application Program Interface.

ARC Authorisation Response Code.

ARPC Authorisation Response Cryptogram. An ICC application cryptogram produced by Central for submission to the ICC, to prove it is a genuine host. *See also* Cryptogram.

ARQC Authorisation Request Cryptogram. An ICC application cryptogram produced by the ICC application to prove to Central that the ICC is genuine. *See also* Cryptogram.

ASCII American Standard Code for Information Interchange.

ATB Alternative Technology Byte. A byte in the track 2 'service code' field identifying cards using alternative technology. ICCs (smart cards) are generally identified by a value of '2' or '6'.

ATC Application Transaction Counter.

ATR Answer To Reset. Data provided by an ICC upon applying power. The data contains information about how to interact with the ICC.

AUC Application Usage Control. A set of flags in the ICC application that define the transaction the card can perform.

B

BCD Binary Coded Decimal.

BER-TLV Basic Encoding Rules - Tag Length Value. A format definition for all EMV data objects.

 $\overline{\mathbf{C}}$

CAM Card Authentication Method. The method or process for authenticating an ICC.

CEN Comité Européen de Normalisation (European Committee for Standardization). Responsible for the XFS interface specification.

CDOL1 Card risk management Data Object List 1. Data objects required by the ICC when submitting the first Generate AC command.

CDOL2 Card risk management Data Object List 2. Data objects required by the ICC when submitting the second Generate AC command.

CID Cryptogram Information Data.

CLA Class of instruction.

Cryptogram The result of encrypting a piece of data using a key and a cryptographic algorithm.

CVM Cardholder Verification Method. The method by which the ICC application verifies that a cardholder is genuine.

D

DASH Dip And Smart Hardware card reader.

DDF Directory Definition File. A file held in the ICC to describe the attributes of an ICC directory.

DF Dedicated File. A file type used in the ICC file system.

DOL Data Object List. A list of data objects required by the ICC, specified by the required tag and the number of bytes of the required value.

 $\overline{\mathbf{E}}$

Easy Entry application An application using a replication of magnetic stripe information on an ICC to facilitate payment. As this is not compliant with the EMV specifications, this is not supported.

EMV Europay MasterCard Visa. The original consortium of companies that introduced the EMV ICC standard functionality. EMV is a trademark owned and registered by EMVCo LLC, now a consortium of JCB International, MasterCard International, and Visa International.

| F | Fallback Payment system rules determine whether fallback to magnetic stripe is allowed after the failure of an ICC read transaction. This behaviour is outside the scope of EMV. |
|---|--|
| | FCI File Control Information. Information used to describe the attributes of a file in the ICC file system. |
| | FIID Financial Institution ID. A FIT entry field containing a partial Financial Institution ID, which is used to match against the data on a card. |
| | FIT Financial Institution Table. A list configured by Central of all acceptable card groups. |
| G | GENAC Generate Application Cryptogram. GENAC1 and GENAC2 are the first and second GENACs respectively. |
| I | IC Integrated Circuit. The microelectronic circuit integrated into a semiconductor chip, such as in a smart card (ICC). |
| | ICC Integrated Circuit Card. A card containing an integrated circuit; also known as a smart card. |
| | INS Instruction. |
| | ISO International Standards Organisation. |
| | ITR Interactive Transaction Response. |
| L | Lc Length of command data. The length of data being submitted to the ICC in a command. |
| | Le Length of expected response data. The length of response data expected to be returned by the ICC in response to a command. |
| M | MAC Message Authentication Code. A cryptographic checksum value used to verify that the data associated with it has not changed. |
| | MCRW Magnetic Card Reader Writer. A device in a terminal for accepting a card and reading the magnetic stripe on the card. <i>See also</i> SCRW. |
| | MSB Most Significant Bit. |
| N | NDC NCR Direct Connect. Supported by NDC+ (for OS/2) and APTRA Advance NDC (for Windows XP or Windows NT). |

P

P1 Parameter 1.

P2 Parameter 2.

PAN Primary Account Number. The number of the cardholder's primary account.

PDF Portable Document Format. The operating system independent file format for Adobe® Reader® files.

PDOL Processing options Data Object List. Data objects required by the ICC when submitting a Get Processing Options command.

PIN Personal Identification Number.

PSE Payment System Environment. The EMV-defined root directory in the ICC filing system.

SCIF Smart Card Interface. The interface board fitted to the MCRW to enable interaction with the SCRW.

SCRW Smart Card Reader Writer. The device fitted to the MCRW providing an extension that can interact with an ICC.

SFI Short File Identifier. An abbreviated file name used to reference a file in the ICC file system.

SHA-1 Secure Hash Algorithm-1. A hashing algorithm used to produce a unique secure signature from given data.

Smart Card General term for a card containing an Integrated Circuit (IC). *See* IC and ICC.

SST Self Service Terminal. The terminal which the cardholder uses for self-service. Also known as 'the terminal'.

SW1 Status Word 1. The first part of the response status from an ICC command.

SW2 Status Word 2. The second part of the response status from an ICC command.

TAA Terminal Action Analysis. The process used to determine whether an ICC transaction should be authorised, and if so, whether the authorisation is performed online or offline.

TC Transaction Certificate. An ICC application cryptogram, produced for successful CAM transactions. *See also* Cryptogram.

TDOL Transaction certificate Data Object List. A DOL which, when processed, provides the input text for the SHA-1. This algorithm outputs the data used for the TC Hash Value data object.

TSI Transaction Status Information. The status of the transaction as seen from the terminal.

S

 $\overline{\mathrm{T}}$

TVR Terminal Verification Results. The results of the verification as seen from the terminal.

X

XFS eXtensions for Financial Services. Application and service provider interface specifications from CEN.

Glossary

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