DIGITAL INFORMATION TRANSFER SYSTEM (DITS) PART 4 ARCHIVE OF ARINC 429 SUPPLEMENTS

ARINC SPECIFICATION 429P4

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ARINC SPECIFICATION 429P4

DIGITAL INFORMATION TRANSFER SYSTEM (DITS)
PART 4
ARCHIVE OF ARINC 429 SUPPLEMENTS

Published: November 29, 2012

Prepared by the AEEC
Specification 429P4 Adopted by the AEEC Executive Committee October 4, 2012

FOREWORD

Aeronautical Radio, Inc., the AEEC, and ARINC Standards

ARINC organizes aviation industry committees and participates in related industry activities that benefit aviation at large by providing technical leadership and guidance. These activities directly support aviation industry goals: promote safety, efficiency, regularity, and cost-effectiveness in aircraft operations.

ARINC Industry Activities organizes and provides the secretariat for international aviation organizations (AEEC, AMC, FSEMC) which coordinate the work of aviation industry technical professionals and lead the development of technical standards for airborne electronic equipment, aircraft maintenance equipment and practices, and flight simulator equipment used in commercial, military, and business aviation. The AEEC, AMC, and FSEMC develop consensus-based, voluntary standards that are published by ARINC and are known as ARINC Standards. The use of ARINC Standards results in substantial technical and economic benefit to the aviation industry.

There are three classes of ARINC Standards:

a) ARINC Characteristics – Define the form, fit, function, and interfaces of avionics and other airline electronic equipment. ARINC Characteristics indicate to prospective manufacturers of airline electronic equipment the considered and coordinated opinion of the airline technical community concerning the requisites of new equipment including standardized physical and electrical characteristics to foster interchangeability and competition.

b) ARINC Specifications – Are principally used to define either the physical packaging or mounting of avionics equipment, data communication standards, or a high-level computer language.

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The release of an ARINC Standard does not obligate any organization or ARINC to purchase equipment so described, nor does it establish or indicate recognition or the existence of an operational requirement for such equipment, nor does it constitute endorsement of any manufacturer's product designed or built to meet the ARINC Standard.

In order to facilitate the continuous product improvement of this ARINC Standard, two items are included in the back of this volume:

An Errata Report solicits any corrections to existing text or diagrams that may be included in a future Supplement to this ARINC Standard.

An ARINC IA Project Initiation/Modification (APIM) form solicits any proposals for the addition of technical material to this ARINC Standard.

ARINC SPECIFICATION 429
SUMMARY OF SUPPLEMENT AND
TABLE OF CONTENTS

PUBLICATIONS	ADOPTION DATE	PUBLISHED DATE
Part 1 Supplement		
Specification 429-1	April 11, 1978	June 1, 1978
Specification 429-2	December 6, 1978	March 1, 1979
Specification 429-3	August 31, 1979	November 1, 1979
Specification 429-4	June 17, 1980	August 1, 1980
Specification 429-5	March 12, 1981	April 4, 1981
Specification 429-6	December 9, 1981	January 22, 1982
Specification 429-7	November 4, 1982	January 3, 1983
Specification 429-8	November 4, 1983	December 3, 1984
Specification 429-9	October 11, 1984	April 30, 1985
Specification 429-10	November 7, 1985	November 17, 1986
Specification 429-11	June 15, 1988	July 22, 1988
Specification 429-12	October 25, 1989	July 1, 1990
Specification 429-13	October 8, 1991	December 30, 1991
Specification 429-14	November 4, 1992	January 4, 1993
Specification 429-15*	April 18, 1995	September 1, 1995
Specification 429-16	November 14, 2000	September 27, 2001
Specification 429-17	May 5, 2004	May 17, 2004
Specification 429-18	October 4, 2012	November 29, 2012
Part 2 Supplement		
Specification-1 to 14	See Part 1 Supplement	See part 1 Supplement
Specification 429-15*	April 18, 1995 (Same as Part 1)	March 6, 1996
Specification 429-16	October 27, 2004	December 17, 2004
Part 3 Supplement		
Specification 429-1 to 14	See Part 1 Supplement	See Part 1 Supplement
Specification 429-15*	April 18, 1995 (unique to Part 3)	August 31, 1995
Specification 429-17	March 31, 1999	May 17, 1999
Specification 429-18	July 18, 2001	October 12, 2001
Specification 429-19	October 22, 2008	June 25, 2009
Part 4 Supplement		
Archive of ARINC 429 Supplements	October 4, 2012	November 29, 2012

*ARINC Specification 429 was published as a single doucment through mid-1995. It was adopted as a multi-part document on **April 18, 1995**, and subsequently published in multiple parts. Part 1 and Part 2 use the same Supplement 15 to record the changes. Part 3 has a unique Supplement 15. Over time, as each part evolved, Supplements were prepared for each part independent of the other, both in content and in date.

April 18, 1995 adoption and the publication of Parts 1, 2, and 3

Part	Adoption Date	Effective Supplement	Publication Date
1	April 18, 1995	Supplement 15	September 1, 1995
2	April 18, 1995	Supplement 15	March 6, 1996
3	April 18, 1995	Supplement 15	August 31, 1995

1.0 INTRODUCTION

1.1 Purpose of this Document

ARINC Specification 429 defines the air transport industry standards for the transfer of digital information between avionics system elements. Since the first release in 1977, many changes to ARINC Specification 429 have been coordinated with industry. The changes are reflected in the current version of ARINC Specification 429, currently published in multiple parts.

1.2 Organization of ARINC Specification 429

ARINC Specification 429: *Digital Information Transfer System (DITS)* is published in four parts:

Part 1 Functional Description, Electrical Interfaces, Label Assignments and Word Formats

Part 2 Discrete Word Data Standards

Part 3 File Data Transfer Techniques

Part 4 Archive of ARINC 429 Supplements

Part 1 provides the basic description of ARINC 429 functions and the supporting physical and electrical interfaces. Data word formats, standard label and address assignments, and examples are provided.

Part 2 defines ARINC 429 discrete words and bit assignments in label order.

Part 3 describes ARINC 429 data transfer protocols and message definitions for data transferred in large blocks and/or file format.

Part 4 is an archive of the ARINC 429 Supplements as published over the years. It was introduced as part of the update to ARINC 429, Part 1, by Supplement 18, the 35th anniversary publication (2012).

Each part of ARINC Specification 429 is published independent of the others. The dash numbers assigned to each part are not intended to be synchronized. Therefore, the latest version of ARINC Specification 429 Part X should be used when designing or procuring equipment.

1.3 Part 4 Content and Overview

Part 4 is the archive of ARINC 429 Supplements. It was prepared in conjunction with Supplement 18 to ARINC Specification 429, Part 1, which represents a digital re-mastering of the document in the latest ARINC formats and styles. As part of the re-publishing process, the technical content of each Supplement appears in the latest version of ARINC Specification 429.This activity makes each part of ARINC Specification 429 complete.

The Supplements, previously published as “goldenrod pages”, are considered historical artifacts. They are published unchanged, both in content and in form. ARINC 429 Supplements are reproduced in Part 4 for historical reference only.

Supplements to ARINC Specification 429 Part 1

ARINC Specification 429, Part 1

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SUPPLEMENT 1

TO

ARINC SPECIFICATION 429

MARK 33 DIGITAL INFORMATION TRANSFER SYSTEM (DITS)

Published: June 1, 1978

Prepared by the Airlines Electronic Engineering Committee

Adopted by the Airlines Electronic Engineering Committee: April 11, 1978

A. PURPOSE OF THIS SUPPLEMENT

This Supplement adds to Specification 429 material related to the transfer of graphic and ISO alphabet No. 5 encoded alpha/numeric data by the Mark 33 DITS. Also, it clarifies the purpose of the SDI function, adds BCD and BNR numeric data encoding examples to Attachment 6 and introduces two Appendices into the Specification.

B. ORGANIZATION OF THIS SUPPLEMENT

The first part of this document, printed on goldenrod paper, contains descriptions of the changes introduced into the Specification by this Supplement, and, where appropriate, extracts from the original text for comparison purposes. The second part consists of replacement white pages for the Specification, modified to reflect these changes. The modified and added material on each replacement page is identified with "c-1" symbols in the margins. Existing copies of Specification 429 may be updated by simply inserting the replacement white pages where necessary and destroying the pages they replace. The goldenrod pages should be inserted inside the rear cover of the Specification.

Copies of the Specification bearing the number 429-1 already contain this Supplement and thus do not require revisions by the reader.

C. CHANGES TO SPECIFICATION 429 INTRODUCED BY THIS SUPPLEMENT

This section presents a complete tabulation of the changes and additions to the Specification introduced by this Supplement. Each change or addition is identified by the section number and title currently employed in the Specification, or by the section number and title that will be employed when the Supplement is eventually incorporated. In each case there is included a brief description of the addition or change and, for other than very minor revisions, any text originally contained in the Specification is reproduced for reference.

1.3.2 ISO Alphabet No. 5 Data Transfer

Existing text supplemented – no other changes.

1.3.3 Graphic Data Transfer

New section added by this Supplement.

2.1.2 Information Element

COMMENTARY

revised to improved clarity of opening sentence, and to modify the statement concerning the BCD-encoding of latitude and longitude as a consequence of the clarification of the use priorities for bit nos. 9 and 10 introduced into Section 2.1.4 by this Supplement.

ORIGINAL TEXT FOLLOWS

To permit the use of common hardware elements for the transmission of BNR and BCD numeric data, the format for the Mark 33 DITS BCD word differs from that used formerly for this type of data. Bit no. 32 is assigned to parity, bit nos. 31 and 30 to the sign/status matrix, bit no. 29 is the most significant bit of the data field, and the maximum decimal value of the most significant character is 7. Previously, the BCD word contained no parity bit, the sign/status matrix occupied bit nos. 32 and 31, bit no. 30 was the most significant data bit and the maximum decimal value of the most significant character was 3. This format made the word 8-bit byte oriented with respect to the data. This characteristic is not retained in the Mark 33 system.

Also, the Mark 33 BCD word will not accommodate latitude and longitude to the formerly specified resolution of 0.1 minute of arc. If BCD transmission of these quantities in required, either the resolution must be decreased or the word must be restructured. Restructuring involves limiting the maximum decimal value of the most significant character to 1, moving the remaining BCD characters towards the MSB by two bit positions and using bit nos. 9 and 10 for data instead of reserving them for source/destination identification encoding per Section 2.1.4 of this document. It is probable, however, that future latitude and longitude displays will not be the simple, dedicated read-out type for which BCD data is intended. More likely is the use of some form of multiple-message display, such as a CRT, which will be backed by its own data processor and prefer inputs of BNR data. If this proves to be the case, there will be no problem!

2.1.3 Information Identifier

Text expanded to explain differing roles of label codes in numeric (BCD/BNR) and alpha/numeric (ISO Alphabet No. 5) data transfer. "Special Note" added.

ORIGINAL TEXT FOLLOWS

The first eight bits of each word are assigned to a label function so that the data contained in the word may be identified. Label code assignments are set forth in the table of Attachment 1 to this document.

2.1.4 Source/Destination Identifier

Section modified to indicate that bit nos. 9 & 10 are not available for the SDI function in DITS words employed for graphic and ISO Alphabet No. 5 data transfer, or in BNR/BCD words in which bit nos. 9 and 10 are needed for valid data in order to achieve the desired resolution. Code table revised and function application more fully described. Consequential revisions to Commentary.

ORIGINAL TEXT FOLLOWS

Bit nos. 9 & 10 of the word should be reserved for a data source/destination identification function. This function may find application when specific words need to be directed to a specific system of a multi-system installation or when the source system of a multi-system installation needs to be recognizable from the word content. When the source/destination identifier function is used, bit nos. 9 & 10 should be encoded as follows. When it is not used, binary zeros or valid data should be transmitted in these positions

Bit No.		System
10	9	
0	0	1
0	1	2
1	0	3
1	1	4

.

COMMENTARY

In many applications of the Mark 33 DITS, data source/destination identification will not be needed. In these cases, bits 9 & 10 will be used as pad bits for valid data. In certain other applications of the system, for example, BCD latitude and longitude encoding (if needed – see Commentary following Section 2.1.2 of this document), the need to use bit nos. 9 and 10 to obtain adequate data resolution will preclude source/destination identification in this way.

Note that this document does not address the practical question of how these bits will be set in those multi-system installations in which the source/destination identification function is desired. One way would be to use program pins on individual system black boxes which would be wired to set up the appropriate code. The ARINC Characteristics devoted to the individual systems will define the method actually to be used.

2.1.5 Sign/Status Matrix

Section divided into two sub-sections, one to describe the BCD numeric and ISO Alphabet #5 alpha/numeric data sign status matrix, and the other to describe the BNR numeric data sign/status matrix.

ORIGINAL TEXT FOLLOWS

The "sign" (plus, minus, north, south, etc.) of the transmitted data and the status of the transmitter hardware should be encoded in bit nos. 30 and 31 as shown in the table below.

Bit No.		Designation	
31	30	BNR/BCD Data	ISO # 5 Data
0	0	Plus, North, East Right, To	TBD
0	1	No Computed Data	
1	0	Functional Test	
1	1	Minus, South, West, Left, From	

Notes:

1. A source system should indicate failure by ceasing to supply data to a bus.
2. Both bits should be "zero" in BNR and BCD words when no sign is needed.
3. The "no computed data" code should be generated when computed data is not available for reasons other than equipment failure.
4. When is appears in a word identified by its label as a system output, the "functional test" code should be interpreted as advice that the data in the word results from the execution of a functional test. When it appears in a word identified by its label as an instruction, e.g., a radio channel change command, this code should be interpreted as a command to perform a functional test.

2.1.6 Data Standards

Typographical errors corrected in second paragraph of Commentary.

2.2.1 Transmission System Interconnect

Existing material supplemented with information concerning shield grounding.

2.2.3.2 Receiver Voltage Levels

DC levels between terminal A and ground and terminal B and ground at which receivers should not be damaged raised from +20VDC to +28VDC (min) and for –20VDC to –28VDC (min) respectively to align numerical values with aircraft DC power supply value.

2.3.1.3 ISO Alphabet No. 5 Data

New section added by this Supplement.

2.4.1 Bit Rate

Existing commentary supplemented with warning against selection of 13.6 KBPS and 100 KBPS because of possible interference with operation of OMEGA and LORAN C system on the aircraft.

Attachment 2: Data Standards Tables 1 and 2

Column heading "MIN TRANSMIT INTERVAL msec" changed to "MAX TRANSMIT INTERVAL msec" in each case.

Attachment 2: Data Standards Table 3

Table 3 (Alpha/Numeric (ISO Alphabet No. 5) Data Standards) deleted. Table 4 (Discrete Data) renumbered Table 3.

Note: Table 3 was reserved for alpha/numeric (ISO Alphabet No. 5) data standards prior to the preparation of this Supplement. The need for it disappeared as a result of the particular approach selected for handling this data introduced into Specification 429 by this Supplement.

Attachment 6: General Word Formats and Encoding Examples

BNR word format example amended as consequence of change to sign/status matrix (see Section 2.1.5) General Word Formats for ISO Alphabet No. 5 data added. Encoding examples added.

Appendix 1: Laboratory Verification of ARINC 429 DITS Electrical Characteristics

New material added by this Supplement.

Appendix 2: An Approach to a Hybrid Broadcast Command/Response Data Bus Architecture.

New material added by this Supplement.

NOTE: Due to the large number of changes Created by this Supplement, it is NOT available separately to update 429-1.

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SUPPLEMENT 2

TO

ARINC SPECIFICATION 429

MARK 33 DIGITAL INFORMATION TRANSFER SYSTEM (DITS)

Published: March 1, 1979

Prepared by the Airlines Electronic Engineering Committee

Adopted by the Airlines Electronic Engineering Committee: December 6, 1978

A. PURPOSE OF THIS SUPPLEMENT

This Supplement amends the material added to Specification 429 on ISO Alphabet No. 5 data transfer, and expands the multiple-word DITS message concept first used in this application to cover Discrete, Acknowledgement and Maintenance (ISO Alphabet No. 5 and discrete data formats) information transfer as well. The Application Notes of Chapter 3 of the Specification are amended to bring them into line with adopted practice in the control of DME's and ATC transponders, and supplemented with material related to the multiple-word message applications of the system just mentioned. Also, additions and modifications have been made to the label codes and data standards in Attachments 1 and 2 of the Specification to bring them into line with adopted practice.

B. ORGANIZATION OF THIS SUPPLEMENT

The first part of this document, printed on goldenrod paper, contains descriptions of the changes introduced into the Specification by this Supplement, and, where appropriate, extracts from the original test for comparison purposes. The second part consists of replacement white pages for the Specification, modified to reflect these changes. The modified and added material on each replacement page is identified with "c-2" symbols in the margins. Existing copies of Specification 429 may be updated by simply inserting the replacement white pages where necessary and destroying the pages they replace. The goldenrod pages should be inserted inside the rear cover of the Specification.

Copies of the Specification bearing the number 429-2 already contain this Supplement and thus do not require revisions by the reader.

C. CHANGES TO SPECIFICATION 429 INTRODUCED BY THIS SUPPLEMENT

This section presents a complete tabulation of the changes and additions to the Specification introduced by this Supplement. Each change or addition is entitled by the section number and title currently employed in the Specification, or by the section number and title that will be employed when the Supplement is eventually incorporated. In each case there is included a brief description of the addition or change and, for other than very minor revisions, any text originally contained in the Specification is reproduced for reference.

2.1.2 INFORMATION ELEMENT

Text revised to describe word application groups.

ORIGINAL TEXT FOLLOWS:

2.1.2 Information Element

The basic information element is a digital word containing 32 bits. Word formats for the different types of data handled by the Mark 33 DITS (see Section 2.3.1 of this document) are depicted in Attachment 6. When less than the full data field is needed to accommodate the information conveyed in a word in the desired manner, the unused bit positions should be filled with binary zeros or valid data pad bits. If valid data bits are used, the resolution possible for the information will exceed that called for in this specification. The Commentary following Section 2.1.6 of this document refers.

2.1.3 INFORMATION IDENTIFIER

Text revised to describe label use for AIM/Discrete/Maintenance data word type identification.

ORIGINAL TEXT FOLLOWS:

2.1.3 Information Identifier

The first eight bits of each word are assigned to a label function. Labels will a) identify the information contained within numeric (BCD/BNR) data words (e.g., DME distance, static air temperature), and b) act as receiving device addresses for alpha/numeric (ISO Alphabet No. 5) data words (e.g., navigation system CDU or map display). Label code assignments are set forth in Attachment 1 to this document.

2.1.5.1 BCD NUMERIC AND AIM DATA WORDS

Title and text revised to include other AIM applications in material originally prepared to describe sign/status matrix use in ISO Alphabet No. 5 words, and to provide definition of Self-Test.

ORIGINAL TEXT FOLLOWS:

2.1.5.1 BCD Numeric and ISO Alphabet No. 5 Data Words

The sign (plus, minus, north, south, etc.) of BCD numeric data, the word type of alpha/numeric (ISO alphabet No. 5) data and the status of the transmitter hardware should be encoded in bit nos. 30 and 31 of the word as shown in the table below.

Bit No.		Designation	
31	30	BNR/BCD Data	ISO #5 Data
0	0	Plus, North, East Right, to	Initial Word
0	1	No Computed Data	No Computed Data
1	0	Functional Test	Intermediate Word
1	1	Minus, South, West Left, From	Final Word

Notes:

1. A source system should annunciate any detected failure that causes one or more of the words normally output by that system to be unreliable by ceasing to supply the affected word or words to the data bus.

2. Both bits should be "zero" when no sign is needed.

3. The "no computed data" code should be generated when computed data is not available for reasons other than equipment failure.

4. When it appears in a word identified by its label as a system output, the "functional test" code should be interpreted as advice that the data in the word results from the execution of a functional test. When it appears in a word identified by its label as an instruction, e.g., a radio channel change command, this code should be interpreted as a command to perform a functional test.

5. See Section 2.3.1.3 of this document for definitions of the terms "Initial Word", "Intermediate Word" and "Final Word".

2.1.5.2 BNR NUMERIC DATA WORDS

Text revised to provide definition of Self-Test.

ORIGINAL TEXT FOLLOWS:

2.1.5.2 BNR Numeric Data Words

The sign (plus, minus, north, south, etc.) of BNR numeric data words and the status of the transmitter hardware should be encoded in bit nos. 29, 30 and 31 of the word as shown in the table below.

Bit No.			Designation
31	30	29	BNR Data
0	0	0	Failure Warning/Plus, North, East Right, To
0	0	1	Failure Warning/Minus, South, West, Left, From
0	1	0	No Computed Data
1	0	0	Functional Test/Plus, North, East, Right, To
1	0	1	Functional Test/Minus, South, West Left, From
1	1	0	Normal Operation/Plus, North, East, Right, To
1	1	1	Normal Operation/Minus, South West, Left, From
0	1	1	Not Used (Growth)

Notes:

1. A source system should annunciate any detected failure that causes one or more of the words normally output by that system to be unreliable by setting bit nos. 30 and 31 in the affected word(s) to the "failure warning" code defined above. Words containing this code should continue to be supplied to the data bus during the failure condition.

2. Bit no. 29 should be "zero" when no sign is needed.

3. The "no computed data" code should be generated when computed data is not available for reasons other than equipment failure.

4. When it appears in a word identified by its label as a system output, the "functional test" code should be interpreted as advice that the data in the word results from the execution of a functional test. A self-test should produce indications of 1/8 of positive full-scale values unless indicated otherwise in an ARINC Equipment Characteristic.

5. If, during the execution of a functional test, a source system detects a failure which causes one or more of the words normally output by that system to be unreliable, it should immediately change the states of bit nos. 30 and 31 in the annunciation is replaced with the "failure warning" annunciation

2.2.3.1 TRANSMITTER VOLTAGE LEVELS

Tolerances on "HI" and "LO" voltage states changed from ± 0.5 volt to ± 1.0 volt to correct previously undetected error.

2.3.1.2 DISCRETES

Minor changes to existing wording to improve clarity. New paragraphs added to describe two types of dedicated –to-discrete words and their applications.

ORIGINAL TEXT FOLLOWS:

2.3.1.2 Discretes

In addition to handling numeric data as specified above, the Mark 33 DITS should also be capable of accommodating discrete items of information, either in the "spare" bits of data words or, when necessary, in dedicated words. Any discrete information contained in a word assigned a label in Attachment 1 is specified in the definition for that word in Attachment 2.

The rule to be followed in the assignment of bits to discrete functions is to start with the least significant bit available in the word and to continue towards the most significant bit. Attachment 6 shows this against the background of the generalized word structure.

2.3.1.3 Maintenance Data (General Purpose)

This section inserted to describe use and application of general purpose Maintenance words.

ORIGINAL TEXT FOLLOWS:

2.3.1.3 Alpha/Numeric (ISO Alphabet No. 5) Data

ISO Alphabet No. 5 alpha/numeric data will consist of seven-bit characters encoded per the table of Attachment 5 to this document. Three such characters should occupy bit nos. 9 through 29 of a DITS 32-bit word, as shown in the general word format diagram in Attachment 6. As for numeric (BCD) data words, bit nos. 1 through 8 should be the word label (receiving device address-see Section 2.1.3), bit nos. 30 and 31 the sign/status matrix and bit no. 32 the word parity bit.

The typical alpha/numeric message contains more than three ISO Alphabet No. 5 characters, necessitating the transmission of multi-DITS-word messages. The following procedure should be used to permit receivers to determine that such messages are received in their entirety, with no words having been "lost along the way". Only when this determination has been made, and the parity check for each word shows the data to be error-free, should the message be displayed to the aircrew or otherwise utilized.

2.3.1.3 Alpha/Numeric (ISO Alphabet No. 5) Data (cont'd)

The first DITS word of the message should contain the label in bit nos. 1 through 8, two numeric characters encoded per ISO Alphabet No. 5 in bit nos. 9 through 15 and 16 through 22 and the ISO Alphabet No. 5 control character "STX"in bit nos. 23 through 29. The two numeric characters should indicate the decimal number of DITS words in the message (maximum number is 99), with the most significant character occupying bit nos. 16 through 22. This count, which should include this initial word, will be one plus the next whole number greater than one third of the number of ISO Alphabet No. 5 characters to be transmitted. The sign/status matrix should contain the "initial word" code defined in Section 2.1.5 of this document.

The subsequent DITS words of the message should each contain the label in bit nos. 1 through 8 and three ISO Alphabet No. 5 characters. The sign/status matrix of all these words except the last word should contain the "intermediate word" code defined in Section 2.1.5.1 of this document. The last word of the message should contain the "final word" code in its sign/status matrix. Any unused bit positions in the final word resulting from the number of ISO characters in the message being one or two less than a number wholly divisible by three should be filled with binary "zeros".

2.3.1.4 AIM Data

Section number, text and title revised to include other AIM word applications in material originally prepared to describe ISO Alphabet No. 5 data handling (originally in Section 2.3.1.3). Detailed amendments in this area also.

3.1.4.2 DME

The "Override" switching function has been replaced by the "DME Mode Select" function.

3.1.4.7 ATC TRANSPONDER

"Mode A/B Select" and "Standby" deleted from list of switching functions. Control word format re-structured to release bits unneeded in numeric data part of word for assignment to discrete switching functions.

Fig. 3-1 Radio Systems Management Word Formats

Bit nos. 11 and 12 in the DME data word have been assigned to "DME Mode Select".

The description of bit 14 in the VOR/ILS data word has been revised to improve clarity.

ORIGINAL TEXT FOLLOWS:

[1] When bit no. 4 is "zero", the ILS mode should be "off. When bit no 14 is "one", the ILS mode should be "one".

ORIGINAL ATC TRANSPONDER WORD FORMAT ILLUSTRATION FOLLOWS:

ATC TRANSPONDER Bit No. Example	PARITY (odd)	SIGN/STATUS MATRIX	0.7 (3)	0.7 (6)	0.7 (2)	0.7 (0)	A/B Mode Select	IDENT	STANDBY	ALT. REP. OFF	RESERVED (SDI)	LABEL Beacon Transponder Code
	32	31 30	29 28 27	26 25 24 23	22 21 20 19	18 17 16 15	14	13	12	11	10 9	8 7 6 5 4 3 2 1
	0	0 0	0 1 1	0 1 1 0	0 0 1 1	0 0 0 0	0	0	0	0	0 0	1 1 0 1 1 0 0 0

[1]

[1]

Bit	Zero	One
11	Alt. Rep. ON	Alt. Rep. OFF
12	Standby OFF	Standby ON
13	Ident OFF	Ident ON
14	Select Mode A	Select Mode B

The revised format of the ATC transponder word is as shown on page 10.

3.2 AIM Information Transfer

New section added by this Supplement.

Attachment 1: Label codes

Some parameter names have been changed and others have been added to the list. Instead of showing the entire list, only the original assignment of those that have been changed are shown below.

Label (Octal)	Original Assignment	Proposed Assignment
007	Align Status/Inertial Discretes	No assignment
014	None assigned	Magnetic Heading
015	None assigned	Wind Speed
016	None assigned	Wind Direction-True
017	None assigned	Selected Runway Heading
024	Selected Course	Selected Course #1
027	None assigned	Selected Course #2
041	None assigned	Set Latitude
042	None assigned	Set Longitude
043	None assigned	Set Magnetic Heading
044	None assigned	True heading
045	None assigned	Minimum Airspeed
100	Selected Course	Selected Course #1
107	AFS Discretes	No assignment
110	None assigned	Selected Course #2
112	None assigned	Selected EPR or N_1
124	FMC Discretes	Caution & Warning DFDR Discretes #1
130	None assigned	Tt2
131	None assigned	Pt2
132	None assigned	Pt7
133	None assigned	Thrust Lever Angle
145	None assigned	AFS DFDR Discretes #1
146	None assigned	AFS DFDR Discretes #2
147	None assigned	AFS DFDR Discretes #3
166	None assigned	RALT Check Point Dev.
203	Altitude (29.92)	Altitude (1013.25mb)
204	Altitude (Baro)	Baro Corrected Altitude #1
214	Air Data Computer Discretes	No assignment
216	Baroset	No assignment
220	None assigned	Baro Corrected Altitude #2
221	None assigned	Indicated Angle of Attack
223	Altitude (29.92)	No assignment
224	Altitude Baro	Caution/Warning DFDR Discretes #2
225	Mach	No assignment
226	Computed Airspeed	No assignment
227	Max Allowable Airspeed	No assignment
234	Baroset (millibars)	Baro Correction (mb #1)
235	Baroset (ins. of Hg)	Baro Correction (mb #1)
236	None assigned	Baro Correction (mb #2)
237	None assigned	Baro Corrected (in of Hg #2)
241	None assigned	Corrected Angle of Attack
242	None assigned	Total Pressure
245	None assigned	Minimum Airspeed
247	None assigned	Total Fuel
270	None assigned	Discrete Data #1
271	None assigned	Discrete Data #2
272	None assigned	Discrete Data #3
273	None assigned	Discrete Data #4
274	None assigned	Discrete Data #5
334	Free Heading	Platform Heading
340	N_1 or EPR Actual	EPR Actual
346	None assigned	N_1 Actual
350	Engine Discretes	Maintenance Data #1
351	Control Panel Discretes	Maintenance Data #2
352	Control Panel Discretes	Maintenance Data #3
353	Control Panel Discretes	Maintenance Data #4
354	Instrument Discretes	Maintenance Data #5
355	None assigned	Acknowledgement
356	None assigned	Maintenance ISO #5 Message
357	None assigned	ISO #5 Message
360	None assigned	Potential Vertical Speed
372	None assigned	Wind Direction-Magnetic
373	None assigned	N-S Velocity-Magnetic
374	None assigned	E-W Velocity-Magnetic
375	None assigned	Along Heading Acceleration
376	None assigned	Cross Heading Acceleration

Attachment 2: Data Standards

A number of additions and changes have been made to the tables. The octal labels and parameter names are shown for each data item that has been changed. The original data is shown only for the data that has been changed by this supplement. Also a second "Note" has been added to Table 2.

Table 1 BCD DATA

Label (Octal)	Parameter Name	Max Transmit Interval	Range (Scale)	Sig. Fig.	Pad Fig.	Units	Resol
170	Decision Hgt Sel.(EFI)	200	0 - 500	3	2	Feet	1.0
201	DME Distance	200*	-1 - 399.99*	5	0	N.M.	0.01
230	True Airspeed	500*	130 - 599*	3	2	Knots	1.0
231	Total Air Temp.	500	+500 — 99*	2	3	o_c	1.0
233	Static Air Temp.	500	-99 - +60*	2	3	o_c	1.0
234	Baroset (mb)*	200*	0 - 3999*	4*	1*	mb	1.0*
235	Baroset (ins. of Hg*)	200*	0 - 39.99*	4*	1*	ins.Hg	0.01*

*This data has been changed.

Note: Labels 017, 027, 041, 042, 043, 044, 045, 236 and 237 previously had no values assigned. Values for labels 223, 224, 225, 226 and 227 have been changed.

Table 2 BNR DATA

Label (Octal)	Parameter Name	Max Transmit Interval	Sig. Bits (Not Inc. Sign)	Units	Range	Approx. Resol.
100	Selected Course	62.5*	9	Deg/180	± 180 ^{o}	0.35^o
103	Selected Airspeed	62.5*	11*	Deg/180	± 180 ^{o}	0.25*
121	Horiz. Strg. Signal	100	9*	Deg/180	+45^o *	0.1 ^{o} *
122	Vert.Strg.Signal	100	9	Deg/180	+22.50 ^{o} *	0.05 ^{o} *
140	Flight Director-Roll	62.5*	9	Deg/180	±45 ^{o}	0.1 ^{o}
141	Flight Director-Pitch	62.5*	9	Deg/180	± 22.5	0.05 ^{o}
164	Radio Height	50	18*	Feet	32768*	0.125
202	DME Distance	200*	16	N.M.	512	0.0008
203	Altitude (29.92)	62.5	17*	Feet	131,071	1.0*
206	Computed Airspeed	125	12*	Knots	1024	0.25*
207	Max.Allowable Airspeed	500*	12	Knots	1024	0.25
210	True Airspeed	500*	11	Knots	2048	1.0
215	Impact Pressure	125	12*	ins/Hg*	32*	0.008*
313	Track Angle True	50*	12	Deg/180	± 180 ^{o}	0.05 ^{o}
314	True Heading	50*	12	Deg/180	± 180 ^{o}	0.05 ^{o}
317	Track Angle-Magnetic	50*	12	Deg/180	± 180 ^{o}	0.05 ^{o}
320	Magnetic Heading	50*	12	Deg/180	± 180 ^{o}	0.05 ^{o}
321	Drift Angle	50*	11	Deg/180	+90 ^{o}	0.05 ^{o}
322	Flight Path Angle	50*	10	Deg/180	± 45 ^{o}	0.05 ^{o}
323	Flight Path Acceleration	20	12*	g	4*	0.001*
324	Pitch Angle	50*	13	Deg/180	+90 ^{o}	0.01 ^{o}
325	Roll Angle	50*	14	Deg/180	± 180 ^{o}	0.01 ^{o}
331	Body Long-accel.	6.25*	12	g	4	0.001
334	Free Heading	20*	12*	Deg/180	± 180 ^{o}	0.05 ^{o}
335	Track Angle Rate	*	*	*	*	*
336	Inertial Pitch Rate	20	12*	Deg/sec	128	0.03 ^{o} *
337	Inertial Roll Rate	20	12*	Deg/sec	128	0.03 ^{o} *
340	N_1 Actual *	200	12	RPM	4096	1
341	N_1 Command	200	12*	RPM*	4096*	1*
342	N_1 Limit	200	12*	RPM*	4096*	1*
343	N_1 Derate	200	12*	RPM*	4096*	1*
344	N_2	100	14	RPM*	16384*	1*

Table 2 BNR Data (cont'd)

Label (Octal)	Parameter Name	Max Transmit Interval	Sig. Bits (Not Inc. Sign)	Units	Range	Approx. Resol.
345	Exhaust Gas Temp.	200	11*	^{O}C *	2048	1*
346	N_1 Actual	200	12*	RPM*	4096*	1*
347	Fuel Flow	200	11*	Lbs/hr	32768	16*
362	Along Track Horiz. Accel.	50*	12	g	4	0.001
365	Integrated Vertical Accel.	50*	15*	Knots	4096*	0.125*
366	N-S Velocity	200*	15	Knots	4096	0.125
367	E-W Velocity	200*	15	Knots	4096	0.125

Note: Labels 110, 112, 130, 131, 132, 133, 241, 245, 247, 346, 360, 372, 373, 374 and 376 previously had no values assigned. Values for label 216 have been deleted.

*This data has been changed.

Attachment 6: General Word Formats and Encoding Examples

AIM word format examples have been added. Detailed descriptions of these words have been included in the text of Section 2.3.1.3.

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SUPPLEMENT 3

TO

ARINC SPECIFICATION 429

MARK 33 DIGITAL INFORMATION TRANSFER SYSTEM (DITS)

Published: November 1, 1979

Prepared by the Airlines Electronic Engineering Committee

Adopted by the Airlines Electronic Engineering Committee: August 31, 1979

A. PURPOSE OF THIS SUPPLEMENT

This Supplement introduces material on the transfer of file data and the related protocol. The file transfer capability is being added primarily for the Flight management Computer (FMC) program/data load and update and FMC intersystem crosstalk. A number of labels and corresponding data standards have been added.

B. ORGANIZATION OF THIS SUPPLEMENT

The first part of this document, printed on goldenrod paper, contains descriptions of the changes introduced into the Specification by this Supplement; and, where appropriate, extracts from the original text for comparison purposes. The second part consists of replacement white pages for the Specification, modified to reflect these changes. The modified and added material on each replacement page is identified with "c-3" symbols in the margins. Existing copies of Specification 429 may be updated by simply inserting the replacement white pages where necessary and destroying the pages they replace. The goldenrod pages should be inserted inside the rear cover of the Specification.

Copies of the Specification bearing the number 429-3 already contain this Supplement and thus do not require revisions by the reader.

C. CHANGES TO SPECIFICATION 429 INTRODUCED BY THIS SUPPLEMENT

This section presents a complete tabulation of the changes and additions to the Specification introduced by this Supplement. Each change or addition is entitled by the section number and title currently employed in the Specification or by the section number and title that will be employed when the Supplement is eventually incorporated. In each case there is included a brief description of the addition or change and, for other than very minor revisions, any text originally contained in the Specification is reproduced for reference.

2.1.5.1 BCD NUMERIC, DISCRETE AND AIM DATA WORDS

Table amended to provide consistency between AIM and file transfer data words.

ORIGINAL TEXT FOLLOWS:

Bit No.		Designation	
31	30	BCD Numeric Data	AIM Data
0	0	Plus, North East Right, To	Final Word
0	1	No Computed Data	Intermed. Word
1	0	Functional Test	Control Word
1	1	Minus, South West, Left, From	Initial Word

2.1.6 DATA STANDARDS

Text added to clarify data encoding.

ORIGINAL TEXT FOLLOWS:

2.1.6 Data Standards

The units, ranges, resolutions, refresh rates, number of significant bits, pad bits etc. for the items of information to be transferred by the Mark 33 DITS are tabulated in Attachment 2 to this document.

COMMENTARY

Note that Section 2.3.1.1 of this document calls for numeric data to be encoded in BCD and binary, the latter using two's complement fractional notation. In this notation, the most significant bit of the data filed represents one half of the maximum value chosen for the parameter being defined. Successive bits represents the increments of a binary fraction series. Negative number are encoded as the complements of positive values and the negative sign is annunciated in the sign/status matrix.

In establishing a given parameter's binary data standards for inclusion in Attachment 2, the units, maximum value and resolution of the parameter are first determined in that order. The least significant bit of the word is then given a value equal to the resolution increment, and the number of significant bits is chosen such that the maximum value of the fractional binary series just exceeds the maximum value of the parameter, i.e., equals the next whole binary number greater than the maximum parameter value less one least significant bit value. For example, if the Mark 33 DITS is required to transfer altitude in units of feet over a range of zero to 100,000 feet with a resolution of one foot, the number of significant bits is 17 and the maximum value of the fractional binary series is 131,071 (i.e., 131,071 – 1). Note that because accuracy is a quality of the measurement process and not the data transfer process, it plays no part in the selection of word characteristics. Obviously, the resolution provided in the DITS word should equal or exceed the accuracy in order not to degrade it.

For the binary representation of angular data, the Mark 33 DITS employs "degrees divided by 180^{o}" as the unit of data transfer and $\pm$ 1 (semicircle) as the range for two's complement fractional notation encoding ignoring, for the moment, the subtraction of the least significant bit value. Thus the angular range 0 through 359.XXX degrees is encoded as 0 through $\pm$ 179.XXX degrees, the value of the most significant bit is none half semicircle and there are no discontinuities in the code.

For convenience, all binary word ranges in Attachment 2 are shown as whole binary numbers rather than such numbers less one least significant bit value. Also the resolutions shown are approximate only. Accurate resolutions can be determined, if required, by reference to the range values and numbers of significant bits for the words of interest.

2.1.6 Data Standards (cont'd)

COMMENTARY (cont'd)

It should be noted that in all applications of the two's complement fractional notation, the maximum value of the word, once chosen, cannot be changed by the use of more bits in the data field. The number of bits in the word affects only the resolution of the data, not its range.

Binary coded decimal (BCD) data is encoded per the numeric subset of the ISO Alphabet No. 5 code (see Attachment 5 to this document) using bit nos. 1 through 4 of the seven-bit-per-character code. Alpha/numeric data is encoded using all seven bits per character of the ISO Alphabet #5 code and is transmitted using the special word format described in Section 2.3.1.3 of this document.

2.3.1.5 FILE DATA TRANSFER

Section added to provide description of file data transfer protocol.

3.1.4.3 HF COMMUNICATIONS

Text amended to describe switching functions and finer frequency selection increments.

ORIGINAL TEXT FOLLOWS:

3.1.4.3 HF Communications

Frequency Range:	2.8MHz to 24MHz
Frequency Selection Increments	1kHz
Characters encoded in DITS word:	10MHz, 1MHz, 0.1MHz, 0.01MHz, 0.001MHz
Switching Functions:	USB/AM mode selection

Fig. 3-1 RADIO SYSTEMS MANAGEMENT WORD FORMATS

Error corrected in bits 24 and 25 of ILS word.

HF COMM frequency word format changed and second word added to enable the use of 100 Hz channel spacing.

ORIGINAL TEXT FOLLOWS:

HF COM Function	PARITY (Odd)	SIGN/STATUS MATRIX	10MHz (2)	1MHz (3)	0.1MHz (5)	0.01MHz (7)	0.001MHz (9)	USB/AM MODE	RESERVED (SDI)	LABEL HF COM Frequency
Bit No.	32	31 30	29 28 27	26 25 24 23	22 21 20 19	18 17 16 15	14 13 12 11	10	9	8 7 6 5 4 3 2 1
Example	0	0 0	0 1 0	0 0 1 1	0 1 0 1	0 1 1 1	1 0 0 1	0	0	1 1 1 1 1 0 0 0
Notes								[1]	[2]	

[1] When bit no. 10 is "zero" the equipment should operate in the AM mode. When bit no. 10 is "one" the equipment should operate in the SSB (USB) mode.

[2] Only bit no. 9 is available for the SDI function in this word.

ATTACHMENT 1: LABEL CODES

The following labels have been given new assignments:

053, 056, 060, 061, 062, 063, 065, 066, 067, 070, 071, 075, 076, 077, 120, 126, 134, 137, 143, 175, 176, 177, 200, 217, 226, 251, 252-256, 257, 260, 261, 277, 300-307, 361.

ATTACHMENT 2: DATA STANDARDS

Tables 1 and 2 have both additions and modifications made to the data standards. Notes 2 thru 5 deleted. The original information provided in ARINC 429-2 is included in these tables. An asterisk beside a value designated that a change has been recommended. The formats of table 1 and 2 have also been changed to provide the addition of data standard descriptors.

Table 3.7 added for GPWS discretes.

ATTACHMENT 2: DATA STANDARDS (cont'd)

TABLE 1 BCD DATA

LABEL (OCTAL)			PARAMETER NAME	MAX. TRANSMIT INTERVAL msec	RANGE (SCALE	SIG. FIG.	PAD FIG.	UNITS	RESOL
0	1	0	Present Position-Lat.	200*	90S-90N	5	0	Deg/Min*	0.1
0	1	1	Present Position-Long.	200*	180E-180W	6	0	Deg/Min*	0.1
0	1	2	Ground Speed	200*	0-2000	4	1	Knots	1.0
0	1	3	Track Angle (true)	200*	0-359.9	4	1	Deg	0.1
0	1	4	Magnetic Heading	200*	0-359	3	2	Deg	1.0
0	1	5	Wind Speed	200*	0-299	3	2	Knots	1.0
0	1	6	Wind Direction (true)	200*	0-359	3	2	Deg	1.0
0	4	1	Set Latitude	200*	90S-90N	5	0	Deg/Min	0.1
0	4	2	Set Longitude	200*	180E-180W	6	0	Deg/Min	0.1
0	4	3	Set Magnetic Heading	200*	0-359.9*	4*	1*	Deg	0.1*
1	2	5	Greenwich Mean Time	200	0-23.59.9	5	0	Hr/Min*	0.1
# 2	3	0	True Airspeed	62.5*	100-599	3	0	Knots	1.0

TABLE 2 BNR DATA

LABEL (OCTAL)			PARAMETER NAME	MAX. TRANSMIT INTERVAL msec	SIG. BITS (NOT INC. SIGN)	UNITS	RANGE See Note 1	APPROX RESOL
1	0	0	Selected Course #1	50	9*	Deg/180	$\pm 180^{o}$	0.35*
1	0	1	Selected Heading	62.5	9*	Deg/180	$\pm 180^{o}$	0.35*
1	0	5	Selected Runway Heading	62.5	9*	Deg/180	$\pm 180^{o}$	0.35*
1	1	0	Selected Course #2	50	9*	Deg/180	$\pm 180^{o}$	0.35*
1	1	6	Cross Track Distance	62.5	8*	N.M.	128	0.5*
1	2	1	Horiz. Steering Signal	100	10*	Deg/180	$\pm 60^{o}$	0.06*
1	2	2	Vertical Steering Signal	100	9*	Deg/180	$\pm 30^{o}$	0.06*
1	2	3	Throttle Command	*	*	*	*	*
1	3	0	Tt2*	200	11	^{o}C	128	0.06
1	3	1	Pt2*	200	13	PSIA	32	0.004
1	3	2	Pt7*	200	13	PSIA	32	0.004
1	4	0	Flight Director-Roll	100	9*	Deg/180	$\pm 45^{o}$*	0.1*
1	4	1	Flight Director-Pitch	100	9*	Deg/180	$\pm 22.5^{o}$	0.05
1	4	2	Fast/Slow	62.5	8*	Knots	32	0.125*
1	4	3	Flight Director-Yaw*	100*	12*	Deg/180*	$\pm 180^{o}$	0.05*
1	6	4	Radio Height	50	17*	Feet	16384*	0.125
2	0	3	Altitude (1013.25mb)	62.5	18*	Feet	131,072	0.05*
2	1	0	True Airspeed	62.5*	11*	Knots	2048	1.0*
2	1	1	Total Air Temp.	500	10*	^{o}C	512	0.5*
2	1	3	Static Air Temp.	500	10*	^{o}C	512	0.5*
2	2	1	Indicated Angle of Attack	62.5	11*	Deg/90*	$\pm 90^{o}$*	0.05
2	4	1	Corrected Angle of Attack	62.5	11*	Deg/90*	$\pm 90^{o}$*	0.05
2	4	7	Total Fuel	200*	15*	Lb.	655,360	20*
3	1	0	Present Position-Lat.	200	18*	Deg/180	0-90N-0-90S	0.00035*
3	1	1	Present Position-Long.	200	18*	Deg/180	0-180E-0-180W	0.00070*
3	1	2	Ground speed	100*	15	Knots	4096	0.125
3	1	3	Track Angle True	40*	12	Deg/180	$\pm 180^{o}$	0.05
3	1	4	True Heading	40*	12	Deg/180	$\pm 180^{o}$	0.05
3	1	7	Track Angle-Mag	40*	12	Deg/180	$\pm 180^{o}$	0.05
3	2	0	Magnetic Heading	40*	12	Deg/180	$\pm 180^{o}$	0.05
3	2	1	Drift Angle	40*	11*	Deg/180	$\pm 90^{o}$*	0.05
3	2	2	Flight Path Angle	40*	10*	Deg/180	$\pm 45^{o}$*	0.05
3	2	4	Pitch Angle	20*	13*	Deg/180	$\pm 90^{o}$*	0.01
3	2	5	Roll Angle	20*	14	Deg/180	$\pm 180^{o}$	0.01
3	6	0	Potential Vertical Speed	50	10*	Ft/min*	16384*	16*

The change to MTI was erroneously omitted from Draft 1 of Supplement 3, but was included prior to publication of Supplement 3.

ATTACHMENT 2: DATA STANDARDS (cont'd)

NOTES

1. The number entered in the Range Column for each parameter that is not angular in nature is the nearest whole binary number greater than the parameter range required. As explained in the Commentary following Section 2.1.6 of this document, the weight of the most significant bit of the two's complement fractional notation binary word will be one half this value, and the actual maximum value of the parameter capable of being encoded will be the number in the range column less one least significant bit value. The numbers entered in the RANGE column for angular parameters are the actual degree ranges required. The way in which these parameters are encoded is also explained in the Commentary following Section 2.1.6.

2. Bit nos. 9 and 10 of the word may be used to achieve a 20 bit capability for high resolution of the Lat./Long. Position (codes 310 and 311). The resulting resolution is .000086° for latitude and .00017° for longitude.

3. A change in ARINC 707 not shown in Supplement 2 is a planned change for Supplement 3. A self-test inhibit bit will be added and the range of the data word will be halved to a value of 8192 ft.

4. A change in ARINC 710 not shown in Supplement 2 is a planned change for Supplement 3. The resolution of Selected Runway Heading (BCD and BNR) will be changed to .1°.

5. A change being considered for Supplement 3 is to change the range to –6g - +4g to facilitate direct recording by the flight recorder.

ATTACHMENT 6: GENERAL WORD FORMATS & ENCODING EXAMPLES

SSM codes in AIM words changed to reflect table amendment of section 2.1.5.1.

Radio Height code example changed to reflect shift in field.

Note 4 of Table 6.2 deleted to revert data coding to the original two's complement notation.

Word formats added for date/flight leg and flight number information.

Word format added for VOR Omnibearing.

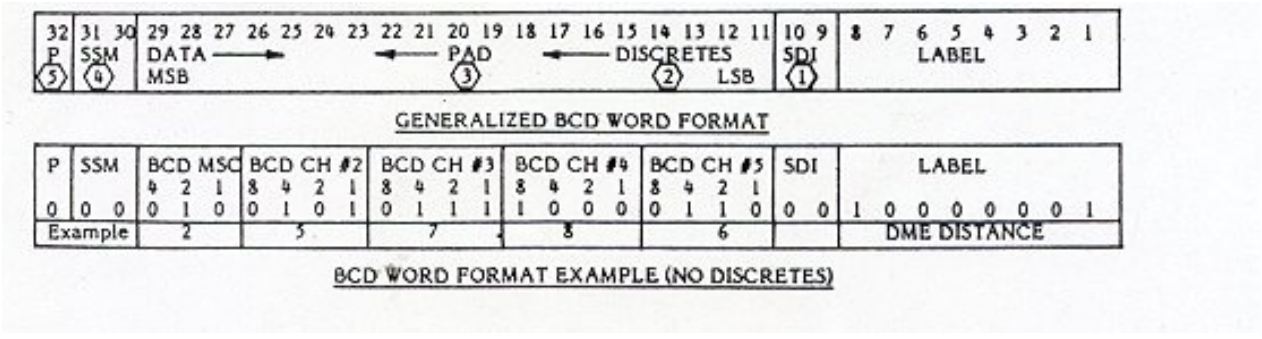
Codes 203, 204, 206 and 207 deleted in Table 6.1a.

ORIGINAL TEXT FOLLOWS:

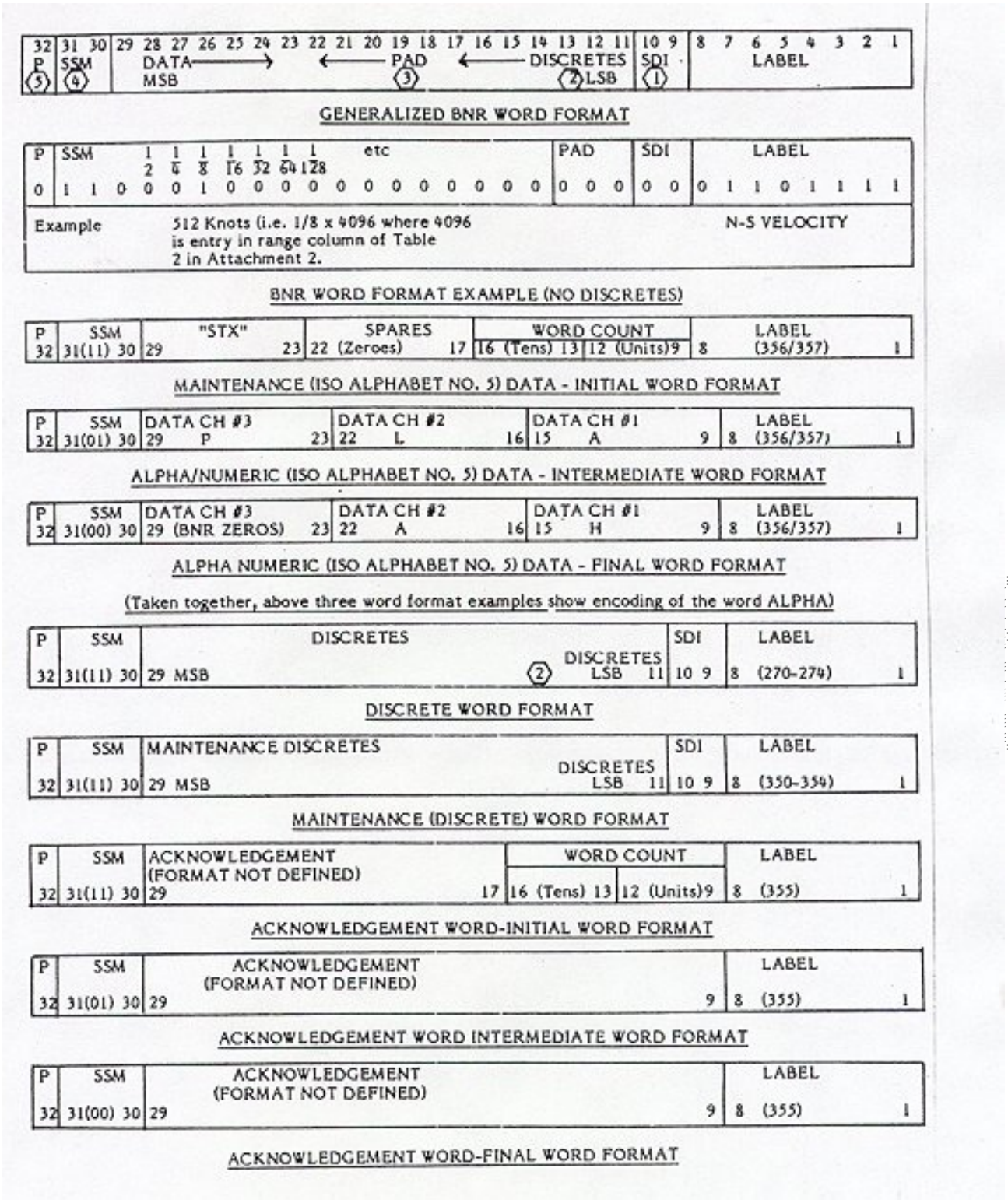
ATTACHMENT 6

GENERAL WORD FORMATS AND ENCODING EXAMPLES

1. GENERAL WORD FORMATS



ATTACHMENT 6: GENERAL WORD FORMATS & ENCODING EXAMPLES (cont'd)



32	31 30	29 28 27 26 25 24 23 22 21 20 19 18 17 16 15 14 13 12 11	10 9	8 7 6 5 4 3 2 1
P (5)	SSM (4)	DATA → MSB ← PAD (3) ← DISCRETES (2) LSB	SDI (1)	LABEL

GENERALIZED BNR WORD FORMAT

P	SSM	1	2	4	8	16	32	64	128	etc	PAD	SDI	LABEL
0	1 1 0	0	0	1	0	0	0	0	0	0 0 0 0 0 0 0 0	0 0 0	0 0	0 1 1 0 1 1 1 1

Example	512 Knots (i.e. 1/8 x 4096 where 4096 is entry in range column of Table 2 in Attachment 2.	N-S VELOCITY

BNR WORD FORMAT EXAMPLE (NO DISCRETES)

P	SSM	"STX"	SPARES	WORD COUNT		LABEL
32	31(11) 30	29 23	22 (Zeroes) 17	16 (Tens) 13	12 (Units) 9	8 (356/357) 1

MAINTENANCE (ISO ALPHABET NO. 5) DATA - INITIAL WORD FORMAT

P	SSM	DATA CH #3	DATA CH #2	DATA CH #1	LABEL
32	31(01) 30	29 P 23	22 L 16	15 A 9	8 (356/357) 1

ALPHA/NUMERIC (ISO ALPHABET NO. 5) DATA - INTERMEDIATE WORD FORMAT

P	SSM	DATA CH #3	DATA CH #2	DATA CH #1	LABEL
32	31(00) 30	29 (BNR ZEROS) 23	22 A 16	15 H 9	8 (356/357) 1

ALPHA NUMERIC (ISO ALPHABET NO. 5) DATA - FINAL WORD FORMAT

(Taken together, above three word format examples show encoding of the word ALPHA)

P	SSM	DISCRETES	SDI	LABEL
32	31(11) 30	29 MSB (2) DISCRETES LSB 11	10 9	8 (270-274) 1

DISCRETE WORD FORMAT

P	SSM	MAINTENANCE DISCRETES	SDI	LABEL
32	31(11) 30	29 MSB DISCRETES LSB 11	10 9	8 (350-354) 1

MAINTENANCE (DISCRETE) WORD FORMAT

P	SSM	ACKNOWLEDGEMENT (FORMAT NOT DEFINED)	WORD COUNT		LABEL
32	31(11) 30	29 17	16 (Tens) 13	12 (Units) 9	8 (355) 1

ACKNOWLEDGEMENT WORD-INITIAL WORD FORMAT

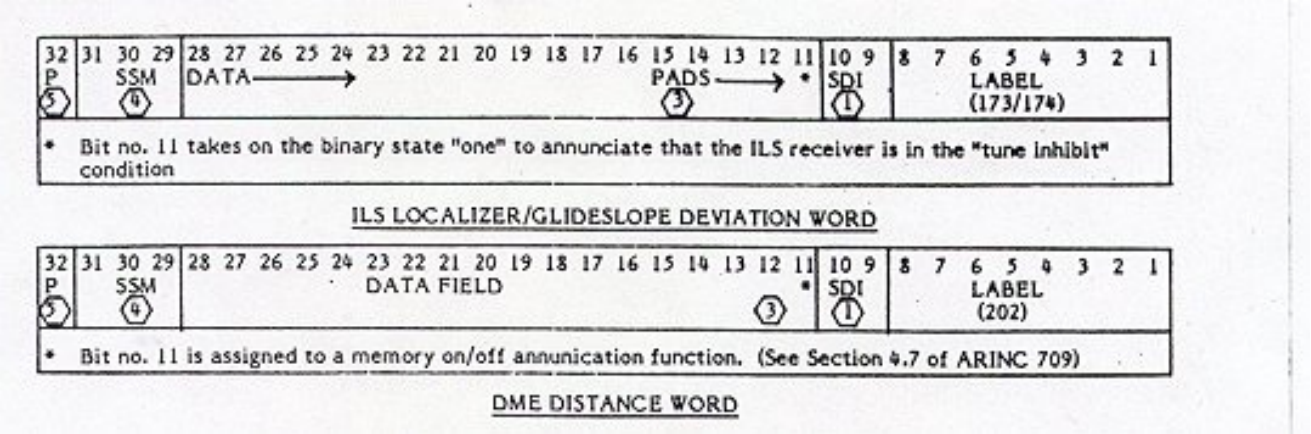
P	SSM	ACKNOWLEDGEMENT (FORMAT NOT DEFINED)	LABEL
32	31(01) 30	29 9	8 (355) 1

ACKNOWLEDGEMENT WORD INTERMEDIATE WORD FORMAT

P	SSM	ACKNOWLEDGEMENT (FORMAT NOT DEFINED)	LABEL
32	31(00) 30	29 9	8 (355) 1

ACKNOWLEDGEMENT WORD-FINAL WORD FORMAT

ATTACHMENT 6: GENERAL WORD FORMATS & ENCODING EXAMPLES (cont'd)



DME DISTANCE WORD

Attachment 6 (cont'd)
GENERAL WORD FORMATS AND ENCODING EXAMPLES

NOTES

[1] Source/Destination Identifier (SDI) Field

The purpose of the SDI field is explained in Section 2.1.4 of this document, as are also the limitations on its use. When the SDI function is not required, this field may be occupied by binary zero or valid data pad bits.

[2] Discretes

As discussed in Section 2.3.1.2 of this document, unused bits in a word may be assigned to discrete functions, one bit per variable. Bit #11 of the word should be the first to be so assigned; followed by bit #12 and so on in ascending numerical order until the data field is reached. In the absence of discretes, unused bit positions should be occupied by binary zero or valid data pad bits.

[3] Pad

All bit positions not used for data or discretes should be filled with binary zero or valid pad bits. Section 2.1.2 of this document refers.

[4] Sign/Status Matrix (SSM)

Section 2.1.5 of this document describes the functions of the sign/status matrix and the ways in which the bits constituting it are encoded.

[5] Parity Bit

This bit is encoded to render word parity odd. Section 2.3.4 of this document refers.

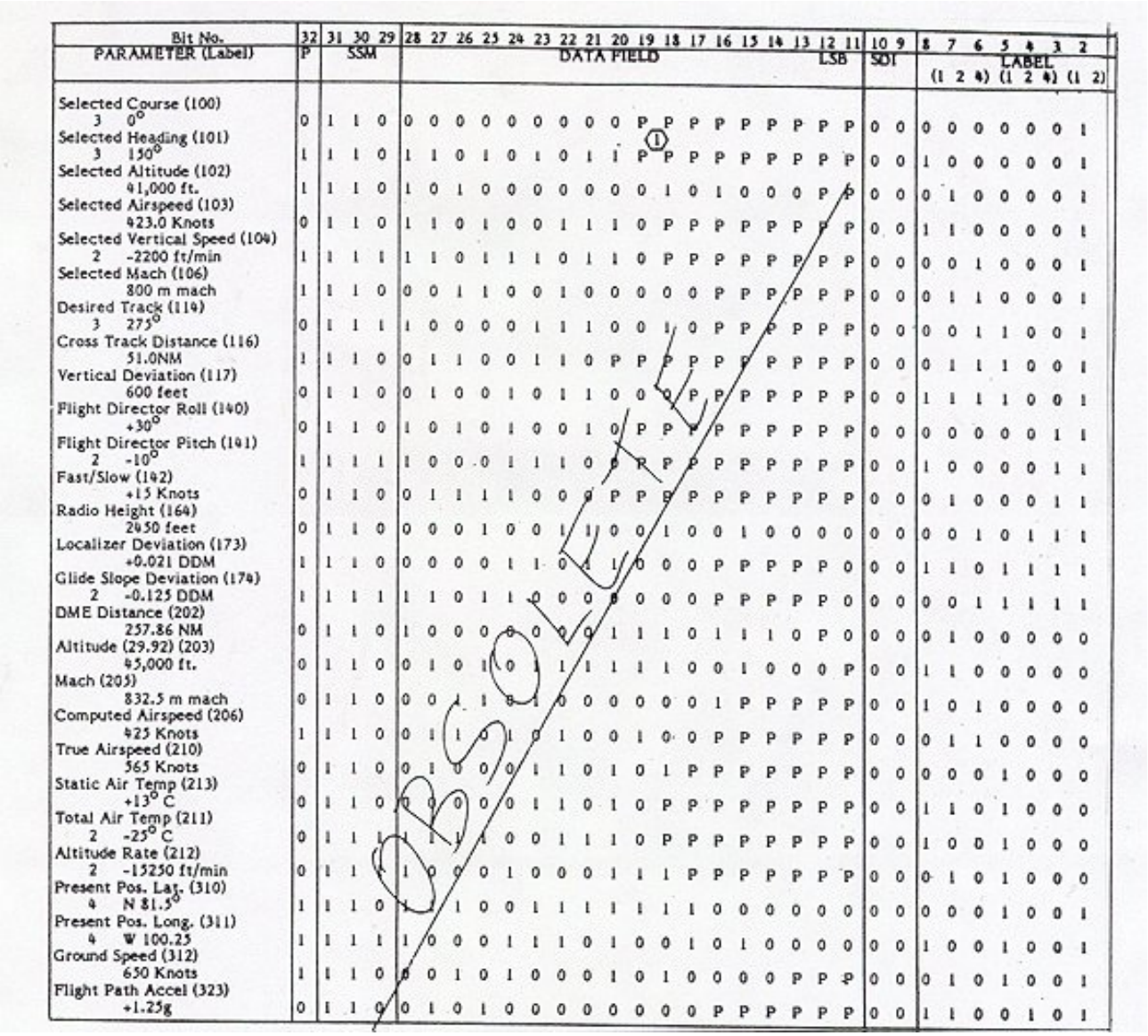
Bit No.	32	31 30	29 28 27 26 25 24 23 22 21 20 19 18 17 16 15 14 13 12 11	10 9	8 7 6 5 4 3 2 1
PARAMETER (Label)		SSM	DATA FIELD MSC (4 2 1) (8 4 2 1) (8 4 2 1) (8 4 2 1) (8 4 2 1) LSC	SDI	LABEL (1 2 4) (1 2 4) (1 2 4)
Distance To Go (001) +2750.4 NM	1	0 0	0 1 0 0 1 1 1 0 1 0 1 0 0 0 0 0 1 0 0	0 0	1 0 0 0 0 0 0 0
Time To Go (002) 145.3 min	0	0 0	0 0 1 0 1 0 0 0 1 0 1 0 0 1 1 P P P P	0 0	0 1 0 0 0 0 0 0
Cross Track Distance (003) 225.6 NM	1	0 0	0 1 0 0 0 1 0 0 1 0 1 0 1 1 0 P P P P	0 0	1 1 0 0 0 0 0 0
Ground Speed (012) 650 Knots	1	0 0	0 0 0 0 1 1 0 0 1 0 1 0 0 0 0 P P P P	0 0	0 1 0 1 0 0 0 0
Track Angle (True) (013) 165.5 deg	1	0 0	0 0 1 0 1 1 0 0 1 0 1 0 1 0 1 P P P P	0 0	1 1 0 1 0 0 0 0
Selected Vertical Speed (020) -2200 ft/min	0	1 1	0 1 0 0 0 1 0 0 0 0 0 0 0 0 0 P P P P	0 0	0 0 0 0 1 0 0 0
Selected EPR (021) 2.05	0	0 0	0 1 0 0 0 0 0 0 1 0 1 P P P P P P P P	0 0	1 0 0 0 1 0 0 0
Selected N_1 (021) 2750 RPM	1	0 0	0 1 0 0 1 1 1 0 1 0 1 0 0 0 0 P P P P	0 0	1 0 0 0 1 0 0 0
Selected Mach (022) 0.850 Mach	0	0 0	0 0 0 1 0 0 0 0 1 0 1 0 0 0 0 P P P P	0 0	0 1 0 0 1 0 0 0
Selected Heading (023) 177 deg	1	0 0	0 0 1 0 1 1 1 0 1 1 1 P P P P P P P P	0 0	1 1 0 0 1 0 0 0
Selected Course (024) 254 deg	1	0 0	0 1 0 0 1 0 1 0 1 0 0 P P P P P P P P	0 0	0 0 1 0 1 0 0 0
Selected Altitude (025) 41,000 ft.	0	0 0	1 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0	0 0	1 0 1 0 1 0 0 0
Selected Airspeed (026) 423 Knots	0	0 0	1 0 0 0 0 1 0 0 0 1 1 P P P P P P P P	0 0	0 1 1 0 1 0 0 0
Greenwich Mean Time (125) 1545.5 hr	1	0 0	0 0 1 0 1 0 1 0 1 0 0 0 1 0 1 0 1 0 1	0 0	1 0 1 0 1 0 1 0
Radio Height (165) 2450.5 ft	0	0 0	0 1 0 0 1 0 0 0 1 0 1 0 0 0 0 0 1 0 1	0 0	1 0 1 0 1 1 1 0
Decision Ht. Selected (170) 200 ft.	0	0 0	0 1 0 0 0 0 0 0 0 0 0 P P P P P P P P	0 0	0 0 0 1 1 1 1 0
DME Distance (201) 257.86 NM	0	0 0	0 1 0 0 1 0 1 0 1 1 1 1 0 0 0 0 1 1 0	0 0	1 0 0 0 0 0 0 1
Altitude (29.92) (203) 39500 ft.	1	0 0	0 1 1 1 0 0 1 0 1 0 1 0 0 0 0 0 0 0 0	0 0	1 1 0 0 0 0 0 1
Altitude (Baro) (204) 41350 ft	0	0 0	0 1 0 0 0 0 1 0 0 1 1 0 1 0 1 0 0 0 0	0 0	0 0 1 0 0 0 0 1
Computed Airspeed (206) 425 Knots	1	0 0	1 0 0 0 0 1 0 0 1 0 1 P P P P P P P P	0 0	0 1 1 0 0 0 0 1
Max Allowable Airspeed (207) 450 Knots	1	0 0	1 0 0 0 1 0 1 0 0 0 0 P P P P P P P P	0 0	1 1 1 0 0 0 0 1
True Airspeed (230) 565 Knots	0	0 0	1 0 1 0 1 1 0 0 1 0 1 P P P P P P P P	0 0	0 0 0 1 1 0 0 1
Total Air Temp (231) -025°C 2	0	1 1	0 0 0 0 0 1 0 0 1 0 1 P P P P P P P P	0 0	1 0 0 1 1 0 0 1
Altitude Rate (232) -15250 ft/min	1	1 1	0 0 1 0 1 0 1 0 0 1 0 0 1 0 1 0 0 0 0	0 0	0 1 0 1 1 0 0 1
Static Air Temp. (233) +013°C 2	1	0 0	0 0 0 0 0 0 1 0 0 1 1 P P P P P P P P	0 0	1 1 0 1 1 0 0 1
Baroset (ins Hg) (235) 29.92 ins Hg	0	0 0	0 1 0 1 0 0 1 1 0 0 1 0 0 1 0 P P P P	0 0	1 0 1 1 1 0 0 1

TABLE 6-1a

BCD DATA ENCODING EXAMPLES

NOTES: [1] "P" denotes pad "zero" or valid data. Section 2.1.2 if this document refers. Note possible use of pad bits for discrete functions per Section 2.3.1.2.

[2] Because the actual maximum value of the most significant character of each of these quantities exceeds 7, it cannot be encoded in the most significant character position of the BCD word. For this reason each quantity has been given and "artificial" MSC of zero and its actual MSC encoded in the next most significant character position of the word.



Bit No. / PARAMETER (Label)	32 P	31 30 29 SSM	28 27 26 25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 DATA FIELD LSB	10 9 SDI	8 7 6 5 4 3 2 LABEL (1 2 4) (1 2 4) (1 2)
Selected Course (100) 3 0°	0	1 1 0	0 0 0 0 0 0 0 0 0 P P P P P P P P P	0 0	0 0 0 0 0 0 0 1
Selected Heading (101) 3 150°	1	1 1 0	1 1 0 1 0 1 0 1 1 P P P P P P P P P	0 0	1 0 0 0 0 0 0 1
Selected Altitude (102) 41,000 ft.	1	1 1 0	1 0 1 0 0 0 0 0 0 0 1 0 1 0 0 0 P P	0 0	0 1 0 0 0 0 0 1
Selected Airspeed (103) 423.0 Knots	0	1 1 0	1 1 0 1 0 0 1 1 1 0 P P P P P P P P	0 0	1 1 0 0 0 0 0 1
Selected Vertical Speed (104) 2 -2200 ft/min	1	1 1 1	1 1 0 1 1 1 0 1 1 0 P P P P P P P P	0 0	0 0 1 0 0 0 0 1
Selected Mach (106) 800 m mach	1	1 1 0	0 0 1 1 0 0 1 0 0 0 0 0 P P P P P P	0 0	0 1 1 0 0 0 0 1
Desired Track (114) 3 275°	0	1 1 1	1 0 0 0 0 1 1 1 0 0 1 0 P P P P P P	0 0	0 0 1 1 0 0 0 1
Cross Track Distance (116) 51.0NM	1	1 1 0	0 1 1 0 0 1 1 0 P P P P P P P P P P	0 0	0 1 1 1 0 0 0 1
Vertical Deviation (117) 600 feet	0	1 1 0	0 1 0 0 1 0 1 1 0 0 0 P P P P P P P	0 0	1 1 1 1 0 0 0 1
Flight Director Roll (140) +30°	0	1 1 0	1 0 1 0 1 0 0 1 0 P P P P P P P P P	0 0	0 0 0 0 0 0 1 1
Flight Director Pitch (141) 2 -10°	1	1 1 1	1 0 0 0 1 1 1 0 0 P P P P P P P P P	0 0	1 0 0 0 0 0 1 1
Fast/Slow (142) +15 Knots	0	1 1 0	0 1 1 1 1 0 0 0 P P P P P P P P P	0 0	0 1 0 0 0 0 1 1
Radio Height (164) 2950 feet	0	1 1 0	0 0 0 1 0 0 1 1 0 0 1 0 0 1 0 0 0 0	0 0	0 0 1 0 1 1 1
Localizer Deviation (173) +0.021 DDM	1	1 1 0	0 0 0 0 1 1 0 1 1 0 0 0 P P P P P 0	0 0	1 1 0 1 1 1 1
Glide Slope Deviation (174) 2 -0.125 DDM	1	1 1 1	1 1 0 1 1 0 0 0 0 0 0 0 P P P P P 0	0 0	0 0 1 1 1 1 1
DME Distance (202) 257.86 NM	0	1 1 0	1 0 0 0 0 0 0 0 1 1 1 0 1 1 1 0 P 0	0 0	0 1 0 0 0 0 0 0
Altitude (29.92) (203) 45,000 ft.	0	1 1 0	0 1 0 1 0 1 1 1 1 1 1 0 0 1 0 0 0 P	0 0	1 1 0 0 0 0 0 0
Mach (205) 832.5 m mach	0	1 1 0	0 0 1 1 0 1 0 0 0 0 0 0 1 P P P P P	0 0	1 0 1 0 0 0 0 0
Computed Airspeed (206) 425 Knots	1	1 1 0	0 1 1 0 1 0 1 0 0 1 0 0 P P P P P P	0 0	0 1 1 0 0 0 0 0
True Airspeed (210) 565 Knots	0	1 1 0	0 1 0 0 0 1 1 0 1 0 1 P P P P P P P	0 0	0 0 0 1 0 0 0 0
Static Air Temp (213) +13° C	0	1 1 0	0 0 0 0 0 1 1 0 1 0 P P P P P P P P	0 0	1 1 0 1 0 0 0 0
Total Air Temp (211) 2 -25° C	0	1 1 1	1 1 1 1 0 0 1 1 1 0 P P P P P P P P	0 0	1 0 0 1 0 0 0 0
Altitude Rate (212) 2 -15250 ft/min	0	1 1 1	1 0 0 0 1 0 0 0 1 1 1 P P P P P P P	0 0	0 1 0 1 0 0 0 0
Present Pos. Lat. (310) 4 N 81.5°	1	1 1 0	1 1 1 0 0 1 1 1 1 1 1 1 0 0 0 0 0 0	0 0	0 0 0 1 0 0 1
Present Pos. Long. (311) 4 W 100.25	1	1 1 1	1 0 0 0 1 1 1 0 1 0 0 1 0 1 0 0 0 0	0 0	1 0 0 1 0 0 1
Ground Speed (312) 650 Knots	1	1 1 0	0 0 1 0 1 0 0 0 1 0 1 0 0 0 0 P P P	0 0	0 1 0 1 0 0 1
Flight Path Accel (323) +1.25g	0	1 1 0	0 1 0 1 0 0 0 0 0 0 0 0 P P P P P P	0 0	1 1 0 0 1 0 1

TABLE 6-2

BNR DATA ENCODING EXAMPLES

NOTES: [1] "P" denotes pad "zero" or valid data. Section 2.1.2 of this document refers. Note possible use of pad bits for discrete functions per Section 2.3.1.2.

[2] Negative values are encoded as the two's complements of positive values and the negative sign is annunciated in the sign/status matrix.

[3] Angles in the range 0 to 180° are encoded as positive numbers. Angles in the range 180° to 360° are subtracted from 360° and the resulting number encoded as a negative value per note 2. Arc minutes and seconds are encoded as decimal degrees.

[4] Latitude values are encoded as positive angles in the range 0 to 90° with the sign/status matrix indicating North or South. Longitude values are encoded as positive angles in the range 0 to 180° with the sign/status matrix indicating East or West. Arc minutes and seconds are encoded as decimal degrees.

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SUPPLEMENT 4

TO

ARINC SPECIFICATION 429

MARK 33 DIGITAL INFORMATION TRANSFER SYSTEM (DITS)

Published: August 1, 1980

Prepared by the Airlines Electronic Engineering Committee

Adopted by the Airlines Electronic Engineering Committee: June 17, 1980

A. PURPOSE OF THIS SUPPLEMENT

This Supplement introduces material on defining "No Computed Data" and "Failure Warning", priority assignment of SSM codes, description of fault tolerance and isolation, address capability of A/N messages, command/response protocol, modification of data standards, addition of new labels, change of some word formats, addition of material on signal characteristics, change of receiver impedance limits, expansion of the current label, change of the receiver voltage thresholds and modification of the HF and DME word formats.

B. ORGANIZATION OF THIS SUPPLEMENT

The first part of this document, printed on goldenrod paper, contains description of the changes introduced into the Specification by this Supplement, and, where appropriate, extracts from the original text for comparison purposes. The second part consists of replacement white pages for the Specification, modified to reflect these changes. The modified and added material on each replacement page is identified with "c-4" symbols in the margins. Existing copies of Specification 429 may be updated by simply inserting the replacement white pages where necessary and destroying the pages they replace. The goldenrod pages should be inserted inside the rear cover of the Specification.

Copies of the Specification bearing the number 429-4 already contain this Supplement and thus do not require revisions by the reader.

C. CHANGES TO SPECIFICATION 429 INTRODUCED BY THIS SUPPLEMENT

This section presents a complete tabulation of the changes and additions to the Specification introduced by this Supplement. Each change or addition is entitled by the section number and title currently employed in the Specification, or the section number and title that will be employed when the Supplement is eventually incorporated. In each case there is included a brief description of the addition or change and, for other than very minor revisions, any text originally contained in the Specification is reproduced for reference.

2.1.3 INFORMATION IDENTIFIER

Text changed to describe use of five-character label.

Commentary text partially deleted.

ORIGINAL TEXT FOLLOWS:

2.1.3 Information Identifier

The first eight bits of each word are assigned to a label function. Label will:

a. identify the information contained within BNR and BCD numeric data words (e.g., DME distance, static air temperature, etc.) and

b. identify the word application for Discrete, Maintenance and AIM data.

Label code assignments are set forth in Attachment 1 to this document.

Special Note:

In some ARINC 429 DITS applications, a bus will be dedicated to delivering a single information element from a source to one or more identical sink devices. In such circumstances, the sink device designer might be tempted to assume that decoding the word label is not necessary. Experience has shown, however, that system developments frequently occur that result in the need for additional information elements to appear on the bus. If a sink device designed for service prior to such a development cannot decode the original word label, it cannot differentiate between this word and the new data in the new situation. The message for sink designers should therefore be quite clear – provide label decoding from the outset, no matter how strong the temptation to omit it might be.

COMMENTARY

Attachment 1 defines 256 discrete label codes. This quantity is expected to meet label assignment needs for the foreseeable future. Should additional labeling capability be required in the longer term, it is envisaged that, rather than extend the length of the label field, a scheme will be devised in which existing label assignments are duplicated. For example, the system could readily accommodate the assignment of the same label to two dissimilar parameters for which the probability of transmission on the same bus is very low.

Adherence to the label code assignments of Attachment 1 is essential in inter-system communications and in intra-system communications where the system elements are defined as "unit interchangeable" per ARINC Report No. 403. The assignment of label codes for all such communications must be coordinated with the air transport industry if chaos is to be avoided. A manufacturer who finds that Attachment 1 does not specify the label he needs for such system application must not simply choose one from those unassigned and "drive on". He should contact ARINC for assistance.

2.1.5.1 BCD NUMERIC, DISCRETE, AIM DATA AND FILE TRANSFER WORDS

Text describing "no computed data" modified.

Commentary providing definitions added.

ORIGINAL TEXT FOLLOWS:

2.1.5.1 BCD Numeric, Discrete, AIM Data and File Transfer Words

The sign (Plus, minus, North, South, etc.) of BCD numeric data, the word type (first, intermediate, control, last) for AIM data, and the status of the transmitter hardware should be encoded in bit nos. 30 and 31 of the word as shown in the table below. The sign/status matrices of Discrete words should be encoded per the rules set forth for BCD numeric data.

Bit No.		Designation		
31	30	BCD Numeric Word	AIM	File Transfer
0	0	Plus, North East, Right To, Above	Intermediate Word	Intermediate Word, Plus, North, etc.
0	1	No Computed Data	Initial Word	Initial Word
1	0	Functional Test	Final Word	Final Word
1	1	Minus, South West, Left, From, Below	ControlWord	Intermediate Word, Minus South, etc.

Notes:

1. A source system should annunciate any detected failure that causes one or more of the words normally output by that system to be unreliable by ceasing to supply the affected word or words to the data bus.

2. Bit nos. 30 and 31 of BCD numeric data words should be "zero" when no sign is needed.

3. The "no computed data" code should be generated for BCD numeric data words when computed data is not available for reasons other than equipment failure.

4. When it appears in a BCD numeric data word identified by its (label) as a system output, the "functional test" code should be interpreted as advice that the data in the word results from the execution of a functional test. When it appears in a BCD numeric data word identified by its label as an instruction, e.g., a radio channel change command, this code should be interpreted as a command to perform a functional test. A self-test should produce indications of 1/8 of positive full-scale values unless indicated otherwise in an ARINC Equipment Characteristic.

5. See Section 2.3.1.3 of this document for definitions of the terms "Initial Word", "Control Word", "Intermediate Word" and "Final Word."

2.1.5.2 BNR NUMERIC DATA WORDS

Table modified to permit sign coding for "no computed data".

Definition of "failure warning" and "no computed data" added.

ORIGINAL TEXT FOLLOWS:

2.1.5.2 BNR Numeric Data Words

The sign (plus, minus, north, south, etc.) of BNR numeric data words and the status of the transmitter hardware should be encoded in bit nos. 29, 30 and 31 of the word as shown in the table below.

Bit No.			Designation
31	30	29	BNR Data
0	0	0	Failure Warning/Plus, North, East Right, To
0	0	1	Failure Warning/Minus, South, West Left, From
0	1	0	No Computed Data
1	0	0	Functional Test/Plus, North, East, Right, To
1	0	1	Functional Test/Minus, South, West Left, From
1	1	0	Normal Operation/Plus, North, East, Right, To
1	1	1	Normal Operation/Minus, South West, Left, From
0	1	1	Not Used (Growth)

Notes:

1. A source system should annunciate any detected failure that causes one or more of the words normally output by that system to be unreliable by setting bit nos. 30 and 31 in the affected word(s) to the "failure warning" code defined above. Words containing this code should continue to be supplied to the data bus during the failure condition.

2. Bit no. 29 should be "zero" when no sign is needed.

3. The "no computed data" code should be generated when computed data is not available for reasons other than equipment failure.

4. When it appears in a word identified by its label as a system output, the "functional test" code should be interpreted as advice that the data in the word results from the execution of a functional test. A self-test should produce indications of 1/8 of positive full-scale values unless indicated otherwise in an ARINC Equipment Characteristic.

5. If, during the execution of a functional test, a source system detects a failure which causes one or more of the words normally output by that system to be unreliable, it should immediately change the states of bits nos. 30 and 31 in the annunciation to the "failure warning" annunciation.

2.1.5.3 STATUS PRIORITIES

New section inserted.

2.2.1 TRANSMISSION SYSTEM INTERCONNECT

Commentary expanded to provide description of possible solutions to single-wire fault conditions.

ORIGINAL TEXT FOLLOWS:

2.2.1 Transmission System Interconnect

A data source should be connected to the data sink(s) by means of a single twisted and shielded pair of wires. The shields should be grounded at both ends and at all production breaks in the cable. The interwiring diagram to be found in each ARINC Equipment Characteristic shows connector pins assigned to carry shields into black boxes for grounding. Equipment manufacturers should ensure, however, that their equipment will operate correctly if, instead of being terminated on these pins, shields are grounded in the aircraft close to the rack connector.

COMMENTARY

In practical wire line digital information transmission systems, cable characteristics and electrical mismatches can produce distortion of the digital data pulses. Also, noise due to electrical interference perturbs digital signals.

The performance of a digital receiver depends upon the receiver input signal characteristics (data with distortion and noise) and the receiver design.

Prior to the selection of the voltage and impedance parameters set forth in this Section of this document, the pulse distortion likely to be encountered in systems built around them in existing size commercial aircraft was evaluated and judged to be acceptable for a well-designed receiver. No restriction is placed by this specification, therefore, on the number or length of sturbs for installations on aircraft no larger than those existing, e.g., B 747. See Appendix 1 to this document for a report of this investigation.

2.2.3.1 TRANSMITTER VOLTAGE LEVELS

Text changed to improve clarity.

ORIGINAL TEXT FOLLOWS:

2.2.3.1 Transmitter Voltage Levels

The differential output signal across the specified output terminals (balanced to ground at the transmitter) should be + 10 ± 1.0 volts, 0 ± 0.5 volts and –10 ± 1.0 volts respectively for the "HI", "NULL" and "LO" states when the transmitter is open circuit. The output impedance of the transmitter should be as specified in Section 2.2.4.1 of this document. This output impedance should be present for the "HI", "NULL" and "LO" transmitter output conditions and also during transitions between these levels.

2.2.3.2 RECEIVER VOLTAGE LEVELS

Receiver voltage thresholds changed.

Fault voltage text deleted.

Commentary revised to include description of receiver reaction to undefined voltages.

ORIGINAL TEXT FOLLOWS:

2.2.3.2 Receiver Voltage Levels

The differential voltage presented at the receiver input terminals will be dependent upon line length, stub configuration and the number of receivers connected. In the absence of noise, the normal ranges of voltages presented to the receiver terminals (A and B) would be:

"HI"	+6V to 10V
"NULL"	+0.5 to –0.5V
"LO"	-6V to –10V

In practice, these nominal voltages will be perturbed by noise and pulse distortion. Thus, receivers should associate the following voltage ranges with the three states indicated:

"HI"	+5V to 13V
"NULL"	+2.5V to –2.5V
"LO"	-5V to –13V

Receivers should not be damaged by the application of up to 20VAC (RMS) across terminals A and B by the application of up to +28Vdc (min) bias between terminal A and ground and –28Vdc (min) bias between terminal B and ground. See Attachment 3 to this document for a pictorial representation of transmitter and receiver voltage levels.

COMMENTARY

Receiver input common mode voltages (terminal A to ground and terminal B to ground) are not specified because of the difficulties of defining ground with any satisfactory degree of precision. Receiver manufacturers are encouraged to work with the differential input voltage (line A to line B) and not line-to-ground voltages.

The opinion is held by some people that conditions on transmission lines will be encountered which will require receivers to operate with less than the above-defined minimum difference of 2.5V between the NULL and HI and NULL and LO states. Receiver designers are encouraged to investigate the possibilities and problems of working with a minimum difference of 1 volt between these states and to report their findings.

2.2.4.1 TRANSMITTER OUTPUT IMPEDANCE

Text added to improve clarity.

ORIGINAL TEXT FOLLOWS:

2.2.4.1 Transmitter Output Impedance

The transmitter output impedance should be 75 ± 5 ohms, divided equally between line A and line B to provide an impedance balanced output.

COMMENTARY

The output impedance of the transmitter is specified as 75 ± 5 ohms to provide an approximate match to the characteristic impedance of the cable. The match can only be approximate due to the wide range of characteristic impedance which may be encountered due to the variety of conductor wire gages and insulation properties. Measurements on a few samples of wire showed a spread of characteristic impedance of 63 and 71 ohms. An extrapolation over the wire gages 20 to 26 for wrapped and extruded insulation indicate an expected characteristic impedance spread of 80 to 60 ohms approx. Twisted shielded wire specifications do not control the characteristic impedance of the cable, thus future developments in insulation techniques may result in cables having characteristic impedances outside the range estimated.

2.2.4.2 RECEIVER INPUT IMPEDANCE

Value of RI changed.

ORIGINAL TEXT FOLLOWS:

2.2.4.2 Receiver Input Impedance

The receiver should exhibit the following characteristics, measured at the receiver input terminals:

Differential Input Resistance RI = 6,000 ohms minimum

Differential Input Capacitance CI = 50pF maximum
Resistance to Ground R_H and $R_G \geq$ 12,000 ohms
Capacitance to Ground C_H and $C_G \leq$ 50pF.

No more than twenty receivers should be connected on to one digital data bus and each receiver should incorporate isolation provisions to ensure that the occurrence of any reasonably probable failure does not cause loss of data to the others.

See Attachment 4 to this document for a pictorial representation of the input and output circuits standards.

COMMENTARY

The above characteristics apply to differential amplifier receivers. Opto-isolator technology is progressing and may soon find application in digital data receivers. Opto-isolator receivers impose slightly greater loads on data buses than differential amplifier receivers and the way in which they are characterized is different. It is probable, however, that a future revision of this Specification will include material specifically related to their use.

2.2.5 Fault Tolerance

New section inserted.

2.2.5.1 Receiver External Fault voltage Tolerance

New section inserted.

2.2.5.2 Transmitter External Fault Voltage Tolerance

New section inserted.

2.2.5.3 Transmitter External Fault Load Tolerance

New section inserted.

2.2.6 Fault Isolation

New section inserted.

2.2.6.1 Receiver Fault Isolation

New section inserted.

2.2.6.2 Transmitter Fault Isolation

New section inserted.

2.3.1.2 Discretes

Text modified to expand label examples.

Reference to AIDS limitations deleted.

ORIGINAL TEXT FOLLOWS:

2.3.1.2 Discretes

In addition to handling numeric data as specified above, the Mark 33 DITS should also be capable of accommodating discrete items of information either in the unused (pad) bits of data words or, when necessary, in dedicated words. Any discrete information contained in a numeric data word assigned a label in Attachment 1 is specified in the definition for that word in Attachment 2.

The rule to be followed in the assignments of bits to discretes in numeric data words is to start with the least significant bit of the word and to continue towards the most significant bit available in the word. Attachment 6 shows that this against the background of the generalized word structure.

There are two types of discrete words. These are general purpose discrete words, and dedicated discrete words. Five labels (octal 270-274) are assigned to the general purpose words in Attachment 1. These words should be used in ascending label order (starting with octal 270) when the system receiving the data can identify its source by reference to the port at which it arrives. The dedicated words should be used when the

2.3.1.2 Discretes (cont'd)

data is intended for the AIDS DFDAU which cannot identify sources in this way.

COMMENTARY

The foregoing special provisions for the delivery of discrete data to an AIDS were made to compensate for the number of digital ports required when many ports are used is extremely difficult to achieve, which necessitated the development of the special AIDS words. These words should be limited to AIDS utilization. The few aircraft systems which deliver discretes to an AIDS by means of the Mark 33 DITS will be burdened very little by this. Similarly, the impact of label use will be small.

2.3.1.4 AIM DATA

Text added to describe unit addressing.

ORIGINAL TEXT FOLLOWS:

2.3.1.4 AIMS Data

AIM data (Acknowledgement, ISO Alphabet No. 5 and Maintenance information encoded in dedicated words) should be handled in the manner described in this Section.

All three of these applications may involve the transfer of more than 21 bits per "data package". Source equipment should format such long messages into groups of 32-bit DITS words, each word containing the relevant application label (see Attachment 1) in bit nos. 1 through 8, and a sign/status matrix code in bit nos. 30 and 31.

Bit no. 32 should be encoded to render word parity odd. The first word of each group should contain the sign/status matrix code defined for "initial word" in Section 2.1.5.1 of this document. It should also contain, in bit nos. 9 through 16, the binary representation of the number of words in the group, except that when this word is the only word to be transmitted, i.e., the total number of information bits to be transmitted is 13 or less, bit nos. 9 through 16 should all be binary "zeros".

When the word application label is assigned in Attachment 1 for Acknowledgement Data, bit nos. 17 through 29 of this initial word may be used for information transfer. When the word application label is either of those assigned in Attachment 1 for ISO Alphabet No. 5 data transfer or Maintenance Data (ISO Alphabet Not. 5), bit nos. 17 through 22 should be binary "zeros" (spares) and bit nos. 23 through 29 should take on the pattern of the ISO Alphabet No. 5 control character "STX".

The second word of the ISO Alphabet No. 5 and Maintenance Data (ISO Alphabet No. 5) application groups is an optional control word containing the sign/status matrix code for "control" information for the display. When it is used, bit nos. 9 through 13 should contain the binary representation of the line count, bit nos. 14 through 16 should encode the required color, bit nos. 17 and 18 the required intensity, bit nos. 19 and 20 the required character size and bit no. 21 should indicate whether or not the display is required to flash. See Attachment 6 to this document for the encoding standards. Bit nos. 22 through 29 of the word should be binary "zero" (spares).

Intermediate words, containing the sign/status matrix code for "intermediate word", follow the initial word of the group or the control word, when used. Intermediate words are optional in the sense that they are only transmitted if more words than the initial word and the final word (see below) are needed to accommodate the quantity of information to be transferred. When the word application group label that is assigned in Attachment 1 for Acknowledgement, Data bit nos. 9 through 29 of that word are available for information transfer. When the word application label is either of those assigned in Attachment 1 for ISO Alphabet No. 5 data transfer or Maintenance Data (ISO Alphabet No. 5), bit nos. 9 through 29 of each word should be divided into three seven-bit bytes (bit nos. 9 through 15, 16 through 22 and 23 through 29), each of which contains one ISO Alphabet No. 5 character.

Each AIM application group transmission other than single-word transmissions (see below) should be terminated with a word containing the sign/status matrix code for "final word" defined in Section 2.1.5.1 of this document. The data field of this word should be structured similarly to that of the intermediate word. Any unused bit positions in ISO Alphabet No. 5) final transfer or Maintenance Data (ISO Alphabet No. 5) final words resulting from the number of ISO Alphabet No. 5 characters in the message being one or two less than a number wholly divisible by three should be filled with binary "zeros".

2.3.1.5.1 COMMAND/RESPONSE PROTOCOL

Text modified to describe transmitter reaction to lack of "Clear to send".

ORIGINAL TEXT FOLLOWS:

2.3.1.5.1 Command/Response Protocol

File data will consist of both ARINC 429 BNR numeric words and ISO alphabet No. 5 characters. A file may contain from 1 to 127 records. Each record may contain from 1 to 126 data words.

A record will contain, at the minimum, one of the eight versions of the "initial word" described in Section 2.3.1.5.2. Records in which this initial word contains the "Data Follows" code will also contain from 1 to 126 "intermediate words" (data) and a "final word" (error control). The file data transfer protocol is as follows. A transmitter having the data to send to a receiver transmits, on the bus connecting it to that receiver, the "Request to Send" initial word. The receiver responds, on the separate bus provided for return data flow, with the "Clear to Send" reply. The transmitter then sends the "Data Follows" initial word, the "intermediate words" and the "final word". The receiver processes the error control information in the "final word" and, if no errors are revealed, closes out the transaction by

sending the "Data Received OK" word to the transmitter.

If the receiver is not ready to accept data when the transmitter sends its "Request to Send" word, it will so indicate in its response (see Section 2.3.1.5.2). The transmitter should then wait 200 milliseconds and retransmit the "Request to Send". The transmitter should also repeat a "Request to Send" transmission 50 milliseconds after the initial transmission if no response is obtained from the receiver. An alert should be raised in the system containing the transmitter if 4 attempts to obtain a "Clear to Send" response from a receiver are unsuccessful.

If the receiver detects a parity error during the transmission, it may request an error-correcting retransmission by sending a "Data Received Not OK" word to the transmitter in which is identified the record in which the error occurred. The transmitter will interrupt the data flow and back up to the start of the record so identified. It will then send a "Data Follows" initial word identifying this record as the starting point of the retransmission and recommence its output of data, continuing through the "final word". The receiver will then close out the transaction as before.

An error detected by processing the error control information in the "final word" will also result in the receiver sending a "Data Received Not OK" word to the transmitter. In the absence of identification of the record in which the error occurred, this word should contain the sequence number of the first record of the file. The transmitter's response will be to retransmit the whole file.

The receiver can signal loss of synchronization to the transmitter at any time by sending the "Synchronization Lost" initial word. On receiving this word the transmitter should curtail the data flow and back up to the beginning of the file. It should then re-establish that the receiver can accept data by going through the request-to-send/clear-to-send routine. Having done this it should send the "Data Follows" initial word, followed by the data and the "final word".

The protocol also allows a transmitter to send file size information to a receiver without any commitment to send, or request to the receiver to accept, the file itself. The "Header Information" initial word is used for this purpose. Additionally, a "Poll" initial word is defined for use in system in which continuous "handshaking" between two terminals is desired. The response to a "Poll" word will be either a "Request to Send" initial word when the polled terminal does have data to transmit, or another "Poll" word when it does not. An exchange of "Poll" words may be interpreted as the message, " I have nothing for you, do you have anything for me?"

2.4.2 INFORMATION RATES

Commentary added to describe refresh rate.

ORIGINAL TEXT FOLLOWS:

2.4.2 Information Rates

The minimum update interval for each item of information transferred by the Mark 33 DITS is specified in the tables of Attachment 2.

Discretes contained within data words will be transferred at the bit rate and repeated at the update rate of the primary data. Words dedicated to discretes should be repeated continuously at the rates defined in Attachment 2.

COMMENTARY

The time intervals between successive transmissions of a given BCD word specified in table 1 of Attachment 2 to this document are, in general, too short for the signal to be of use in driving a display device directly. If the signal was so used, the least significant character of the display would change too rapidly for human perception. Considerations other than human factors demand the time intervals specified. Thus, display designers should incorporate into their devices means for selecting those words to be used for updating the display from the greater quantity delivered.

3.1.4.2 DME

Encoding and switch functions modified.

ORIGINAL TEXT FOLLOWS:

3.1.4.2 DME

Frequency Range:	108.00MHz to 135.95MHz
Frequency Selection: Increment:	50kHz
Characters encoded In DITS word:	10MHz, 1MHz, 0.1MHz, 0.01MHz, (100MHz Character is always Decimal 1)
Switching Functions:	Standby, DME Mode Select ILS Mode

FIGURE 3-1 Radio Systems Management Word Formats

HF and DME words modified.

ORIGINAL TEXT FOLLOWS:

DME Function	PARITY (odd)	SIGN/STATUS MATRIX	10MHz (1)	1MHz (1)	0.1MHz (5)	0.01MHz (0)	ILS Mode	Standby	DME Mode Select	RESERVED (SDI)	LABEL DME Frequency
Bit No.	32	31 30	29 28 27	26 25 24 23	22 21 20 19	18 17 16 15	14	13	12 11	10 9	8 7 6 5 4 3 2 1
Example	1	0 0	0 0 1	0 0 0 1	0 1 0 1	0 0 0 0	0	0	0 0	0 0	1 0 1 1 1 0 0 0
Notes							[1]	[2]	[3]		

[1] Bit no. 14 should be set to “zero” for VOR frequencies and “one” for ILS frequencies by the tuning information source.

[2] [3]

Bit	Zero	One
11	DME Mode select coding per	
12	Section 4.1.6 of ARINC Char. 709	
13	Standby off	Standby on

HF COM Word #1 Function	PARITY (odd)	SIGN/STATUS MATRIX	10MHz (2)	1MHz (3)	0.1MHz (5)	0.01MHz (7)	0.001MHz (9)	USB/LSB Mode	SSB/AM Mode Word Identifier	LABEL HF COM Frequency
Bit No.	32	31 30	29 28	27 26 25 24	23 22 21 20	09 18 17 16	15 14 13 12	11	10 9	8 7 6 5 4 3 2 1
Example	0	0 0	1 1	0 0 1 1	0 1 0	0 1 1 1	1 0 0 1	0	0 0	1 1 1 1 1 0 0 0
Notes								[1]	[2] [3]	

[1] Bit no. 11 should be set to “zero” for LSB operation and “one” for USB operation.

[2] Bit no. 10 should be set to “zero” for AM operation and “one” for SSB operation.

[3] Bit no. 9 should be set to “zero” when the 100 Hz option is not used and “one” when it is.

HF COM Word #2 Function	PARITY (odd)	SIGN/STATUS MATRIX	.1Khz (5)	NOT USED		LABEL HF COM Frequency
Bit No.	32	31 30	29 28 27 26	25 24 23 22 21 20 19 18 17 16 15 14 13 12 11	10 9	8 7 6 5 4 3 2 1
Example	0	0 0	0 1 0 1	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0	1 1 1 1 1 0 0 0
Note: The HF COMM #2 word is used only when bit no. 9 of word #1 is “one”.						

ATTACHMENT 1: LABEL CODES

Column "EQPT. ID (HEX)" has been added for five-character label implementation.

Table containing "Equipment ID Codes" added.

The following labels have been given new assignments:

004, 034, 056, 060-064, 070-106, 111, 114-122, 126, 127, 135, 136, 140-141, 144-162, 173-177, 202-212, 215, 217, 222-226, 242, 244-252, 256-265, 276, 310-322, 340-342, 344, 345, 347, 350, 370, 377.

Label 226 (FWC #2) deleted.

Labels 124 and 224 (C&W DFDR Discretes) deleted.

ATTACHMENT 2: DATA STANDARDS

The columns for "bandwidth", "noise level" and "update interval" have been deleted. A column for "minimum transmit interval" has been added. The column for "transport delay" has been changed to "maximum transport delay". A column for "EQPT.ID (HEX)" has been added.

Data standards added for new labels.

Note [2]: A nominal interval description has been added.

Note [3]: A definition for "maximum transport delay" has been added.

Note [4]: SDI assignments defined for labels 060-064.

The following tables list the parameters for which the data standards have changed. An asterisk beside a particular value designates that a new value is suggested.

TABLE 1 BCD DATA

LABEL (OCTAL)	PARAMETER NAMES	UNITS	RANGE (SCALE)	SIG. DIG.	POSITIVE SENSE	RESOL.	MAXIMUM TRANSMIT INTERVAL
010	Present Position – Lat.	Deg:Min	90S-90N*	5*		0.1	500
017	Selected Runway Heading	Deg	0-359.9	4		0.1	200*
024	Selected Course #1	Deg	0-359	3		1.0	200*
027	Selected Course #2	Deg	0-359	3			200*
033	ILS Frequency						200*
034	VOR/ILS Frequency						200*
041	Set Latitude	Deg:Min	90S-90N*	5*	N	0.1	500
065	Gross Weight	100lb.	0-10000*	5		1.0	200
067	Lateral CG	Mlb-in.*	± 100.00*	4*		0.1*	200
200	Drift Angle	Deg	± 90*	3*		0.1	200
231	Total Air Temperature	°C	-60-+90*	2*		1.0	500
232	Altitude Rate	Ft/Min	± 20,000	4	Up	20.0*	62.5
233	Static Air Temperature	°C	-99-+60*	2*		1.0	500

TABLE 2 BNR DATA

LABEL (OCTAL)	PARAMETER NAME	UNITS	RANGE	SIG. BITS	POSITIVE SENSE	APPROX. RESOL.	MAXIMUM TRNASMIT INTERVAL
077	Lateral CG	MLB/in	± 128*	14*		0.001	200
100	Selected Course #1	Deg/180	± 180°	12		0.05°	50*
105	Selected Runway Heading	Deg/180	± 180°	11		0.05°	62.5*
110	Selected course #2	Deg/180	± 180°	12		0.05°	50*
173	Localizer Deviation	DDM	± 0.4	12		0.0001	62.5*
174	Glideslope Deviation	DDM	± 0.8	12		0.0002	62.5*
222	VOR Omnibearing	Deg/180	± 180°	12		0.044°	62.5*
256	Fuel Quantity #1	Lbs.	131,072	15		4	200*
257	Fuel Quantity #2	Lbs.	131,072	15		4	200*
310	Present Position – Lat.	Deg/180	0-90N-0-90S*	20		.000086°*	200

ATTACHMENT 2: DATA STANDARDS (cont'd)

ORIGINAL TEX FOLLOWS:

[2] Transmit intervals and the number of parameters to be transmitted are prime factors in bus loading. It was suggested that a Minimum Transmit Interval be specified (perhaps a value of ½ the Transmit Interval) to control bus loading. The ability of receivers to reject unwanted words would also be effective in improving bus efficiency.

Table 3.2 FCC DISCRETES – LABELS 270, 271

Existing tables replaced by new set of tables.

ORIGINAL TEXT FOLLOWS:

Table 3.2: FCC Discretes – Labels 270, 271

Discrete Word #1

Bit No.	Function	Bit Status	
		1	0
1	Label	X	
2			X
3		X	
4		X	
5		X	
6			X
7			X
8			X
9*	Capt. Flight Director	On	Off
10*	F. O. Flight Director	On	Off
11	Turbulence Mode	Requested	Not Requested
12	Autopilot #1	Engaged	Not Engaged
13	Autopilot #2	Engaged	Not Engaged
14	RESERVED (A/P #3)	Engaged	Not engaged
15	Autothrottle #1	Armed	Not Armed
16	RESERVED (A/T #2)	Armed	Not Armed
17	Airspeed Hold Mode	Requested	Not Requested
18	Airspeed Select Mode	Requested	Not Requested
19	Mach Select Mode	Requested	Not Requested
20	Mach Hold Mode	Requested	Not Requested
21	Bank Angle Limit	See Below	
22			
23			
24	Heading Select Mode	Requested	Not Requested
25	N1/EPR Select Mode	Requested	Not Requested
26	IAS on Throttle	Requested	Not Requested
27	Mach on Throttle	Requested	Not Requested
28	Spare		
29	Spare		
30	Sign/Status		
31	Matrix		
32	Parity (Odd)		

ATTACHMENT 2: DATA STANDARDS (cont'd)

Bank Angle Limit Encoding

Bit nos. 21, 22 and 23 of Discrete Word #1 should be encoded to indicate selected bank angle limit as follows:

*Bits 9 and 10, which are normally used for the SDI, have purposely been used for Discrete information.

Limit	Bit No.		
	21	22	23
Not used	0	0	0
5°	0	0	1
10°	0	1	0
15°	0	1	1
20°	1	0	0
25°	1	0	1
30°	1	1	0
Spare	1	1	1

Discrete Word #2

Bit No.	Function	Bit Status	
		1	0
1		X	
2			X
3		X	
4	Label	X	
5		X	
6			X
7			X
8		X	
9*	Altitude Hold Mode	Requested	Not Requested
10*	Altitude Select Mode	Requested	Not Requested
11	Vertical Speed Select Mode	Requested	Not Requested
12	Vertical Speed Hold Mode	Requested	Not Requested
13	Horizontal Navigation	Requested	Not Requested
14	Vertical Navigation	Requested	Not Requested
15	Land Command	Requested	Not Requested
16	LOC Approach Command	Requested	Not Requested
17	Back Course Approach Command	Requested	Not Requested
18	CWS #1	Requested	Not Requested
19	CWS #2	Requested	Not Requested
20	CWS #3	Requested	Not Requested
21	Pitch Upper Mode Cancel	Requested	Not Requested
22	Roll Upper Mode Cancel	Requested	Not Requested
23	Heading Hold	Requested	Not Requested
24			
25			
26	Spare		
27			
28			
29			
30	Sign/Status		
31	Matrix		
32	Parity (odd)		

* Bits 9 and 10, which are normally used for the SDI, have purposely been used for Discrete information.

TABLE 3.7 GPWS DISCRETE LABEL 270 23

Visual message bit assignments inserted.

TABLE 3.8 TCC DISCRETES LABELS 272 03, 273 03, 274 03, 275 03

New tables inserted.

ATTACHMENT 3: VOLTAGE LEVELS

Hi and Lo thresholds changed from 5-13 volts to 6.5-13 volts.

ATTACHMENT 4: INPUT/OUTPUT CIRCUIT STANDARDS

R_I increased from 6,000 to 12,000 ohms.

Total system resistance range of 300-6000 ohms changed to 400-8000 ohms.

ATTACHMENT 6: GENERAL WORD FORMATS AND ENCODING EXAMPLES

Format for alphanumeric message initial word modified.

Slat/Flap angle word added.

GMT binary word added.

Label Fields changed in discrete word and maintenance (discrete) word.

In table 6-1b note [1] deleted and bits 21 and 22 of latitude word interchanged.

In Table 6-2 examples corrected for Present Position (Latitude and Longitude).

Radio Height word added.

ORIGINAL TEXT FOLLOW:

P	SSM	"STX"	SPARES	WORD COUNT	LABEL
32	31 (01) 30	29 23	22 (Zeros) 17	16 BNR EQUIV. 9	8 (356/357) 1

ALPHA NUMERIC (ISO ALPHABET NO. 5) DATA – INITIAL WORD FORMAT

P	SSM		SDI	LABEL
32	31 (00) 30	29 MSB DISCRETES 2 LSB 11	10 9	8 (270-274) 1

DISCRETE WORD FORMAT

P	SSM	MAINTENANCE DISCRETES	SDI	LABEL
32	31 (00) 30	29 MSB DISCRETES LSB 11	10 9	8 (350-354) 1

MAINTENANCE (DISCRETE) WORD FORMAT

APPENDIX 3: DIGITAL SYSTEMS GUIDANCE (PART 1)

Appendix added.

APPENDIX 4: DIGITAL SYSTEM GUIDANCE (PART 2)

Appendix added.

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SUPPLEMENT 5

TO

ARINC SPECIFICATION 429

MARK 33 DIGITAL INFORMATION TRANSFER SYSTEM (DITS)

Published: April 4 1981

Prepared by the Airlines Electronic Engineering Committee

Adopted by the Airlines Electronic Engineering Committee: March 12, 1981

A. PURPOSE OF THIS SUPPLEMENT

This Supplement introduces material on fault detection, transmit intervals for words using multiple SDI codes, modification of IRS/AHRS discrete formats, expansion of error control definition, revision of ILS word, addition of new labels and change of existing data standards.

B. ORGANIZATION OF THIS SUPPLEMENT

The first part of this document, printed on goldenrod paper, contains descriptions of the changes introduced into the Specification by this Supplement, and, where appropriate, extracts from the original text for comparison purposes. The second part consists of replacement white pages for the Specification, modified to reflect these changes. The modified and added material on each replacement page is identified with "c-5" symbols in the margins. Existing copies of Specification 429 may be updated by simply inserting the replacement white pages where necessary and destroying the pages they replace. The goldenrod pages should be inserted inside the rear cover of the Specification.

Copies of the Specification bearing the number 429-5 already contain this Supplement and thus do not require revisions by the reader.

C. CHANGES TO SPECIFICATION 429 INTRODUCED BY THIS SUPPLEMENT

This section presents a complete tabulation of the changes and additions to the Specification introduced by this Supplement. Each change or addition is entitled by the section number and title currently employed in the Specification, or by the section number and title that will be employed when the Supplement is eventually incorporated. In each case there is included a brief description of the addition or change and, for other than very minor revisions, any text originally contained in the Specification is reproduced for reference.

2.2.1 TRANSMISSION SYSTEM INTERCONNECT

Text revised for break connections.

Text added to Commentary describing increase of voltage threshold.

ORIGINAL TEXT FOLLOWS:

2.2.1 Transmission System Interconnect

A data source should be connected to the data sink(s) by means of a single twisted and shielded pair of wires. The shields should be grounded at both ends and at all production breaks in the cable to an aircraft ground close to the rack connector.

COMMENTARY

In practical wire line digital information transmission systems, cable characteristics and electrical mismatches can produce distortion of the digital data pulses. Also, noise due to electrical interference perturbs digital signals. The performance of a digital receiver depends upon the receiver input signal characteristics (data with distortion and noise) and the receiver design.

Prior to the selection of the voltage and impedance parameters set forth in this Section of this document, the pulse distortion likely to be encountered in systems built around them in existing size commercial aircraft was evaluated and judged to be acceptable for a well-designed receiver. No restriction is placed by this specification, therefore, on the number or length of stubs for installations on aircraft no larger than those existing, e.g., B 747. See Appendix 1 to this document for a report of this investigation.

Tests have shown that some receivers continue decoding data properly when one side of the transmission line is open or shorted to ground. When this condition exists noise immunity decreases and intermittent operation may occur. Users desire protection against non-annunciated system operation in this mode. This protection may consist of additional circuitry to detect and annunciate the fault.

2.2.3.2 RECEIVER VOLTAGE LEVELS

Normal voltage ranges changed due to impedance changes.

ORIGINAL TEXT FOLLOWS:

2.2.3.2 Receiver Voltage Levels

The differential voltage presented at the receiver input terminals will be dependent upon line length, stub configuration and the number of receivers connected. In the absence of noise, the normal ranges of voltages presented to the receiver terminals (A and B) would be:

"HI"	+6.5V to 10V
"NULL"	+2.5V to –2.5V
"LO"	-6.5V to –13V

In practice, these nominal voltages will be perturbed by noise and pulse distortion. Thus, receivers should associate the following voltage ranges with the three states indicated:

"HI"	+6.5V to 13V
"NULL"	+2.5V to –2.5V
"LO"	-6.5V to –13V

COMMENTARY

Receiver reaction is currently undefined in Specification 429 for voltages that fall in the range just above and below the "NULL" range. Respective equipment Characteristics should be referenced for desired receiver response in this range. However, it is desirable that all DITS receivers will discontinue operation when the voltage levels fall into the undefined regions. Manufacturers are urged, as new equipment is developed, to "design in" the rejection capability.

The opinion is held by some people that conditions on transmission lines will be encountered which will require receivers to operate with less than the

above-defined minimum difference of 4.0V between the NULL and HI and NULL and LO states. Receiver designers are encouraged to investigate the possibilities and problems of working with a minimum difference of 1 volt between these states and to report their findings.

Receiver input common mode voltages (terminal A to ground and terminal B to ground) are not specified because of the difficulties of defining ground with any satisfactory degree of precision. Receiver manufacturers are encouraged to work with the differential input voltage (line A to line B) and not line-to-ground voltages.

2.3.1.5.4 FINAL WORDS

Text added to define checksum.

ORIGINAL TEXT FOLLOWS:

2.3.1.5.4 Final Words

The final word of each record contains error control information. Bit nos. 1 through 8 contain the file label. Bit nos. 9 through 29 contain an error control checksum computed from the states of bit nos. 9 through 31 of each intermediate word of the record. Bit nos. 30 and 31 of this word contain the code identifying it as a final word. Bit no. 32 is encoded to render word parity odd.

2.3.4 ERROR DETECTION/CORRECTION

Obsolete text deleted.

ORIGIANL TEXT FOLLOWS:

2.3.4 Error Detection/Correction

The last bit of each word should be encoded such that word parity is rendered odd to allow error detection in receivers. Note that the parity calculation encompasses all 31 label and information bits of the word. The Mark 33 DITS contains no provisions for message retransmission, the inclusion of redundant bits in words or other means of error correction.

Fig. 3-1: RADIO SYSTEMS MANAGEMENT WORD FORMATS

Bits 3 and 7 of transponder word changed to “0”. (editorial)

Bit 11 and 12 assigned to ILS category designation.

Control Panel Function Matrix added to transponder word.

ORIGINAL MATERIAL ON NEXT PAGE:

2.4.2 INFORMATION RATES

Text added to describe transmission of labels with multiple SDI codes.

ORIGINAL TEXT FOLLOWS:

2.4.2 Information Rates

The minimum and maximum transmit intervals for each item of information transferred by the Mark 33 DITS are specified in the tables of Attachment 2.

COMMENTARY

There are no values given for refresh rates in this Specification. However, it is desirable that data be refreshed at least once per transmission. Those data actually requiring long processing times or a large number of samples are the only types not expected to be refreshed with every transmission.

Discretes contained within data words should be transferred at the bit rate and repeated at the update rate of the primary data. Words dedicated to discretes should be repeated continuously at the rates defined in Attachment 2.

COMMENTARY

The time intervals between successive transmissions of a given BCD word specified in table 1 of Attachment 2 to this document are, in general, too short for the signal to be of use in driving a display device directly. If the signal was so used, the least significant character of the display would change too rapidly for human perception. Considerations other than human factors demand the time intervals specified. Thus, display designers should incorporate into their devices means for selecting those words to be used for updating the display from the greater quantity delivered.

Fig. 3-1: RADIO SYSTEMS MANAGEMENT WORD FORMATS (cont'd)

ILS Function	PARITY (odd)	SIGN/STATUS MATRIX	10MHz (0)	1MHz (9)	0.1MHz (3)	0.01MHz (0)	SPARE	SPARE	SPARE	SPARE	RESERVED (SDI)	LABEL ILS Frequency
Bit No.	32	31 30	29 28 27	26 25 24 23	22 21 20 19	18 17 16 15	14	13	12	11	10 9	8 7 6 5 4 3 2 1
Example	1	0 0	0 0 0	1 0 0 1	0 0 1 1	0 0 0 0	0	0	0	0	0 0	1 1 0 1 1 0 0 0

ATTACHMENT 1: LABEL CODES

The following labels have been given new assignments:

073 02, 073 A2, 112 02, 130 1A, 131 2D, 132 1A, 133 1A, 151 02, 154 02, 164 02, 164 03, 174 03, 205 1A, 207 0A, 211 1A, 215 1A, 242 1A, 245 0A, 256 0A, 260 31, 262 0A, 263 0A, 264 0A, 265 0A, 270 1A, 270 1E, 270 30, 271 06, 271 1A, 271 1E, 272 1A, 274 0A, 275 2B, 300 1A, 301 1A, 303 1A, 304 1A, 305 1A, 306 1A, 307 1A, 325 1A, 340 1A, 340 2D, 341 1A, 342 1A, 344 1A, 345 1A, 346 1A, 350 1A, 351 1A, 352 1A, 353 1A, 354 1A.

Label 242** was deleted.

Label 316 04 changed form "Wind Angle" to "Wind Direction (True)".

ATTACHMENT 1: EQUIPMENT CODES

New assignments were made for 0A and 2D.

Note added to 1A.

ATTACHEMENT 2: DATA STANDARDS

Data standards were added for new labels.

The following table lists the parameters for which the existing data standards have changed. An asterisk beside a particular value designates that a new value is suggested.

LABEL	EQPT ID (HEX)	PARAMETER NAME	UNITS	RANGE	SIG. DIG/ BITS	POS. SENSE	RESOL	MIN. TR. INT.	MAX. TR. INT.
004	01	Runway Distance to Go	Feet	0-79900	3		100.0	200*	400*
165	07	Radio Height	Feet	± 0-7999.9	5		0.1	100*	200*
205	06	Mach	mMach*	4096*	13*		0.5*	62.5	125
210	06	True Airspeed	Knots	2048*	13*		0.25*	62.5	125
215	06	Impact Pressure	mb	512*	9*		1.0*	62.5	125
242	06	Total Pressure	mb	2045*	11*		1.0*	62.5	125
313	04	Track Angle True	Deg/180	± 180°	12*		0.05°	25	50
314	04	True Heading	Deg/180	± 180°	12*		0.05°	25	50
317	04	Track Angle Magnetic	Deg/180	± 180°	12*		0.05°	25	50
317	05	Track Angle Magnetic	Deg/180	± 180°	12*		0.05°	25	50
320	04	Magnetic Heading	Deg/180	± 180°	12*		0.05°	25	50
320	05	Magnetic Heading	Deg/180	± 180°	12*		0.05°	25	50
323	04	Flight Path Acceleration	g	2*	14*		0.0001*	10	20
323	05	Flight Path Acceleration	g	2*	14*		0.0001*	10	20
324	04	Pitch Angle	Deg/180	± 180°	14		0.01°	25*	50*
324	05	Pitch Angle	Deg/180	± 180°	14		0.01°	25*	50*
325	04	Roll Angle	Deg/180	± 180°	14		0.01°	25*	50*
325	05	Roll Angle	Deg/180	± 180°	14		0.01°	25*	50*
360	04	Potential Vertical Speed	Ft/min	16384*	10*		16*	25	50
360	05	Potential Vertical Speed	Ft/min	16384*	10*		16*	25	50
361	04	Altitude (Inertial)	Feet	131,072	18*		0.5*	32.25*	62.5*
361	05	Altitude (Inertial)	Feet	131,072	18		0.5	31.25*	62.5*
365	04	Inertial Vert. Vel. (EFI)	Ft/min	16384*	10*		16*	20	40
365	05	Inertial Vert. Vel. (EFI)	Ft/min	16384*	10*		16*	20	40
375	05	Along Heading Accel.	g	4	12		0.001	25*	50*
376	05	Cross Heading Accel.	g	4	12		0.001	25*	50*

Note [2]: Guidance added for transmission intervals of labels with multiple SDI codes.

ORIGINAL TEXT FOLLOWS:

[2] Transmit intervals and the number of parameters to be transmitted are prime factors in bus loading. The interval for transmission of parameters should fall between the minimum and maximum specified intervals and nominally should be near the center of the range at equal intervals between transmissions. When heavy bus loading dictates a shift from the center of the range, the shift should be toward the maximum transmit interval.

TABLE 3.1: INTERVAL DISCRETES – LABEL 270

Discrete word formats revised.

ORIGINAL TEXT FOLLOWS:

Table 3.1: Inertial Discretes – Label 270

Bit No.	Function	Bit Status	
		1	0
1	Label	x	
2			x
3		x	
4		x	
5		x	
6			x
7			x
8			x
9	SDI		
10			
11	Icing Detector	On	Off
12	Pitot Probe Heat	On	Off
13	ADS Computer [illegible]	Fail	Good
14	Pitot/Static [illegible] eat	On	Off
15	Static S[illegible] at	On	Off
16	TAT [illegible] eat	On	Off
17	[illegible] Angle of Attack Sensor Heat	On	Off
18	[illegible]ght Side Angle of Attack Sensor Heat	On	Off
19	VMO/MMO Overspeed Warning	Warn	Not Warn
20	Spare		
21			
22			
23			
24			
25			
26			
27			
28			
29			
30	SSM		
31			
32	Parity (Odd)		

OBSOLETE DO NOT USE

Notes: [1] Attitude invalid is equivalent to IRS failure.
[2] Bit 14 "1" condition indicates that the "Magnetic Heading" outputs are no longer being computer and have the characteristics of a "free DG" which is subject to control by a "Set Heading" input to the IRU. (See Section 3.2.4 for further explanation).

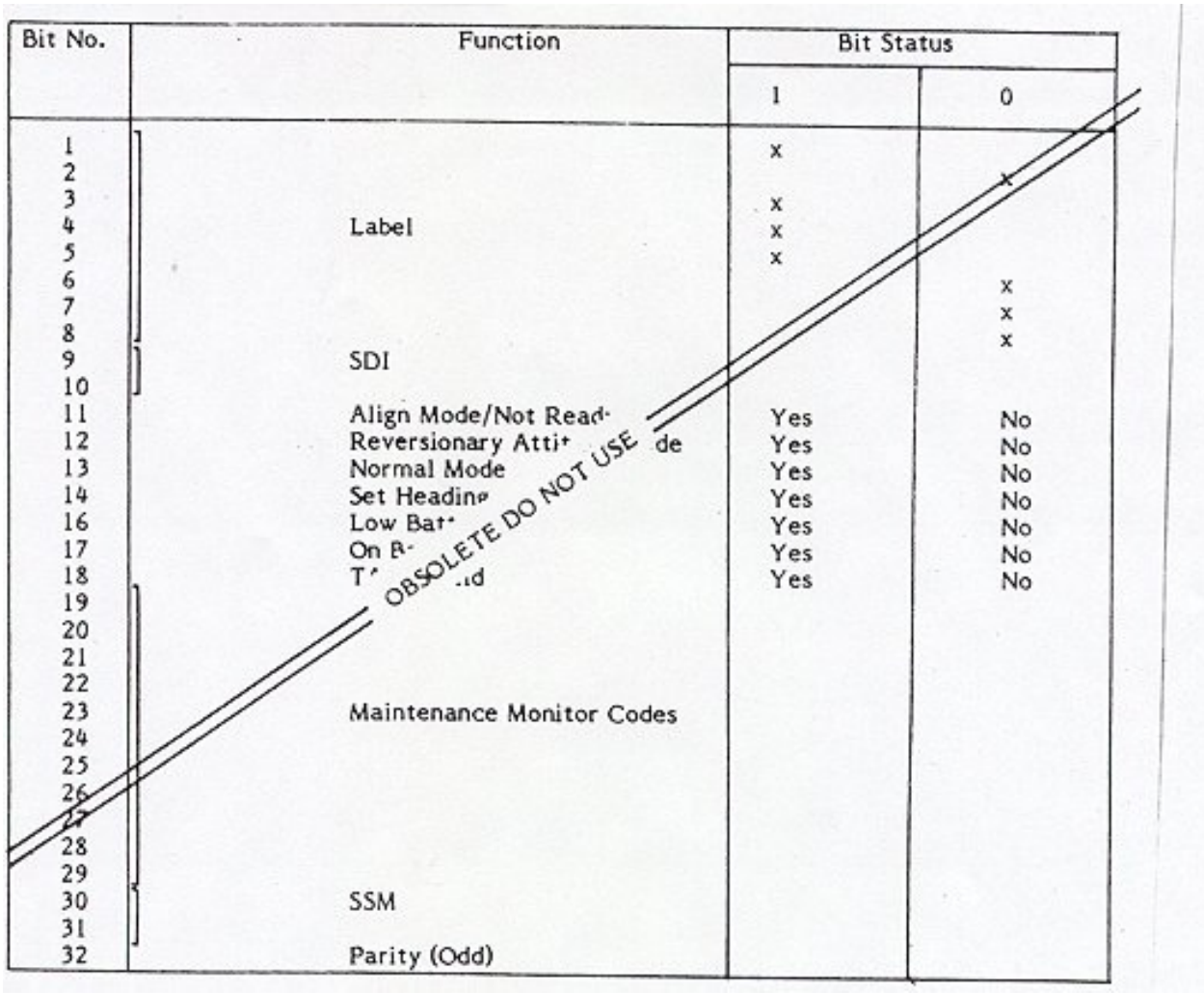
TABLE 3.4: AIR DATA DISCRETES

Discrete word #1 format changed.

Discrete word #2 added.

ORIGINAL TEXT FOLLOWS:

Table 3.4: Air Data Discretes – Label 270



Bit No.	Function	Bit Status	
		1	0
1		x	
2			x
3		x	
4	Label	x	
5		x	
6			x
7			x
8			x
9	SDI		
10			
11	Align Mode/Not Read·	Yes	No
12	Reversionary Atti+ de	Yes	No
13	Normal Mode	Yes	No
14	Set Headin·	Yes	No
16	Low Bat+	Yes	No
17	On R·	Yes	No
18	T· .id	Yes	No
19			
20			
21			
22			
23	Maintenance Monitor Codes		
24			
25			
26			
27			
28			
29			
30	SSM		
31			
32	Parity (Odd)		

OBSOLETE DO NOT USE

ATTACHMENT 6 – GENERAL WORD FORMATS AND ENCODING EXAMPLES

Examples revised to agree with adopted data standards changes. (editorial)

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SUPPLEMENT 6

TO

ARINC SPECIFICATION 429

MARK 33 DIGITAL INFORMATION TRANSFER SYSTEM (DITS)

Published: January 22, 1982

Prepared by the Airlines Electronic Engineering Committee

Adopted by the Airlines Electronic Engineering Committee: December 9, 1981

A. PURPOSE OF THIS SUPPLEMENT

This Supplement introduces the assignment of octal labels and hexadecimal equipment identifiers, the addition of guidance for label selection, a revision of failure warning annunciation in discrete words, deletion of the weight & balance words, editorial revisions to the label tables and addition of EEC discrete word formats.

B. ORGANIZATION OF THIS SUPPLEMENT

The first part of this document, printed on goldenrod paper, contains descriptions of the changes introduced into the Specification by this Supplement, and, where appropriate, extracts from the original text for comparison purposes. The second part consists of replacement white pages for the Specification, modified to reflect these changes. The modified and added material on each replacement page is identified with "c-6" symbols in the margins. Existing copies of Specification 429 may be updated by simply inserting the replacement white pages they replace. The goldenrod pages should be inserted inside the rear cover of the Specification.

Copies of the Specification bearing the number 429-6 already contain this Supplement and thus do not require revisions by the reader.

C. CHANGES TO SPECIFICATION 429 INTRODUCED BY THIS SUPPLEMENT

This section presents a complete tabulation of the changes and additions to the Specification introduced by this Supplement. Each change or addition is entitled by the section number and title currently employed in the Specification, or by the section number and title that will be employed when the Supplement is eventually incorporated. In each case there is included a brief description of the addition or change and, for other than very minor revisions, any text originally contained in the Specification is reproduced for reference.

2.1.5.1 BCD, NUMERIC, DISCRETE, AIM DATA AND FILE TRANSFER WORDS

Commentary revised to reflect use of failure warning flags in discrete words.

ORIGINAL TEXT FOLLOWS:

COMMENTARY

Definitions

Invalid Data – is defined as any data generated by a source system whose fundamental characteristic is the inability to convey reliable information for the proper performance of a user system. There are two categories of invalid data namely, "No Computed Data" and "Failure Warning".

No Computes Data – is a particular case of data invalidity where the source system is unable to compute reliable data for reasons other than system failure. This inability to compute reliable data is caused exclusively be a definite set of events or conditions whose boundaries are uniquely defined in the system characteristic. When such a condition exists, the source system should annunciate its outputs to be invalid by setting the sign/status matrix of the affected words to the "NCD" code, as defined in sections2.1.5.1 and 2.1.5.2. The system indicators may or may not be flagged depending on system requirements.

Failure Warning – is a particular case of data invalidity where the system monitors have detected one or more failures. These failures are uniquely characterized by boundaries defined in the system characteristic. When such a condition exists, the source system should annunciate its outputs to be invalid by either ceasing to supply the affected words to the data bus (the case of BCD data and ILS-LRRA installations with provisions for the interruption of AFS BNR data – see ARINC characteristics 707 and 710) or by setting the sign/status matrix of the affected words to the "Failure Warning" code (BNR case), as defined in sections 2.1.5.1 and 2.1.5.2. The system indicators should always be flagged during a "Failure Warning" condition.

2.1.5.2 BNR NUMERIC DATA WORDS

Commentary for failure warning revised.

ORIGINAL TEXT FOLLOWS:

COMMENTARY

Definitions

Invalid Data – is defined as any data generated by a source system whose fundamental characteristic is the inability to convey reliable information for the proper performance of a user system. There are two categories of invalid data, namely, "No Computed Data" and "Failure Warning".

No Computed Data – is a particular case of data invalidity where the source system is unable to compute reliable data for reasons other than system failure. This inability to compute reliable data is caused exclusively by a definite set of events or conditions whose boundaries are uniquely defined in the system characteristic. When such a condition exists the source system should annunciate its outputs to be invalid by setting the sign/status matrix of the affected words to the "NCD" code, as defined in sections 2.1.5.1 and 2.1.5.2. The system indicators may or may not be flagged depending on system requirements.

Failure Warning – is a particular case of data invalidity where the system monitors have detected one or more failures. These failures are uniquely characterized by boundaries defined in the system characteristic. When such a condition exists, the source system should annunciate its outputs to be invalid by either ceasing to supply the affected words to the data bus (the case of BCD data and ILS-LRRA Installations with provisions for the interruption of AFS BNR data – see ARINC Characteristics 707 and 710) or by setting the

sign/status matrix of the affected words to the "Failure Warning" code (BNR case), as defined in sections 2.1.5.1 and 2.1.5.2. The system indicators should always be flagged during a"Failure Warning" conditions.

Fig. 3.1 RADIO SYSTEMS MANAGEMENT WORD FORMATS

Assignments for bits 12, 15 and 17 removed from table for note 1 of ATC transponder word (editorial).

ATTACHMENT 1: LABEL CODES

The following labels have been given new assignments:

021 02, 041 02, 042 02, 043 02, 066 02, 071 33, 072 2F, 072 33, 074 33, 075 02, 077 02, 114 2F, 115 2F, 130 2F, 131 2F, 132 33, 133 2F, 155 33, 156 33, 157 33, 160 33, 161 33, 241 2C, 244 33, 250 2B, 252 2F, 260 33, 261 33, 262 02, 262 33, 263 33, 264 2F, 264 33, 265 33, 267 0A, 267 33, 270 2F, 270 3A, 271 2F, 271 3A, 273 2F, 272 2F, 273 33, 274 2F, 274 33, 275 2F, 315 02, 340 2F, 341 2F, 342 2F, 344 2F, 344 33, 345 2F, 346 2F, 350 2F, 351 2E, 351 2F, 352 2E, 352 2F, 353 2F, 354 2F, 375 33, 376 33.

The following labels have been deleted:

060 32, 061 32, 062 32, 063 32, 064 32.

Editorial changes were made to provide for consistency between Attachment 1 and Attachment 2.

"Predictive" deleted from 207 0A.

ATTACHMENT 1: EQUIPMENT CODES

New assignments were made for 0D, 2E, 2F, 3A, 3B, 33, and 34.

Nomenclature modified for 2C and 32.

ATTACHMENT 2: DATA STANDARDS

Data standards were added for new labels.

Editorial changes made.

Resolutions revised for 315 04, 315 05, 316 04, 321 04, 321 05, 322 04, 334 04, and 334 05 to match ARINC 704 and 705.

EEC discrete words added.

ATTACHMENT 6: GENERAL WORD FORMATS AND CODING EXAMPLES

Format added for label 262 02.

Bit 12 corrected in DME distance word (editorial).

Example added for GMT binary word.

APPENDIX 5: LABEL SELECTION GUIDANCE

Appendix added.

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SUPPLEMENT 7

TO

ARINC SPECIFICATION 429

MARK 33 DIGITAL INFORMATION TRANSFER SYSTEM (DITS)

Published: January 3, 1983

Prepared by the Airlines Electronic Engineering Committee

Adopted by the Airlines Electronic Engineering Committee: November 4, 1982

A. PURPOSE OF THIS SUPPLEMENT

This Supplement introduces new label assignments, data standards and equipment identification codes, and means for transmitting data with reduced accuracy.

B. ORGANIZATION OF THIS SUPPLEMENT

The first part of this document, printed on goldenrod paper, contains descriptions of the changes introduced into the Specification by this Supplement, and, where appropriate, extracts from the original text for comparison purposes. The second part consists of replacement white pages for the Specification, modified to reflect these changes. The modified and added material on each replacement page is identified with "c-7" symbols in the margins. Existing copies of Specification 429 may be updated by simply inserting the replacement white pages they replace. The goldenrod pages should be inserted inside the rear cover of the Specification.

Copies of the Specification bearing the number 429-7 already contain this Supplement and thus do not require revisions by the reader.

C. CHANGES TO SPECIFICATION 429 INTRODUCED BY THIS SUPPLEMENT

This section presents a complete tabulation of the changes and additions to the Specification introduced by this Supplement. Each change or addition is entitled by the section number and title currently employed in the Specification, or by the section number and title that will be employed when the Supplement is eventually incorporated. In each case there is included and, for other than very minor revisions, any text originally contained in the Specification is reproduced for reference.

2.1.5.1 BCD, NUMERIC, DISCRETE, AIM DATA AND FILE TRANSFER WORDS

Note [6] added.

2.1.5.2 BNR NUMERIC DATA WORDS

Note [6] added.

ATTACHMENT 1 – LABEL CODES

The following labels have been given new assignments:

046 33, 047 33, 114 3F, 115 3F, 127 33, 130 30, 130 3F, 131 30, 131 33, 132 30, 133 3F, 164 3B, 173 3B, 174 3B, 175 33, 212 3B, 242 3B, 244 3B, 245 3B, 246 3B, 247 3B, 252 3F, 264 3F, 270 30, 270 33, 270 3B, 270 3F, 271 30, 271 33, 271 3B, 271 3F, 272 3B, 272 3F, 273 3B, 273 3F, 274 3B, 274 3F, 275 3B, 275 3F, 311 3B, 214 3B, 325 2F, 325 3F, 340 33, 340 3F, 341 3F, 342 3B, 342 3F, 344 3F, 345 3F, 346 33, 346 3F, 347 30, 350 3F, 351 3F, 352 3F, 353 3F, 354 3F, 377 30.

The terminology has been modified for the following labels:

072 33, 074 33, 132 33, 244 33, 262 33, 263 33, 264 33, 265 33.

Station identifiers deleted on engine related parameters.

ATTACHMENT 1 – EQUIPMENT CODES

Code 2F changed from "EEC (Full Authority)" to "Full Authority EEC-A".

Code 30 assigned as "Airborne Separation Assurance System".

Description of Code OD changed to "AIDS Data Management Unit (DMU)"

Code 3F assigned as "Full Authority EEC_B".

ATTACHMENT 2 – DATA STANDARDS

Data standards were added for new labels.

Data standards added for the following existing labels:

270 3A, 271 3A, 270 2F-275 2F, 350 2F,-354 2F.

Note added to label 072 33.

Digits of label 014 changed from 3 to 4 (previously adopted).

Range of label 014 changed from 359 to 359.9 (previously adopted). Significant bits of label 321 changed from 12 to 11 (typo).

Note [4] added.

Note [5] added.

Note flag [5] added to following labels:

074 2C, 075 2C, 247 2C 250 2C, 256 2C, 257 2C, 260 2C, 262 2C.

ATTACHMENT 6 – GENERAL WORD FORMATS AND ENCODING EXAMPLES

Formats for engine serial number words added.

Formats for ASAS words added.

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SUPPLEMENT 8

TO

ARINC SPECIFICATION 429

MARK 33 DIGITAL INFORMATION TRANSFER SYSTEM (DITS)

Published: December 3, 1984

Prepared by the Airlines Electronic Engineering Committee

Adopted by the Airlines Electronic Engineering Committee: November 4, 1983

A. PURPOSE OF THIS SUPPLEMENT

This Supplement introduces new label assignments, revised data standards, expanded text describing SDI codes and makes note of a change in the resolution of the Magnetic Heading label incorporated in Supplement 7.

B. ORGANIZATION OF THIS SUPPLEMENT

The first part of this document, printed on goldenrod paper, contains descriptions of the changes introduced into the Specification by this Supplement, and, where appropriate, extracts from the original text for comparison purposes. The second part consists of replacement white pages for the Specification, modified to reflect these changes. The modified and added material on each replacement page is identified with "c-8" symbols in the margins. Existing copies of Specification 429 may be updated by simply inserting the replacement white pages they replace. The goldenrod pages should be inserted inside the rear cover of the Specification.

Copies of the Specification bearing the number 429-8 already contain this Supplement and thus do not require revisions by the reader.

C. CHANGES TO SPECIFICATION 429 INTRODUCED BY THIS SUPPLEMENT

This section presents a complete tabulation of the changes and additions to the Specification introduced by this Supplement. Each change or addition is entitled by the section number and title currently employed in the Specification, or by the section number and title that will be employed when the Supplement is eventually incorporated. In each case there is included a brief description of the addition or change and, for other than very minor revisions, any text originally contained in the Specification is reproduced for reference.

2.1.4 SOURCE DESTINATION IDENTIFIER

Text added to clarify use of SDI on combined source/sink equipment.

ORIGINAL TEXT FOLLOWS:

2.1.4 Source/Destination Identifier

Bit nos. 9 and 10 of numeric data words should be reserved for a data source/destination identification function. They are not available for this function in alpha/numeric (ISO Alphabet No. 5) data words (See Section 2.3.1.3 of this document) or when the resolution needed for numeric (BNR/BCD) data necessitates their use for valid data. The source/destination identifier function may find application when specific words need to be directed to a specific system of a multi-system installation or when the source system of a multi-system installation needs to be recognizable from the word content. When it is used, a source equipment should encode its aircraft installation number in bit nos. 9 and 10 as shown in the table below. A sink equipment should recognize words containing its own installation number code and words containing code "00", the "all-call" code.

Bit No.		Installation No.
10	9	
0	0	See Note Below
0	1	1
1	0	2
1	1	3

Note: In certain specialized application of the SDI function the all-call capability may be forfeited so that code "00" is available as an "installation no. 4" identifier.

When the SDI function is not used, binary zeros or valid data should be transmitted in bit nos. 9 and 10.

COMMENTARY

This document does not address the practical question of how the SDI bits will be set in those multi-installation systems in which the source/destination function is desired. One way would be to use program pins on the individual installation black boxes which would be wired to set up the appropriate code. The ARINC Characteristics devoted to the individual systems will define the method actually to be used.

ATTACHMENT 1 – LABEL CODES

The following labels have been given new assignments:

012 25, 060 3C, 061 3C, 062 3C, 063 3C, 064 3C, 137 2F, 137 3F, 140 25, 141 25, 142 25, 151 27, 152 27, 153 27, 154 27, 155 27, 156 27, 157 27, 160 27, 161 27, 162 27, 163 27, 164 25, 164 27, 165 27, 170 C5, 173 25, 270 25, 271 C5, 272 C5, 273 C5, 274 25, 275 25, 313 25, 314 25, 317 25, 320 25, 324 25, 325 25, 330 2F, 330 3F, 331 2F, 332 2F, 332 3F, 333 3F, 334 2F, 334 3F, 350 25, 351 25, 352 25, 353 25, 370 C5.

ATTACHMENT 1 - EQUIPMENT CODES

Code 3C assigned to Tire Pressure System.

ATTACHMENT 2 – DATA STANDARDS

Table 1 had been modified in Supplement 7 to reflect the resolution of label 014 as 0.1, rather than 1.0, which had been incorrectly introduced in a previous Supplement. This change is hereby noted.

Data standards added for new labels.

Data standards revised for labels 115 2F, 115 3F, 325 2F, 325 3F.

ATTACHMENT 6 – GENERAL WORD FORMATS

Tire pressure SDI bit coding added.

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SUPPLEMENT 9

TO

ARINC SPECIFICATION 429

MARK 33 DIGITAL INFORMATION TRANSFER SYSTEM (DITS)

Published: April 30, 1985

Prepared by the Airlines Electronic Engineering Committee

Adopted by the Airlines Electronic Engineering Committee: October 11, 1984

A. PURPOSE OF THIS SUPPLEMENT

This Supplement introduces new label assignments and equipment identification codes. This Supplement also corrects a word format bit error introduced in a previous Supplement.

B. ORGANIZATION OF THIS SUPPLEMENT

The first part of this document, printed on goldenrod paper, contains descriptions of the changes introduced into the Specification by this Supplement, and, where appropriate, extracts from the original text for comparison purposes. The second part consists of replacement white pages for the Specification, modified to reflect these changes. The modified and added material on each replacement page is identified with "c-9" symbols in the margins. Existing copies of Specification 429 may be updated by simply inserting the replacement white pages they replace. The goldenrod pages should be inserted inside the rear cover of the Specification.

Copies of the Specification bearing the number 429-9 already contain this Supplement and thus do not require revisions by the reader.

C. CHANGES TO SPECIFICATION 429 INTRODUCED BY THIS SUPPLEMENT

This section presents a complete tabulation of the changes and additions to the Specification introduced by this Supplement. Each change or addition is entitled by the section number and title currently employed in the Specification, or by the section number and title that will be employed when the Supplement is eventually incorporated. In each case there is included a brief description of the addition or change and, for other than very minor revisions, any text originally contained in the Specification is reproduced for reference.

ATTACHMENT 1 – LABEL CODES

The following labels have been given new assignments:

075 3E, 076 3E, 103 1B, 104 1B, 105 1B, 106 1B, 107 1B, 130 35, 131 35, 132 35, 203 18, 270 1B, 270 35, 270 3E, 270 4A, 271 18, 271 35, 272 18, 272 35, 273 18, 273 35, 274 18, 274 35, 275 18, 275 4A, 276 18, 300 3D, 336 1A, 337 1A, 347 18, 347 35, 350 18, 350 35, 350 3E, 370 04, and 370 05.

ATTACHMENT 1 – EQUIPMENT CODES

Codes 3D, 3E, 4A, 4B, 4C and 90-9F given new assignments.

ATTACHMENT 2 – DATA STANDARDS

Data standards entered for new labels. Range for labels 012 and 170 changed to 7999.

ATTACHMENT 6 – GENERAL WORD FORMATS AND ENCODING EXAMPLES

Label 150 and 323 examples corrected.

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SUPPLEMENT 10

TO

ARINC SPECIFICATION 429

MARK 33 DIGITAL INFORMATION TRANSFER SYSTEM (DITS)

Published: November 17, 1986

Prepared by the Airlines Electronic Engineering Committee

Adopted by the Airlines Electronic Engineering Committee: November 7, 1985

A PURPOSE OF THIS SUPPLEMENT

This Supplement introduces new label assignments, equipment identification codes and revised data standards.

B. ORGANIZATION OF THIS SUPPLEMENT

The first part of this document, printed on goldenrod paper, contains descriptions of the changes introduced into the Specification by this Supplement, and, where appropriate, extracts from the original text for comparison purposes. The second part consists of replacement white pages for the Specification, modified to reflect these changes. The modified and added material on each replacement page is identified with "c-10" symbols in the margins. Existing copies of Specification 429 may be updated by simply inserting the replacement white pages they replace. The goldenrod pages should be inserted inside the rear cover of the Specification.

Copies of the Specification bearing the number 429-10 already contain this Supplement and thus do not require revisions by the reader.

C. CHANGES TO SPECIFICATION 429 INTRODUCED BY THIS SUPPLEMENT

This section presents a complete tabulation of the changes and additions to the Specification introduced by this Supplement. Each change or addition is entitled by the section number and title currently employed in the Specification, or by the section number and title that will be employed when the Supplement is eventually incorporated. In each case there is included a brief description of the addition or change and, for other than very minor revisions, any text originally contained in the Specification is reproduced for reference.

3.1.4 FREQUENCY RANGES AND SWITCHING FUNCTIONS

Note 6 deleted on DME Frequency Word.

Attachment 1 – Label Codes

The following labels have been given new assignments:

072 02, 075 0B, 076 0B, 077 0B, 176 5A, 177 5A, 200 5A, 201 5A, 202 5A, 203 5A, 204 5A, 205 5A, 206 18, 213 8D, 227 7E, 241 4D, 242 09, 242 10, 242 11, 242 12, 244 8D, 247 4D, 251 1A, 255 2F, 255 3F, 256 4D, 270 0B, 272 3A, 272 5A, 273 5A, 274 5A, 275 5A, 276 2F, 276 3F, 335 2F, 336 2F, 336 3F, 356 XX, 371 00.

Labels for ARINC Characteristic 737 WBT and ARINC Characteristic 738 ADIRS added.

Attachment 1 – Equipment Codes

The following codes have been given new assignments:

0B, 35, 36, 37, 38, 4D, 4E, 5A, 5B, 5C, 5D, 5E, 5F, 6A, 6B, 6C, 6D, 6E, 6F, 7A, 7B, 7C, 7D, 7E, 7F, 8A, 8B, 8C, 8D, AD, C3.

Attachment 2 – Data Standards

Data standards entered for new labels.

Data standards revised for the following labels:

060 36, 061 3C, 062 3C, 063 3C, 064 3C, 150 31, 176 03, 176 29, 270 3A, 270 2F, 270 3F, 271 2F, 271 3F, 272 2F, 272 3F, 273 2F, 273 3F, 274 2F, 274 3F, 275 2F, 275 3F, 350 2F, 350 3F, 351 2F, 351 3F, 352 2F, 352 3F, 353 2F, 353 3F, 354 2F, 354 3F.

Labels 060 37-064 3C significant bits changed from 9 to 10 and range changed from 512 to 1024.

Following note added to words (labels 270 3B-275 3B):

> Typical discrete functions are shown in the above tables. Slight variations of bit usage may arise according to the specific application.

Label 203 35 changed to 203 18 (typographical error).

Transmit interval range added to label 150 31.

Labels 176 03 and 176 29 resolutions changed from 0.05 to 0.5 (typographical error).

Original bit assignments for remaining labels listed in following pages.

Attachment 6 – General Word Formats and Encoding Examples

Example added for label 251 1A, 077 0B and 206 18.

For TPIS word formats:

Wheel #519 label corrected to read "060". SDI labels clarified.

For BTMS word formats:

Wheel #10, #11, #12 labels corrected to read "116". Bit 27 assigned to a value of "1024". SDI labels clarified.

Special expanded format word example added for label 260 31.

Attachment 9A – General Aviation Labels and Data Standards

New attachment added.

Attachment 9B – General Aviation Word Examples

New attachment added.

Attachment 9C – General Aviation Equipment Identifiers

New attachment added.

Table 3.11 Propulsion Discrete Interface Unit – Labels 270 3A and 271 3A

Label 270 3A

Bit No.	Function	Bit Status		Notes
		1	0	
1	Label	X		
2			X	
3		X		
4		X		
5		X		
6			X	
7			X	
8			X	
9	SDI (1 = Left Engine; 0 = Right Engine)			
10	SDI (0 = Left Engine; 1 = Right Engine)			
11	PDIU Status Flag	Failed	OK	
12	T_2 / P_2 Probe Heat	HEAT OFF	HEAT ON	
13	TLA Interlock Fault	FAULT	OK	1
14	Idle Select	MINIMUM	APPROACH	
15	Air/Ground Switch	GROUND	AIR	
16	Opposite Engine Status	SHUT DOWN	RUNNING	
17	Spare		X	2
18	Spare		X	
19	N2 Mode Trim Release (PROV)	RELEASED	FIXED	1
20	Spare		X	
21	Spare		X	
22	Spare		X	
23	Maintenance Test (Provisional)	ON	OFF	1
24	Ground Test Power	ON	OFF	
25	Spare		X	
26	T/R Indication Power Failed (PROV)	FAILED	OK	1
27	T/R Not Stowed	NOT STOWED	STOWED	1
28	T/R Deployed Indication	DEPLOYED	NOT DEPLOYED	1
29	Engine Fire Warning	ON	OFF	1
30	SSM			
31	SSM			
32	Parity (Odd)			

1 = RETURN TO SPARE

2 = CHANGE SPARE TO DEFINITION ON NEXT PAGE

Table 3.12 EEC Status – Labels 270 2F, 270 3F, 271 2F, 271 3F, 272 2F, 272 3F, 273 2F, 273 3F, 274 2F, 274 3F, 275 2F, 275 3F

Label 270 2F

Bit No.	Function	Bit Status		Notes
		1	0	
1	Label	X		
2			X	
3		X		
4		X		
5		X		
6			X	
7			X	
8			X	
9	SDI			
10	SDI			
11	PAD		X	
12	PAD		X	
13	PAD		X	
14	Spare		X	2
15	Data Entry Plug	Failed	Normal	1
16	Auto Mode	Selected	Not Selected	3
17	Channel Manually Selected	Selected	Not Selected	3
18	N_2 Droop Control Mode	Engaged	Not Engaged	
19	Reverser System Failed	Failed	OK	
20	Channel Controlling Status	Controlling	Not Controlling	
21	Bleed Fall-Safe Open	Fall-Safe	Operational	3
22	TCA Valve Failed Closed	Failed	OK	
23	Spare		X	2
24	Overspeed Self-Test Failed	Failed	OK	3
25	Channel Incapable (Failed)	Incapable	Capable	
26	Abnormal Start	Abnormal	OK (Provision)	3
27	SVA Fall-Safe	Fall-Safe		3
28	Starter Cutout Command	Cutout	Not Cutout	
29	Oil Overtemperature	Overtemp	OK	1
30	SSM			
31	SSM			
32	Parity (Odd)			

1 = RETURN TO SPARE

2 = CHANGE SPARE TO DEFINITION ON NEXT PAGE

3 = CHANGE DEFINITION TO DEFINITION ON NEXT PAGE

Label 270 3F

Bit No.	Function	Bit Status		Notes
		1	0	
1	Label	X		
2			X	
3		X		
4		X		
5		X		
6			X	
7			X	
8			X	
9	SDI			
10	SDI			
11	PAD		X	
12	PAD		X	
13	PAD		X	
14	Spare		X	2
15	Data Entry Plug	Failed	Normal	1
16	Auto Mode	Selected	Not Selected	3
17	Channel Manually Selected	Selected	Not Selected	3
18	N_2 Droop Control Mode	Engaged	Not Engaged	
19	Reverser System Failed	Failed	OK	
20	Channel Controlling Status	Controlling	Not Controlling	
21	Bleed Fall-Safe Open	Fall-Safe	Operational	3
22	TCA Valve Failed Closed	Failed	OK	
23	Spare		X	2
24	Overspeed Self-Test Failed	Failed	OK	3
25	Channel Incapable (Failed)	Incapable	Capable	
26	Abnormal Start	Abnormal	OK (Provision)	3
27	SVA Fall-Safe	Fall-Safe		3
28	Starter Cutout Command	Cutout	Not Cutout	
29	Oil Overtemperature	Overtemp	OK	1
30	SSM			
31	SSM			
32	Parity (Odd)			

Label 271 2F

Bit No.	Function	Bit Status		Notes
		1	0	
1	Label	X		
2			X	
3		X		
4		X		
5		X		
6			X	
7			X	
8		X		
9	SDI			
10	SDI			
11	PAD		X	
12	PAD		X	
13	PAD		X	
14	Reverser Deploy Command	ON	OFF	
15	Turbine Cooling Air Valve Solenoid	ON	OFF	
16	Oil Cooler Bypass Valve Solenoid	ON	OFF	3
17	Cowl Vent Solenoid	ON	OFF	1
18	Breather Compartment Ejector Sol.	ON	OFF	1
19	Spare		X	2
20	Spare		X	
21	Spare		X	
22	Spare		X	
23	Autostar Relay	ON	OFF (Provision)	1
24	TLA Interlock Actuator Command	Block Fwd	Block Rev	
25	Spare Reverser Group Relay	ON	OFF (Provision)	1
26	Spare		X	2
27	Spare		X	2
28	Spare		X	2
29	Spare		X	2
30	SSM			
31	SSM			
32	Parity (Odd)			

Label 271 3F

Bit No.	Function	Bit Status		Notes
		1	0	
1	Label	X		
2			X	
3		X		
4		X		
5		X		
6			X	
7			X	
8		X		
9	SDI			
10	SDI			
11	PAD		X	
12	PAD		X	
13	PAD		X	
14	Reverser Deploy Command	ON	OFF	
15	Turbine Cooling Air Valve Solenoid	ON	OFF	
16	Oil Cooler Bypass Valve Solenoid	ON	OFF	3
17	Cowl Vent Solenoid	ON	OFF	1
18	Breather Compartment Ejector Sol.	ON	OFF	1
19	Spare		X	2
20	Spare		X	
21	Spare		X	
22	Spare		X	
23	Autostar Relay	ON	OFF (Provision)	1
24	TLA Interlock Actuator Command	Block Fwd	Block Rev	
25	Spare Reverser Group Relay	ON	OFF (Provision)	1
26	Spare		X	2
27	Spare		X	2
28	Spare		X	2
29	Spare		X	2
30	SSM			
31	SSM			
32	Parity (Odd)			

Label 272 2F

Bit No.	Function	Bit Status		Notes
		1	0	
1	Label	X		
2			X	
3		X		
4		X		
5		X		
6			X	
7		X		
8			X	
9	SDI			
10	SDI			
11	PAD		X	
12	PAD		X	
13	PAD		X	
14	N1 Loop	Engaged	Not Engaged	
15	N2 Loop	Engaged	Not Engaged	
16	N2 Topping Loop	Engaged	Not Engaged	
17	PB Topping Loop	Engaged	Not Engaged	
18	PB Topping Loop Minimum	Engaged	Not Engaged	
19	EPR Loop	Engaged	Not Engaged	
20	Acceleration Schedule Loop	Engaged	Not Engaged	
21	Deceleration Schedule Loop	Engaged	Not Engaged	
22	T4.9 Topping Loop	Engaged	Not Engaged	1
23	Back Up Mode	Engaged	Not Engaged	
24	Spare		X	2
25	Spare		X	
26	Spare		X	
27	Spare		X	
28	Spare		X	
29	Spare		X	
30	SSM			
31	SSM			
32	Parity (Odd)			

Label 272 3F

Bit No.	Function	Bit Status		Notes
		1	0	
1	Label	X		
2			X	
3		X		
4		X		
5		X		
6			X	
7		X		
8			X	
9	SDI			
10	SDI			
11	PAD		X	
12	PAD		X	
13	PAD		X	
14	N1 Loop	Engaged	Not Engaged	
15	N2 Loop	Engaged	Not Engaged	
16	N2 Topping Loop	Engaged	Not Engaged	
17	PB Topping Loop	Engaged	Not Engaged	
18	PB Topping Loop Minimum	Engaged	Not Engaged	
19	EPR Loop	Engaged	Not Engaged	
20	Acceleration Schedule Loop	Engaged	Not Engaged	
21	Deceleration Schedule Loop	Engaged	Not Engaged	
22	T4.9 Topping Loop	Engaged	Not Engaged	1
23	Back Up Mode	Engaged	Not Engaged	
24	Spare		X	2
25	Spare		X	
26	Spare		X	
27	Spare		X	
28	Spare		X	
29	Spare		X	
30	SSM			
31	SSM			
32	Parity (Odd)			

Label 273 2F

Bit No.	Function	Bit Status		Notes
		1	0	
1	Label	X		
2			X	
3		X		
4		X		
5		X		
6			X	
7		X		
8		X		
9	SDI			
10	SDI			
11	PAD		X	
12	PAD		X	
13	PAD		X	
14	P4.9 Interface Failed	Failed	OK	3
15	PB Interface Failed	Failed	OK	3
16	P2 (Pamb) Interface Failed*	Failed	OK	3
17	C3C Interface Failed	Failed	OK	3
18	T2 Interface Failed	Failed	OK	3
19	T4.9 Interface Failed	Failed	OK	3
20	Tfuel Interface Failed	Failed	OK	3
21	A/D Interface Failed	Failed	OK	3
22	RES/LVDT Interface Failed	Failed	OK	3
23	SVA Interface Failed	Failed	OK	3
24	N1 Interface Failed	Failed	OK	3
25	N2 Interface Failed	Failed	OK	3
26	P4.9 Sensor Prom Failed	Failed	OK	3
27	P2 (Pamb) Sensor Prom Failed*	Failed	OK	3
28	PB Sensor Prom Failed	Failed	OK	3
29	Background is not Executing	Not Executing	Executing	3
30	SSM			
31	SSM			
32	Parity (Odd)			

* Primary channel uses P2, Secondary channel uses Pamb.

Label 273 3F

Bit No.	Function	Bit Status		Notes
		1	0	
1	Label	X		
2			X	
3		X		
4		X		
5		X		
6			X	
7		X		
8		X		
9	SDI			
10	SDI			
11	PAD		X	
12	PAD		X	
13	PAD		X	
14	P4.9 Interface Failed	Failed	OK	3
15	PB Interface Failed	Failed	OK	3
16	P2 (Pamb) Interface Failed*	Failed	OK	3
17	C3C Interface Failed	Failed	OK	3
18	T2 Interface Failed	Failed	OK	3
19	T4.9 Interface Failed	Failed	OK	3
20	Tfuel Interface Failed	Failed	OK	3
21	A/D Interface Failed	Failed	OK	3
22	RES/LVDT Interface Failed	Failed	OK	3
23	SVA Interface Failed	Failed	OK	3
24	N1 Interface Failed	Failed	OK	3
25	N2 Interface Failed	Failed	OK	3
26	P4.9 Sensor Prom Failed	Failed	OK	3
27	P2 (Pamb) Sensor Prom Failed*	Failed	OK	3
28	PB Sensor Prom Failed	Failed	OK	3
29	Background is not Executing	Not Executing	Executing	3
30	SSM			
31	SSM			
32	Parity (Odd)			

* Primary channel uses P2, Secondary channel uses Pamb.

Label 274 2F

Bit No.	Function	Bit Status		Notes
		1	0	
1	Label	X		
2			X	
3		X		
4		X		
5		X		
6		X		
7			X	
8			X	
9	SDI			
10	SDI			
11	PAD		X	
12	PAD		X	
13	PAD		X	
14	Parity Test Hardware Fault	Error	OK	3
15	ROM Checksum Failure	Failed	OK	3
16	Ram Test Failure	Failed	OK	3
17	Instruction Test Failure	Failed	OK	3
18	High Speed Cross Link Failure	Failed	OK	3
19	Foreground Software Execution	Incorrectly	Correctly	
20	Watch Dog Timer Fault	Error	OK	3
21	Watch Dog/Parity Counter Latch	Latched	Not Latched	1
22	EAROM Failure	Failed	OK	3
23	ROM Parity Error Caused Reset	Yes	No	
24	RAM Parity Error Caused Reset	Yes	No	
25	Watchdog Timer Error Caused Reset	Yes	No	
26	Status Buffer or Watchdog/Parity	Failed	OK	3
27	Loss of Clock Caused Reset	Yes	No	
28	SDD Output #1 W/A	Failed	OK	
29	SDD Output #2 W/A	Failed	OK	
30	SSM			
31	SSM			
32	Parity (Odd)			

Label 274 3F

Bit No.	Function	Bit Status		Notes
		1	0	
1	Label	X		
2			X	
3		X		
4		X		
5		X		
6		X		
7			X	
8			X	
9	SDI			
10	SDI			
11	PAD		X	
12	PAD		X	
13	PAD		X	
14	Parity Test Hardware Fault	Error	OK	3
15	ROM Checksum Failure	Failed	OK	3
16	Ram Test Failure	Failed	OK	3
17	Instruction Test Failure	Failed	OK	3
18	High Speed Cross Link Failure	Failed	OK	3
19	Foreground Software Execution	Incorrectly	Correctly	
20	Watch Dog Timer Fault	Error	OK	3
21	Watch Dog/Parity Counter Latch	Latched	Not Latched	1
22	EAROM Failure	Failed	OK	3
23	ROM Parity Error Caused Reset	Yes	No	
24	RAM Parity Error Caused Reset	Yes	No	
25	Watchdog Timer Error Caused Reset	Yes	No	
26	Status Buffer or Watchdog/Parity	Failed	OK	3
27	Loss of Clock Caused Reset	Yes	No	
28	SDD Output #1 W/A	Failed	OK	
29	SDD Output #2 W/A	Failed	OK	
30	SSM			
31	SSM			
32	Parity (Odd)			

Label 275 2F

Bit No.	Function	Bit Status		Notes
		1	0	
1	Label	X		
2			X	
3		X		
4		X		
5		X		
6		X		
7			X	
8		X		
9	SDI			
10	SDI			
11	PAD		X	
12	PAD		X	
13	PAD		X	
14	Lamp (1,2 &/or 3) W/A Failed	Failed	OK	3
15	Other Channels Depower Discrete	Disagree	Agree	
16	PB Sensor Failed	Failed	OK	3
17	PT4.9 Sensor Failed	Failed	OK	3
18	PT2 (Pamb)* Sensor Failed	Failed	OK	3
19	EEC Temperature Status	High	OK	3
20	Spare (all “o” states)			2
21				2
22				2
23				2
24				2
25				2
26				2
27				2
28				2
29				
30	SSM			
31	SSM			
32	Parity (Odd)			

[3] Primary channel uses PT2, Secondary channel uses Pamb.

Label 275 3F

Bit No.	Function	Bit Status		Notes
		1	0	
1	Label	X		
2			X	
3		X		
4		X		
5		X		
6		X		
7			X	
8		X		
9	SDI			
10	SDI			
11	PAD		X	
12	PAD		X	
13	PAD		X	
14	Lamp (1,2 &/or 3) W/A Failed	Failed	OK	3
15	Other Channels Depower Discrete	Disagree	Agree	
16	PB Sensor Failed	Failed	OK	3
17	PT4.9 Sensor Failed	Failed	OK	3
18	PT2 (Pamb)* Sensor Failed	Failed	OK	3
19	EEC Temperature Status	High	OK	3
20	Spare (all “o” states)			2
21				2
22				2
23				2
24				2
25				2
26				2
27				2
28				2
29				
30	SSM			
31	SSM			
32	Parity (Odd)			

CHANGE * Primary channel uses PT2: Secondary channel uses Pamb.

Table 3.13 EEC Maintenance – Labels 350 2F, 350 3F, 351 2F, 351 3F, 352 2F, 352 3F, 353 2F, 353 3F, 354 2F, 354 3F

Label 350 2F

Bit No.	Function	Bit Status		Notes
		1	0	
1	Label	X		
2		X		
3		X		
4			X	
5		X		
6			X	
7			X	
8			X	
9	SDI			
10	SDI			
11	PAD		X	
12	PAD		X	
13	PAD		X	
14	N1 Failed	Failed	OK	3
15	N2 Failed	Failed	OK	3
16	TT2 Failed	Failed	OK	3
17	TT4.9 Failed	Failed	OK	3
18	Tfuel Failed	Failed	OK	3
19	Toll Failed	Failed	OK	3
20	Wf Resolver Failed	Failed	OK	3
21	SVA LVDT Failed	Failed	OK	3
22	Bleed Prox Input Failed	Failed	OK	3
23	ACC #1 LVDT Failed	Failed	OK	3
24	ACC #2 LVDT Failed	Failed	OK	3
25	Reverser LVDT Failed	Failed	OK	3
26	AOC LVDT Failed	Failed	OK	3
27	Spare LVDT Failed	Failed	OK	3
28	TLA Resolver Failed	Failed	OK	3
29	Oil Overtemperature	Overtemp	OK	1
30	SSM			
31	SSM			
32	Parity (Odd)			

Label 350 3F

Bit No.	Function	Bit Status		Notes
		1	0	
1	Label	X		
2		X		
3		X		
4			X	
5		X		
6			X	
7			X	
8			X	
9	SDI			
10	SDI			
11	PAD		X	
12	PAD		X	
13	PAD		X	
14	N1 Failed	Failed	OK	3
15	N2 Failed	Failed	OK	3
16	TT2 Failed	Failed	OK	3
17	TT4.9 Failed	Failed	OK	3
18	Tfuel Failed	Failed	OK	3
19	Toll Failed	Failed	OK	3
20	Wf Resolver Failed	Failed	OK	3
21	SVA LVDT Failed	Failed	OK	3
22	Bleed Prox Input Failed	Failed	OK	3
23	ACC #1 LVDT Failed	Failed	OK	3
24	ACC #2 LVDT Failed	Failed	OK	3
25	Reverser LVDT Failed	Failed	OK	3
26	AOC LVDT Failed	Failed	OK	3
27	Spare LVDT Failed	Failed	OK	3
28	TLA Resolver Failed	Failed	OK	3
29	Oil Overtemperature	Overtemp	OK	1
30	SSM			
31	SSM			
32	Parity (Odd)			

Label 351 2F

Bit No.	Function	Bit Status		Notes
		1	0	
1	Label	X		
2		X		
3		X		
4			X	
5		X		
6			X	
7			X	
8		X		
9	SDI			
10	SDI			
11	PAD		X	
12	PAD		X	
13	PAD		X	
14	Left ADC Inputs Failed	Failed	OK	3
15	Right ADC Inputs Failed	Failed	OK	3
16	Wf T/M W/A Failed	Failed	OK	3
17	SVA T/M W/A Failed	Failed	OK	3
18	BLD T/M W/A Failed	Failed	OK	3
19	ACC #1 T/M W/A Failed	Failed	OK	3
20	ACC #2 T/M W/A Failed	Failed	OK	3
21	AOC T/M W/A Failed	Failed	OK	3
22	Spare T/M W/A Failed	Failed	OK	1
23	Wf Track Check Failed	Failed	OK	3
24	SVA Track Check Failed	Failed	OK	3
25	Bld Track Check Failed	Failed	OK	3
26	ACC #1 Track Check Failed	Failed	OK	3
27	ACC #2 Track Check Failed	Failed	OK	3
28	AOC Track Check Failed	Failed	OK	3
29	Spare Track Check Failed	Failed	OK	1
30	SSM			
31	SSM			
32	Parity (Odd)			

Label 351 3F

Bit No.	Function	Bit Status		Notes
		1	0	
1	Label	X		
2		X		
3		X		
4			X	
5		X		
6			X	
7			X	
8		X		
9	SDI			
10	SDI			
11	PAD		X	
12	PAD		X	
13	PAD		X	
14	Left ADC Inputs Failed	Failed	OK	3
15	Right ADC Inputs Failed	Failed	OK	3
16	Wf T/M W/A Failed	Failed	OK	3
17	SVA T/M W/A Failed	Failed	OK	3
18	BLD T/M W/A Failed	Failed	OK	3
19	ACC #1 T/M W/A Failed	Failed	OK	3
20	ACC #2 T/M W/A Failed	Failed	OK	3
21	AOC T/M W/A Failed	Failed	OK	3
22	Spare T/M W/A Failed	Failed	OK	1
23	Wf Track Check Failed	Failed	OK	3
24	SVA Track Check Failed	Failed	OK	3
25	Bld Track Check Failed	Failed	OK	3
26	ACC #1 Track Check Failed	Failed	OK	3
27	ACC #2 Track Check Failed	Failed	OK	3
28	AOC Track Check Failed	Failed	OK	3
29	Spare Track Check Failed	Failed	OK	1
30	SSM			
31	SSM			
32	Parity (Odd)			

Label 352 2F

Bit No.	Function	Bit Status		Notes
		1	0	
1	Label	X		
2		X		
3		X		
4			X	
5		X		
6			X	
7		X		
8			X	
9	SDI			
10	SDI			
11	PAD		X	
12	PAD		X	
13	PAD		X	
14	Spare		X	1
15	Spare		X	1
16	Spare		X	
17	Spare		X	2
18	Spare		X	2
19	Spare		X	2
20	TCA Valve No. 1	Failed	OK	3
21	TCA Valve No. 2	Failed	OK	3
22	Channel Select Discrete	Failed	OK	3
23	PDIU SDD Input Failed	Failed	OK	3
24	N1 Sensor Failed*	Failed	OK (Provision)	3
25	Pb Pneumatic Line*	Failed	OK (Provision)	
26	P4.9 Pneumatic Line*	Failed	OK (Provision)	
27	TT4.9 Thermocouple Harness*	Failed	OK (Provision)	3
28	PDIU Status	Failed	OK	3
29	T/L Forward Interlock	Failed	OK	3
30	SSM			
31	SSM			
32	Parity (Odd)			

*Primary channel only.

Label 352 3F

Bit No.	Function	Bit Status		Notes
		1	0	
1	Label	X		
2		X		
3		X		
4			X	
5		X		
6			X	
7		X		
8			X	
9	SDI			
10	SDI			
11	PAD		X	
12	PAD		X	
13	PAD		X	
14	Spare		X	2
15	Spare		X	2
16	Spare		X	
17	Spare		X	2
18	Spare		X	2
19	Spare		X	2
20	TCA Valve No. 1	Failed	OK	3
21	TCA Valve No. 2	Failed	OK	3
22	Channel Select Discrete	Failed	OK	3
23	PDIU SDD Input Failed	Failed	OK	3
24	N1 Sensor Failed*	Failed	OK (Provision)	3
25	Pb Pneumatic Line*	Failed	OK (Provision)	
26	P4.9 Pneumatic Line*	Failed	OK (Provision)	
27	TT4.9 Thermocouple Harness*	Failed	OK (Provision)	3
28	PDIU Status	Failed	OK	3
29	T/L Forward Interlock	Failed	OK	3
30	SSM			
31	SSM			
32	Parity (Odd)			

* Primary channel only.

Label 353 2F

Bit No.	Function	Bit Status		Notes
		1	0	
1	Label	X		
2		X		
3		X		
4			X	
5		X		
6			X	
7		X		
8		X		
9	SDI			
10	SDI			
11	PAD		X	
12	PAD		X	
13	PAD		X	
14	N1 Crosscheck Failed	Failed	OK	3
15	N2 Crosscheck Failed	Failed	OK	3
16	PB Crosscheck Failed	Failed	OK	1
17	PT4.9 Crosscheck Failed	Failed	OK	1
18	TT2 Crosscheck Failed	Failed	OK	3
19	TT4.9 Crosscheck Failed	Failed	OK	3
20	Tfuel Crosscheck Failed	Failed	OK	3
21	Toil Crosscheck Failed	Failed	OK	3
22	Wf Resolver Crosscheck Failed	Failed	OK	3
23	SVA Resolver Crosscheck Failed	Failed	OK	3
24	Bld Prox Input Crosscheck Failed	Failed	OK	3
25	ACC #1 LVDT Crosscheck Failed	Failed	OK	3
26	ACC #2 LVDT Crosscheck Failed	Failed	OK	3
27	Reverser LVDT Crosscheck Failed	Failed	OK	3
28	AOC LVDT Crosscheck Failed	Failed	OK	3
29	TLA Resolver Crosscheck Failed	Failed	OK	3
30	SSM			
31	SSM			
32	Parity (Odd)			

Label 353 3F

Bit No.	Function	Bit Status		Notes
		1	0	
1	Label	X		
2		X		
3		X		
4			X	
5		X		
6			X	
7		X		
8		X		
9	SDI			
10	SDI			
11	PAD		X	
12	PAD		X	
13	PAD		X	
14	N1 Crosscheck Failed	Failed	OK	3
15	N2 Crosscheck Failed	Failed	OK	3
16	PB Crosscheck Failed	Failed	OK	1
17	PT4.9 Crosscheck Failed	Failed	OK	1
18	TT2 Crosscheck Failed	Failed	OK	3
19	TT4.9 Crosscheck Failed	Failed	OK	3
20	Tfuel Crosscheck Failed	Failed	OK	3
21	Toil Crosscheck Failed	Failed	OK	3
22	Wf Resolver Crosscheck Failed	Failed	OK	3
23	SVA Resolver Crosscheck Failed	Failed	OK	3
24	Bld Prox Input Crosscheck Failed	Failed	OK	3
25	ACC #1 LVDT Crosscheck Failed	Failed	OK	3
26	ACC #2 LVDT Crosscheck Failed	Failed	OK	3
27	Reverser LVDT Crosscheck Failed	Failed	OK	3
28	AOC LVDT Crosscheck Failed	Failed	OK	3
29	TLA Resolver Crosscheck Failed	Failed	OK	3
30	SSM			
31	SSM			
32	Parity (Odd)			

Label 354 2F

Bit No.	Function	Bit Status		Notes
		1	0	
1	Label	X		
2		X		
3		X		
4			X	
5		X		
6		X		
7			X	
8			X	
9	SDI			
10	SDI			
11	PAD		X	
12	PAD		X	
13	PAD		X	
14	REV Command Solenoid W/A Failure	Failure	OK	3
15	TCA Solenoid W/A Failure	Failure	OK	3
16	Spare Solenoid W/A Failure	Failure	OK	1
17	Spare Solenoid W/A Failure	Failure	OK	1
18	Spare Relay W/A Failure	Failure	OK	1
19	Spare Solenoid W/A Failure	Failure	OK	3
20	BCE Solenoid W/A Failure	Failure	OK	1
21	Spare Solenoid W/A Failure	Failure	OK	1
22	Oil Bypass Solenoid W/A Failure	Failure	OK	3
23	Hot Start Relay W/A Failure	Failure	OK	1
24	TLA Lockout Relay W/A Failure	Failure	OK	3
25	Spare Relay W/A Failure	Failure	OK	1
26	Spare		X	1
27	Essen. Sol. Current Sense Failure	Failure	OK	3
28	Critical & Noncritical Current Sense Failure	Failure	OK	3
29	Spare			
30	SSM			
31	SSM			
32	Parity (Odd)			

Label 354 3F

Bit No.	Function	Bit Status		Notes
		1	0	
1	Label	X		
2		X		
3		X		
4			X	
5		X		
6		X		
7			X	
8			X	
9	SDI			
10	SDI			
11	PAD		X	
12	PAD		X	
13	PAD		X	
14	REV Command Solenoid W/A Failure	Failure	OK	3
15	TCA Solenoid W/A Failure	Failure	OK	3
16	Spare Solenoid W/A Failure	Failure	OK	1
17	Spare Solenoid W/A Failure	Failure	OK	1
18	Spare Relay W/A Failure	Failure	OK	1
19	Spare Solenoid W/A Failure	Failure	OK	3
20	BCE Solenoid W/A Failure	Failure	OK	1
21	Spare Solenoid W/A Failure	Failure	OK	1
22	Oil Bypass Solenoid W/A Failure	Failure	OK	3
23	Hot Start Relay W/A Failure	Failure	OK	1
24	TLA Lockout Relay W/A Failure	Failure	OK	3
25	Spare Relay W/A Failure	Failure	OK	1
26	Spare		X	1
27	Essen. Sol. Current Sense Failure	Failure	OK	3
28	Critical & Noncritical Current Sense Failure	Failure	OK	3
29	Spare			
30	SSM			
31	SSM			
32	Parity (Odd)			

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SUPPLEMENT 11

TO

ARINC SPECIFICATION 429

MARK 33 DIGITAL INFORMATION TRANSFER SYSTEM (DITS)

Published: July 22, 1988

Prepared by the Airlines Electronic Engineering Committee

Adopted by the Airlines Electronic Engineering Committee: June 15, 1988

A. PURPOSE OF THIS SUPPLEMENT

This Supplement introduces new label assignments and equipment identification codes.

B. ORGANIZATION OF THIS SUPPLEMENT

The first part of this document, printed on goldenrod paper, contains descriptions of the changes introduced into the Specification by this Supplement, and, where appropriate, extracts from the original text for comparison purposes. The second part consists of replacement white pages for the Specification, modified to reflect these changes. The modified and added material on each replacement page is identified with "c-11" symbols in the margins. Existing copies of Specification 429 may be updated by simply inserting the replacement white pages they replace. The goldenrod pages should be inserted inside the rear cover of the Specification.

Copies of the Specification bearing the number 429-11 already contain this Supplement and thus do not require revisions by the reader.

C. CHANGES TO SPECIFICATION 429 INTRODUCED BY THIS SUPPLEMENT

This section presents a complete tabulation of the changes and additions to the Specification introduced by this Supplement. Each change or addition is entitled by the section number and title currently employed in the Specification or by the section number and title that will be employed when the Supplement is eventually incorporated. In each case there is included a brief description of the addition or change and, for other than very minor revisions, any text originally contained in the Specification is reproduced or reference.

2.1.5.1 BCD Numeric, Discrete, Aim Data, and File Transfer Words

SSM bit patterns separated from main figure.

FIGURE 3-1 RADION SYSTEMS MANAGEMENT WORD FORMATS

HF COM frequency control words added.

ATTACHMENT 1 – LABEL CODES

070 002, 070 0CC, 071 002, 071 0CC, 072 002, 072 0CC, 073 0CC, 074 002, 100 0BB, 101 0BB, 103 0BB, 104 0BB, 105 0BB, 106 0BB, 107 002, 114 0CC, 115 0BC, 115 0CC, 116 0CC, 117 0CC, 126 002, 127 002,143 041, 143 241, 144 041, 144 341, 150 002, 152 041, 153 002, 153 041, 162 0DE, 173 0BD, 200 002, 202 002,203 002, 204 002, 205 002, 205 0B9, 206 0CC, 207 002, 207 0B9, 211 002, 213 002, 213 08D, 220 002, 220 017, 220 024, 220 07E, 221 002, 221 017, 221 024, 221 07E, 222 002, 222 017, 222 024, 222 07E, 223 002, 223 017, 223 024, 223 07E, 224 002, 224 017, 224 024, 224 07E, 225 002, 226 0XX, 230 002, 230 017, 230 024, 230 07E, 241 002, 242 011, 243 0XX, 244 011, 244 08D, 245 002, 246 002, 246 006, 246 009, 247 002, 247 009, 247 0EB, 250 002, 250 12B, 252 0EB, 253 002, 254 002, 254 012, 255 002, 255 012, 255 08E, 256 002, 256 027, 257 002, 257 027, 263 002, 263 010, 264 002, 264 010, 265 002, 267 002, 271 002, 274 0C5, 275 002, 276 001, 276 002, 276 003, 300 039, 300 040, 301 002, 301 039, 301 040, 302 002, 302 039, 302 040, 303 002, 304 039, 304 040, 305 039, 305 040, 306 039, 306 040, 307 039, 307 040, 314 002, 316 002, 322 002, 341 002, 342 002, 343 01A, 350 00B, 350 027, 350 040, 350 241, 350 341, 351 00B, 351 029, 354 002, 355 027, 360 002.

Label 076 008 changed from "Ellipsoidal Altitude" to "GPS Height Above Referenced Ellipsoid".

ATTACHMENT 1 – EQUIPMENT CODES

The following codes have been given new assignments:

039, 040, 041, 08E, 08F, 0AA, 0AB, 0AC, 0AE, 0AF, 0BA, 0BB, 0BC, 0BD, 0BE, 0BF, 0C2, 0CA, 0CB, 0CC, 0CD, 0CE, 0CF, 0DA, 0DB, 0DC, 0DD, 0DE, 0DF, 0EA, 0FF, 10A, 10B, 10C, 10C, 10D, 10E, 10F, 110, 12A, 12B, 136, 141, 241, 341.

ATTACHMENT 2 – DATA STANDARDS

Data Standards entered for new labels:

Label 076 008 changed from "Ellipsoidal Altitude" to "GPS Height Above Referenced Ellipsoid".

Data Standards revised for following labels:

076 00B, 077 00B, 270 00B

ATTACHMENT 6

Example revised for label 077 00B.

Example for label 260 removed.

Example for label 260 031 expanded to include 260 002.

Format for label 270 00B added.

Format for label 274 0C5 added.

Format for label 350 027 added.

Code for 747 NR corrected in diagram of TPIS word.

Equipment ID word expanded to accommodate three-character identifier.

ATTACHMENT 9 – GENREAL AVIATION EQUIPMENT IDENTIFIERS

Code 08C added to list.

Codes for Loran and Omega changed from 08A/08B to 05A/05B, respectively.

NOTE: Due to the large number of changes Created by this Supplement, it is NOT available separately to update 429-11.

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SUPPLEMENT 12

TO

ARINC SPECIFICATION 429

MARK 33 DIGITAL INFORMATION TRANSFER SYSTEM (DITS)

Published: July 1, 1990

Prepared by the Airlines Electronic Engineering Committee
Adopted by the Airlines Electronic Engineering Committee: October 25, 1989

A. PURPOSE OF THIS SUPPLEMENT

The Supplement introduces the Williamsburg bit-oriented file data transfer protocol which supports the transfer of binary and character data. The previous AIM and character-oriented file transfer protocol sections are moved to Appendix 6. The Sign Status Matrix (SSM) information is revised and reorganized. In addition, this Supplement introduces new label assignments and equipment identification codes.

B. ORGANIZATION OF THIS SUPPLEMENT

The first part of this document, printed on goldenrod paper contains descriptions of the changes introduced into the Specification by this Supplement, and, where appropriate, extracts from the original text for comparison purposes. The second part consists of replacement white pages for the Specification, modified to reflect these changes. The modified and added material on each replacement page is identified with "c-12" symbols in the margins. Existing copies of Specification 429 may be updated by simply inserting the replacement white pages they replace. The goldenrod pages should e inserted inside the rear cover of the Specification.

Copies of the Specification bearing the number 429-12 already contain this Supplement and thus do not require revisions by the reader.

C. CHANGES TO SPECIFICATION 429 INTRODUCED BY THIS SUPPLEMENT

This section presents a complete tabulation of the changes and additions to the Specification introduced by this Supplement. Each change or addition is entitled by the section number and title currently employed in the Specification, or by the section number and title that will be employed when the Supplement is eventually incorporated. In each case there is included a brief description of the addition or change and, for other than very minor revision, any text originally contained into the Specification reproduced for reference.

2.1.3 Information Identifier

This section contains editorial corrections to comply with changes introduced in Supplement 11.

2.1.5 Sign/Status Matrix

This section was revised and reorganized. The changes include moving the AIM and file transfer SSM definitions to Appendix 6, adding failure reporting to the discrete word truth table (Section 2.1.5.3) and moving the description of status priorities to Section 2.1.5.

2.3.1 Digital Language

The contents of Sections 2.3.1.4 through 2.3.1.5.7 were moved to Appendix 6. The AIM Data and File Data Transfer section headings were retained for reference purposes. Section 2.3.1.5. File Data Transfer, provides the reason for moving the original file transfer protocol and introduces the Williamsburg protocol.

2.5 Bit-Oriented Communications Protocol

This new section was added to describe a bit-oriented data transfer protocol. The new protocol was developed to accommodate the interface of the ACARS Management Unit (MU) and the Satellite Data Unit (SDU).

3.2 AIM Information Transfer

The information previously contained in this section is no longer applicable to ARINC Specification 429. For reference purposes, the section header is retained and the original contents of this section are located in Appendix 6.

ATTACHMENT 1 – LABEL CODES

The following labels have been given new assignments:

002 115, 013 0B8, 016 0B8, 046 10A, 046 10B, 047 10A, 047 10B, 107 0BB, 110 0BB, 112 0BB, 114 0BB, 114 10A, 114 10B, 127 10A, 127 10B, 130 035, 130 10A130 10B, 131 035, 132 035, 133 10A, 133 10B, 134 10A, 134 10B, 137 10A, 137 10B, 155 10A, 155 10B, 156 10A, 156 10B, 157 10A, 157 10B, 160 10A, 160 10B, 161 10A, 161 10B, 201 115, 203 035, 203 10A, 203 10B, 205 10A, 205 10B, 211 10A, 211 10B, 220 116, 221 116, 222 115, 222 116,223 116, 224 116, 226 035, 230 116, 234 039, 234 040, 235 039, 235 040, 236 039, 236 040, 237 039, 237 040, 244 10A, 244 10B, 256 114, 257 114, 260 10A, 260 10B, 260 114, 261 10A, 261 10B, 261 114, 262 10A, 262 10B, 262 114, 263 10A, 263 10B, 263 114, 264 10A, 264 10B, 264 114, 265 004, 265 038, 265 10A, 265 10B, 265 114, 267 10A, 267 10B, 270 10A, 270 10B, 270 114, 270 115, 271 10A, 271 10B, 271 114, 272 002, 272 10A, 272 10B, 272 114, 273 10A, 273 10B, 273 114, 274 10A, 274 10B, 274 114, 275 10A, 275 10B, 275 114, 276 114, 277 018, 300 10A, 300 10B, 300 TBD, 301 10A, 301 10B, 302 10A, 302 10B, 303 10A, 303 10B, 304 10A, 304 10B, 305 10A, 305 10B, 306 10D, 310 114, 311 114, 312 114, 313 114, 316 10A, 316 10B, 320 035, 321 10A, 321 10B, 322 10A, 322 10B, 323 10A, 323 10B, 324 10A, 324 10B, 325 10A, 325 10B,326 10A, 326 10B, 327 10A, 327 10B, 330 10A, 330 10B, 331 10A, 331 10B, 335 10A, 335 10B, 336 002, 336 10A, 336 10B, 337 002, 337 002, 337 10A, 337 10B, 341 10A, 341 10B, 342 10A, 342 10B, 343 10A, 343 10B, 344 10A, 344 10B, 345 10A, 345 10B, 346 10A, 346 10B, 347 10A, 347 10B, 350 10A, 350 10B, 350 114, 350 115, 351 10A, 351 10B, 351 114, 352 10A, 352 10B, 352 114, 353 10A, 353 10B, 353 114, 354 10A, 354 10B, 357 035, 360 10A, 360 10B, 360 TBD, 361 10A, 361 10B, 362 10A, 362 10B, 362 115, 363 10A, 363 10B, 365 TBD, 372 10A, 372 10B, 373 10A, 373 10B, 374 10A, 374 10B, 374 TBD, 375 10A, 375 10B, 375 TBD.

Revised label 130 035 from "Traffic Advisory Range" to "Intruder Range".

Revised label 131 035 from "Traffic Advisory Altitude" to "Intruder Altitude".

Revised label 132 035 from "Traffic Advisory Bearing" to "Intruder Bearing".

Removed label 130 030 Traffic Advisory Range.

Removed label 131 030 Traffic Advisory Altitude.

Removed label 132 030 Traffic Advisory Bearing Estimate.

Removed label 270 030 Transponder Discrete.

Removed label 347 030 Sector Control.

Removed label 347 035 Antenna Control.

ATTACHMENT 1 – EQUIPMENT CODES

The following codes have been given new assignments:

113, 114,115, 116, 117, 118, 119, 11A, 123, 124, 125, 126, 127, 128, 129, 15A, 15B, 15C, 15D, 15E, 16A, 16B, 16C, 16D, 16E, 17A, 17B, 17C, 18A, 18B, 18C, 18D, 18E, 18F.

ATTACHMENT 2 – DATA STANDARDS

Tables 1, 2 updated to reflect changes to Attachment 1.

Binary Data notes 6, 7 and 8 added.

Discrete Data Standards entered for new labels:

272 002, 271 018, 272 018, 273 018, 275 018, 276 018, 277 018, 274 018, 270 035, 271 035, 273 035, 274 035, 275 035, 013 0B8, 016 0B8, 161 10A, 161 10B, 350 114, 351 114, 352 114, 353 114, 270 115, 350 115.

ATTACHMENT 6 – GENERAL WORD FORMATS AND ENCODING EXAMPLES

Add format for TCAS Intruder Range label 130.

Add format for TCAS Intruder Altitude label 131.

Add format for TCAS Intruder Bearing label 132.

Add format for Transponder Altitude/TCAS Own A/C Altitude label 203.

Removed 730 ASAS Sector Control Word example.

Removed 730 TCAS Traffic Advisory Range Word example.

Removed 730 TCAS Traffic Advisory Altitude Word example.

Removed 730 TCAS Traffic Advisory Bearing Estimate word example.

ATTACHMENT 9B – GENERAL AVIATION WORD EXAMPLES

Add new Company Name Identifier.

ATTACHMENT 10 – VARIABLES OF BIT-ORIENTED PROTOCOL

Add new Attachment.

ATTACHMENT 11 – BIT-ORIENTED DATA FILE TRANSFER WORD FORMATS

Add new Attachment.

ATTACHMENT 11A – DESTINATION CODES

Add new Attachment.

ATTACHMENT 11B – STATUS CODES

Add new Attachment.

ATTACHMENT 11C – ALOHA/ALOHA RESPONSE PROTOCOL WORDS

Add new Attachment.

ATTACHMENT 12 – FILE TRANSFER EXAMPLE

Add new Attachment.

ATTACHMENT 12A – FILED MAPPING EXAMPLE

Add new Attachment.

ATTACHMENT 13 – PROTOCOL DETERMINATION PROCEDURE DIAGRAMS

Add new Attachment.

ATTACHEMENT 14 – SYSTEM ADDRESS LABELS

Add new Attachment.

ATTACHMENT 15 – LINK LAYER CRC DATA EXAMPLE

Add new Attachment.

APPENDIX 6 – FORMER MAINTENANCE, AIM AND FILE TRANSFER TECHNIQUES

Add new Appendix.

APPENDIX 7 – MATHMATICAL EXAMPLE OF CRC ENCODING/DECODING

Add new Appendix.

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SUPPLEMENT 13

TO

ARINC SPECIFICATION 429

MARK 33 DIGITAL INFORMATION TRANSFER SYSTEM (DITS)

Published: December 30, 1991

Prepared by the Airlines Electronic Engineering Committee

Adopted by the Airlines Electronic Engineering Committee: October 8, 1991

A. PURPOSE OF THIS SUPPLEMENT

This Supplement introduces changes made to the Williamsburg protocol as a result of its initial implementation. This protocol supports the transfer of binary and character data. In addition, this Supplement introduces new label assignments and equipment identification codes.

B. ORGANIZATION OF THIS SUPPLEMENT

The first part of this document, printed on goldenrod paper contains descriptions of changes introduced into this Specification by this Supplement. The second part consists of replacement white pages for the Specification, modified to reflect the changes. The modified and added material on each page is identified by a c-13 in the margins. Existing copies of ARINC Specification 429 may be updated by simply inserting the replacement white pages where necessary and destroying the pages they replace. The goldenrod pages are inserted inside the rear cover of the Specification.

C. CHANGES TO ARINC SPECIFICATION 429 INTRODUCED BY THIS SUPPLEMENT

This section presents a complete tabulation of the changes and additions to the Specification introduced by this Supplement. Each change or addition is defined by the section number and the title currently employed in the Specification or by the section name and title that will be employed when the Supplement is eventually incorporated. In each case a brief description of the change or addition is included.

AEEC STAFF NOTE: THESE CHANGES APPLY TO ARINC 429, PART 3 ONLY.

2.3.1.5 File Data Transfer

An editorial change, correction to section numbering.

2.3.1.5.1 Bit-Oriented Protocol Determination

New Section added to describe ALO/ALR protocol process to be used when a bilingual Link Layer protocol system needs to determine necessary bit-oriented interfaces.

2.5 Bit-Oriented communications Protocol

Included term “Williamsburg” parenthetically since this terminology well-known in industry. Added commentary to explain non-negotiation or parameters in this protocol.

D. Corrected Network Layer definition.

2.5.2 Link Data Unit (LDU) Size and Word Count

Added second paragraph to text, since it is a requirement, and removed second paragraph from commentary.

2.5.4 Bit Rate and Word Timing

Corrected the commentary to change the more ambiguous term “message” to LDU.

2.5.5.3 Destination Code

An editorial change was made.

2.5.6 Response to RTS

The last sentence in the second paragraph was reworded and moved to a more appropriate section, 2.5.6.2.

2.5.6.1 Clear to Send (CTS)

In the second to last sentence, the word “valid” was added to clarify the Not clear to send condition. The last sentence was added to clarify the resetting of RTS counters.

2.5.6.2 Not Clear to Send (NCTS)

The first paragraph was updated to include the information deleted from Section 2.5.6 and to clarify the validity requirements. The second paragraph was updated to describe that and NCTS counter would be reset upon a valid CTS response. The last sentence in the third paragraph was deleted and it’s content expanded in the following commentary of that section.

2.5.6.3 Destination Busy

The second paragraph of this section was updated to indicate that a BUSY counter should be reset with a valid CTS response to RTS.

2.5.7 No Response to RTS

The first paragraph of this section was updated to describe proper response to RTS.

2.5.9 Unexpected RTS

This section was updated to include editorial changes and a description of the correct responses to RTS. The last sentence was deleted as redundant to Section in 2.5.13.1 and in conflict with other possible responses.

2.5.11 Data

The fourth paragraph of this section was updated to describe the proper ending of an LDU transmission, and to include the optional NAK response for receipt of an incomplete octet.

2.5.11.3 Character Data Words

In the last paragraph, the “note” designator was removed and the text clarified for the transfer of characters with a parity bit.

2.5.13 Negative Acknowledgement (NAK)

This section was updated to clarify conditions for sending the NAK word.

2.5.13.1 Missing SOT word

Text was corrected to refer to "reception" instead of "transmission" of a valid SOT word. Also, incorrect text referring to the NAK response timing was deleted.

2.5.13.2 LDU Sequence Number Error

The original text was omitted. Sections 2.5.13.1 – 2.5.13.7 were renumbered.

2.5.13.3 Parity Errors

A commentary section was added to describe the procedures for receiving words with bad parity.

2.5.13.4 Word Count Errors

This section was updated to clarify the NAK response time for word count errors.

2.5.13.5 CRC Errors

This section was updated to clarify the NAK response time for CRC errors.

2.5.13.6 Time Out Errors

This section was renumbered.

2.5.13.7 Restart Initialization

This section was omitted due to potential conflicts with the ALO/ALR procedures.

2.5.14 LDU Transfer Acknowledgement (ACK)

Text was revised to include LDU conditions for sink acknowledgement transmission.

2.5.14.1 Duplicate LDU

This section was added to describe duplicate LDU occurrences.

2.5.14.2 Auto-Synchronized Files

This section was added to describe the method of handling auto-synchronized files.

2.5.15 SYN Word

New text was added to describe SYN response times for non-consecutive LDU Sequence numbers. The last paragraph was incorrect and deleted.

2.5.16 Response to ACK/NAK/SYN

New text was added to describe actions when NAK and SYN are detected during a transmission.

2.5.19 ALO Response

A new section was added and updated to describe ALO responses.

ATTACHMENT 10 – VARIABLES OF BIT ORIENTED PROTOCOL

Tables 10-1 and 10-3 were updated to include events N_5, N^6, and time T_{12}. Options 0_7 and 0_{12} in Table 10-4 were changed to spares for consistency with corresponding text updates.

ATTACHMENT 11C – ALOHA/ALOHA RESPONSE PROTOCOL WORD DEFINITION

Table 11C-3 was added to clarify protocol version number assignments, and is referenced by "note 1". "Note 2" was added to describe the GFI field of the ALOHA word.

ATTACHMENT 12A – FIELD MAPPING EXAMPLE

B_k was changed to B_{24} in the data word map, "nibble" was changed to "semi-octet", and semi-octet arrow lengths were shortened to correspond to the proper four and eight-bit lengths.

APPENDIX 7 – MATHEMATICAL EXAMPLE OF CRC ENDODING/DECODING

Format (alignment) changes were made in the polynomial divisions, "(X)" was corrected to "Q(x)", and the transmission order for the LDU Mapping of the 24-bit example was deleted to avoid possible misinterpretation.

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SUPPLEMENT 14

TO

ARINC SPECIFICATION 429

MARK 33 DIGITAL INFORMATION TRANSFER SYSTEM (DITS)

Published: January 4, 1993

Prepared by the Airlines Electronic Engineering Committee

Adopted by the Airlines Electronic Engineering Committee: November 4, 1992

A. PURPOSE OF THIS SUPPLEMENT

This Supplement introduces changes made to increase the efficiency of data transfer across an ARINC 429 high speed bit-oriented link. This protocol supports the transfer of binary and character data.

B. ORGANIZATION OF THIS SUPPLEMENT

The first part of this document, printed on goldenrod paper, contains descriptions of changes introduced into this Specification by this Supplement. The second part consists of replacement white pages for the Specification, modified to reflect the changes. The modified and added material on each page is identified by a c-14 in the margins. Existing copies of ARINC 429 may be updated by simply inserting the replacement white pages where necessary and destroying the pages they replace. The goldenrod pages are inserted inside the rear cover of the Specification.

C. CHANGES TO ARINC SPECIFICATION 429 INTRODUCED BY THIS SUPPLEMENT

This section presents a complete tabulation of the changes and additions to the Specification introduced by this Supplement. Each change and addition is defined by the section number and the title currently employed in the Specification or by the section name and title that will be employed when the Supplement is eventually incorporated. In each case a brief description of the change or addition is included.

AEEC STAFF NOTE: THESE CHANGES APPLY TO ARINC 429, PART 3 ONLY.

2.3.1.5 File Data Transfer

An editorial change was needed to reference new section.

2.3.1.5.1 Bit-Oriented Protocol Determination

This section was expanded to include determination of different version numbers of the bit-oriented protocol, and was moved to Section 2.5.19.

2.5 Bit-Oriented Communication Protocol

An editorial change references a new section number.

2.5.4 Bit Rate and Word Timing

A maximum word gap of 64 bit-times, (averaged over the LDU transmission) was added to eliminate excessive delay in source transmission time.

Note: Sections 2.5.5 through 2.7 have been renumbered and reordered for consistency.

2.5.5 Word type

The basic definition of "word type" was corrected to include bits 31-29 in all bit-oriented words of an LDU.

2.5.6 Protocol Words

This section was added to specifically define the word type for protocol words.

2.5.6.1 Protocol Identifier

This section was added to clarify the definition of bits 28-25 for protocol words and to specify the relevant addition for error conditions.

2.5.6.2 Destination Code

This section was updated, and a commentary added, to clarify the role of the link layer protocol for upward compatibility with changing network functionality. The requirement for Destination code validation is not a link layer function.

2.5.6.3 Word Count

This section was renumbered.

2.5.7 Request to Send (RTS)

This section was previously titled "Response to TS", and has been renumbered. The title was changed for consistency, and an introductory paragraph added to clarify the basic RTS function.

2.5.7.1 Clear to Send (CTS)

This section was renumbered.

2.5.7.2 Not Clear to Send (NCTS)

This section was renumbered.

2.5.7.3 Destination Busy

This section was renumbered, and an introductory replacement paragraph inserted to clarify the "optional" BUSY response, which may be used when a system cannot accept a transmission by the source in a "timely manner". New commentary equates a "timely manner" to the shorter retry sequence of the NCTS series.

2.5.7.4 No Response to RTS

This section was renumbered, and the ALOHA word was included in the logic for error determination.

2.5.10 Start of Transmission (SOT)

Timer T_{13} was added as a requirement on the source to begin transmission of an LDU within a specified interval after receipt of the CTS word from the sink.

2.5.10.1 General Format Identifier (GFI)

This section was updated, and commentary added to clarify the role of the GFI in pre-OSI as well as OSI environments. Validation of the GFI code is required by a high level entity (network layer) in both environments to determine the format of the data words to follow. GFI validation is not necessarily a link layer function.

2.5.11 Data

All references to Character Data word formats were deleted.

2.5.11.3 Character Data Words

This section was deleted. The Character Data Word format was removed from Supplement 14, as the format is incompatible with those for Full and Partial Data word formats. Currently, both binary and character data are transmitted in octets defined by the other two data word formats. The special character data format is not required.

2.5.12.1 CRC Encoding

References to character data words were deleted. The text for equation: $M9x) = x^{16}G(x) + R(x)$ was corrected by moving the "bar" from G(x) to R(x).

2.5.13 Negative Acknowledgement (NAK)

NAK word interpretation was changed to remove constraint on source for specific order of file sequencing (i.e. Allows source to restart file with new FSN if necessary).

2.5.14.1 Duplicate LDU

This first paragraph was rewritten to clarify.

2.5.14.3 Incomplete File Timer

This section was added to allow the sink to discard a partial file of multiple LDUs when the T_{14} timeout between LDU transmissions is exceeded. It ensures that a source device cannot "lock-up" a sink.

2.5.15 SYN Word

The LDU sequence anomalies which generate a SYN response by the sink were clarified.

2.5.16 Response to ACK/NAK/SYN

The T_{16} timer was introduced to replace T_{10} and T_8. Also, the action taken by the source upon receipt of a SYN word was updated, which relaxes requirements to maintain a specific File Sequence ordering by the source.

2.5.19 Protocol Initialization

2.5.19.1 Bit-Oriented Protocol Version,

2.5.19.2 ALOHA Response, and

2.5.19.3 Character-429 Determination

This section has been added to replace and expand on the definition of the process to determine the link layer protocol version supported by an interfacing system. These sections replace three sections from Supplement 13.

2.3.1.5.1 Bit-Oriented Protocol Determination

2.5.19 ALO Response, and

2.5.20 Bit Protocol Verification

2.6 Windowed Bit-Oriented Protocol

This is a completely new section which contains the system description of the new LLC2-like bit-oriented link layer protocol for 429. It is based on Section 2.5, "Bit-Oriented Communications Protocol", with expanded text as specified to allow for more efficient use of the 429 high (or low) speed data bus through "windowing". The definition includes provision for a Link Control Word prior to each LDU.

ATTACHMENT 1 – EQUIPMENT CODES

New Equipment Code Identifiers were added.

ATTACHEMENT 6 – WORD FORMATS AND ENCODING EXAMPLES

Example added for label 171.

ATTACHMENT 10 – VARIABLES OF BIT ORIENTED PROTOCOL

Table 10-1 was updated to include a standard value for N_7, the maximum number of LDUs in a window (see Section 2.6 "Windowed Bit-Oriented Protocol").

Table 10-3 deleted Option 6 (O_6) for NAK Send Time, and deleted Option 9 (O_9) for the Character Data Word, both of which are no longer used.

Table 10-4 was revised to include columns for low speed maximum and minimum values. These values were established for timers and as response time design goals for incoming transmissions. Timers T_{13} through T_{16} were added.

Table 10-5 was added to include a definition of high speed maximum and minimum values for timers and response time design goals. The format is the same as the revised Table 10-4. Timer T_{10} is not used in the high speed protocol.

Table 10-6 was added to include notes to Tables 10-1 through 10-5.

ATTACHMENT 11 – BIT-ORIENTED DATA FILE TRANSFER WORD FORMATS

Table 11-1A added "spares" for the deleted Character Data Formats and corrected "Protocol Data Word" to read "Protocol Word".

Table 11-4 updated definitions for bits 9 through 24 of the ALO and ALR words, and added the LCW (LDU Control Word) format definition.

Table 11-4A was added as a partial replacement for ATTACHMENT 11C and Table 11-4B was added to define the new window definitions for the Windowed Bit-Oriented protocol in Section 2.6.

Table 11-6A was revised, changing the former GFI bit pattern (0001) for ISO 8208 to "unassigned". The bit pattern (0100) for ISO 8473 was changed to a more

ATTACHMENT 11 – BIT-ORIENTED DATA FILE TRANSFER WORD FORMATS (cont'd)

generic ISO 9577 definition. The bit pattern 1110 (hex"E") is now defined as "ACARS VHF Format".The "NOTES" in ATTACHMENT 11 have been renumbered to correspond to the new table definitions.

ATTACHMENT 11C – ALOHA/ALOHA RESPONSE PROTOCOL WORD DEFINITION

This Attachment has been deleted. This information has been moved to Tables 11-4, 11-4A, and 11-4B.

ATTACHMENT 13A – ALOHA VERSION DETERMINATION SEQUENCE

This Attachment was added to support the ALOHA version determination sequence called out in Section 2.5.19.1.1.

ATTACHMENT 14 – SYSTEM ADDERESS LABELS

New System Address Labels (SAL) were added.

ATTACHMENT 16 – SEQUENCE OF PROTOCOL AND DATA WORDS IN WINDOW TRANSFER

This Attachment was added to illustrate the window transfers for new Section 2.6.

ATTACHMENT 17 – FLOW DIAGRAM USED TO DETERMINE CHARACTER-ORIENTED VS BIT-ORIENTED PROTOCOL

This Attachment was added to illustrate the logic flow that determines whether a character-oriented or bit-oriented link layer protocol interface is to be used.

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SUPPLEMENT 15

TO

ARINC SPECIFICATION 429

MARK 33 DIGITAL INFORMATION TRANSFER SYSTEM (DITS)

Published: September 1, 1995

Prepared by the Airlines Electronic Engineering Committee

Adopted by the Airlines Electronic Engineering Committee: April 18, 1995

A. PURPOSE OF THIS DOCUMENT

This Supplement introduces new label assignments, equipment IDs, system address labels and updates to the 429W protocol.

B. ORGANIZATION OF THIS SUPPLEMENT

The first part of this document, printed on goldenrod paper contains descriptions of changes introduced into this Specification by this Supplement. The second part consists of replacement white pages for the Specification, modified to reflect the changes. The modified and added material on each page is identified by a c-15 in the margins. Existing copies of ARINC Specification 429 may be updated by simply inserting the replacement white pages where necessary and destroying the pages they replace. The goldenrod pages are inserted inside the rear cover of the Specification.

C. CHANGES TO ARINC SPECIFICATION 429 INTRODUCED BY THIS SUPPLEMENT

This section presents a complete tabulation of the changes and additions to the Specification introduced by this Supplement. Each change or addition is defined by the section number and the title currently employed in the Specification or by the section name and title that will be employed when the Supplement is eventually incorporated. In each case a brief description of the change or addition is included.

2.0 Digital Information Transfer System Standards

Numerous changes were made to the protocol throughout this Section.

2.1.5.3 Discrete Data Words

The technique for encoding SSM bits in discrete words were revised.

ORIGINAL TEXT FOLLOWS:

2.1.5.3 Discrete Data Words

A source system should annunciate any detected failure that could cause one or more of the words normally output by that system to be unreliable. Three methods are defined. The first method is to set bit numbers 30 and 31 in the affected word(s) to the "Failure Warning" code defined in the table below. This is the preferred method. Words containing the "Failure Warning" code should continue to be supplied to the data bus during the failure condition. When using the second method, the equipment may stop transmitting the affected word or words on the data bus. The third method applies to data words which are defined such that they contain failure information within the data field. For these applications, refer to the associated ARINC equipment characteristic to determine the proper SSM reporting.

The "No Computed Data" code should be annunciated in the affected Discrete Data word(s) when a source system is unable to compute reliable data for reasons other than system failure.

When the "Functional Test" code appears as a system output, it should be interpreted as advice that the data in the Discrete Data word contents are the result of the execution of a functional test.

DISCRETE DATA WORDS

Bit		Meaning
31	30	
0	0	Verified Data, Normal Operation
0	1	No Computed Data
1	0	Functional Test
1	1	Failure Warning

2.2.2 Modulation

The following Commentary was added:

"Avionics manufacturers are warned that bus activity monitoring should be implemented with caution. Crossed wiring (interchanging A and B) at one end of the bus, which will cause improper LRU/system operation, may not necessarily be detected by a "simple" bus activity monitor."

2.2.4.2 Receiver Input Impedance

The word "parallel" was changed to "combination".

Figure 3.1 Radio Systems Management Word Formats

VHF Com Frequency Word - Bits 7,8,20,23 changed to "0" and bits 15,16,21,28 changed to "1".

ATTACHMENT 1 - LABEL CODES

This attachment was updated according to the tables on the following pages.

Designation for label 155 027 changed from BCD to BNR.

ATTACHMENT 1 - LABEL CODES

The following new equipment codes were assigned:
03D, 053, 05A, 0D0, 0E0, 12C, 160, 19F, 13B

ATTACHMENT 2 - DATA STANDARDS

This attachment was updated according to the tables on the following pages. Newly assigned discrete word formats are included.

In word 270 115, bit 12 was changed from "pad" to "Tune". AUTOTUNE was assigned for "1" and NO AUTOTUNE was assigned to "0".

Word 155 027 moved from Table 1 to Table 2.

In Table 2 "SIG DIG" was changed to "SIG BIT".
In Table 2 under label 077, "0--" was changed to "037".

Duplicate 244 08D word removed.

ATTACHMENT 6 - GENERAL WORD FORMATS AND ENCODING EXAMPLES

Table 2 - examples for Flight Director Pitch and Total Air Temp corrected.

Examples for the following tables added.

Manufacturer Specific Data Word
010101 assigned to Garmin
010110 assigned to ARNAV Systems

Bit 11 modified for label 150 to include reference to precision source.

Word format for label 077 00B removed (from two places).

ATTACHMENT 9B - GENERAL AVIATION WORD EXAMPLES

Manufacturer Specific Data Word
010101 assigned to Garmin
010110 assigned to ARNAV Systems

ATTACHMENT 10 - VARIABLES OF BIT-ORIENTED PROTOCOL

Revised Notes 1 and 4.

Table 10-3 BIT-ORIENTED PROTOCOL OPTIONS - Added Option 0_{12}

Table 10-5 VARIABLES OF HIGH SPEED BIT-ORIENTED PROTOCOL - Revised Time T_{10} min and max values.

ATTACHMENT 11 - BIT-ORIENTED DATA FILE TRANSFER WORD FORMATS

Table 11-6A GENERAL FORMAT IDENTIFIER (GFI) - Revised “Reserved ISO 9577” to “ISO 9577”

ATTACHMENT 11A - DESTINATION CODES

Added Cabin Packet Data Function. Corrected Ground Station bit encoding.

ATTACHMENT 11B - STATUS CODES

Revised description of Code 86. Added entries for Code 8E through 95.

ATTACHMENT 14 - SYSTEM ADDRESS LABELS

The following labels were added:
170 DFDAU (Mandatory Load Function)
266 Cabin Video System (Airshow)
334 Cabin Telecommunications Unit (CTU)
340 HF Data Radio/Data Unit #1
344 HF Data Radio/Data Unit #2

The following labels were revised:
175 HGA HPA
176 Spare
177 LGA HPA

APPENDIX 8 - INTEROPERABILITY OF BIT-ORIENTED LINK LAYER PROTOCOL

Appendix added.

APPENDIX 9 - SDL DIAGRAMS OF THE WILLIAMSBURG PROTOCOL

Appendix added.

NEW AND REVISED BNR LABEL ASSIGNMENTS

	LABEL	EQ ID	PARAMETER	BINARY UNITS	RANGE	SIG	RESOL	MIN TI	MAX TI	NOTES
New	061	002	ACMS Information							See Att. 6
New	062	002	ACMS Information							See Att. 6
New	063	002	ACMS Information							See At. 6
New	145	002	TACAN Control	See Section 3.1.4				180	220	See Att. 6
Add	226	002	Min Op. Fuel Temp (non-conflicting)							
New	233	002	ACMS Information							See Att. 6
New	234	002	ACMS Information							See Att. 6
New	235	002	ACMS Information							See Att. 6
New	236	002	ACMS Information							See Att. 6
Revise	265	002	Min Buffet Airspeed			11				
Revise	360	002	Flight information							See Att. 6
Revise	370	004	g							
Revise	014	005	Magnetic Heading	Deg						
Revise	370	005	g							
Revise	205	006	Mach		4096					
Revise	205	01A	Mach		4096					
New	034	025	VOR/ILS Frequency					125	250	
New	035	025	DME Frequency					125	250	
New	060	025	S/G HARDWARE PART NO.							See Att. 6
New	061	025	S/G HARDWARE PART NO.							See Att. 6
New	101	025	Selected Heading	Deg/180	+ - 180	12	0.05	125	250	
New	121	025	Pitch Limit	Deg/180	+ - 180	14	0.01	125	250	
New	145	025	Discrete Status 2 EFIS							
New	146	025	Discrete Status 3 EFIS							
New	147	025	Discrete Status 4 EFIS							
New	155	025	Discrete Status 5 EFIS							
New	160	025	Discrete Status 6 EFIS							
New	161	025	Discrete Status 7 EFIS							
New	162	025	ADF brg left/right	Deg/180	+ - 180	12	0.05	125	250	SDI-01 = left / SDI-10 = right
New	207	025	OP, SOFTWARE PART NO.							See Att. 6
New	272	025	Discrete Data #3							
New	273	025	Discrete Data #4							
New	276	025	Discrete Status 8 EFIS							
New	054	037	Zero Fuel Weight (kg)	kg	655360	15	20	100	200	
New	074	037	Zero Fuel Weight (lb)	lb	1310720	15	40	100	200	
Correction	076	037	Longitudinal C/G		163.84					
New	077	037	Lateral C/G	%MAC	131.072	17	0.01	100	200	
New	107	037	Long, Zero Fuel C/G	%MAC	163.84	14	0.01	100	200	
DELETE	256	037								
DELETE	257	037								
DELETE	347	037								
Revise	205	038	Mach		4096					
Revise	342	038	EPR Limit		4	12	0.001	150	250	
Revise	342	038	N1 Limit	%RPM	256	14	0.015	150	250	

NEW AND REVISED BNR LABEL ASSIGNMENTS

	LABEL	EQ ID	PARAMETER	BINARY UNITS	RANGE	SIG	RESOL	MIN TI	MAX TI	NOTES
New	227	03D	AVM Command							See Att. 2
New	270	03D	Discrete Data #1							See Att. 2
New	350	03D	Maintenance Data #1							See Att. 2
New	353	03D	Maintenance Data #4							See Att. 2
New	354	03D	N1 Vibration	Scalar	5.12	9	0.01			Bit 11-Chan. A/Bit 12-Chan. B
New	355	03D	N2 Vibration	Scalar	5.12	9	0.01			Bit 11-Chan. A/Bit 12-Chan. B
New	356	03D	N3 Vibration	Scalar	5.12	9	0.01			Bit 11-Chan. A/Bit 12-Chan. B
New	357	03D	BB Vibration	Scalar	5.12	9	0.01			Bit 11-Chan. A/Bit 12-Chan. B
New	360	03D	N1 Rotor Imbalance Angle	Deg.	+-180	9	1			Bit 11-Chan. A/Bit 12-Chan. B
New	361	03D	LPT Rotor Imbalance Angle (737 only)	Deg.	+-180	9	1			
New	025	04D	Load SEL Control	na	204700	11	100			
New	156	04D	L TANK FAULTS					TBD	TBD	See Att. 2
New	157	04D	R TANK FAULTS					TBD	TBD	See Att. 2
New	160	04D	C TANK FAULTS					TBD	TBD	See Att. 2
New	161	04D	A TANK FAULTS					TBD	TBD	See Att. 2
New	241	04D	FQIS SYSTEM DATA		See Att. 6			500	1024	See Att. 6
New	254	04D	Actual Fuel Quan (teat)	Lbs	262144	15	8	500	1000	
New	255	04D	Fuel Quantity (gal)	Gallons	32768	15	1	500	1000	
New	256	04D	FUEL DISCRETES					TBD	TBD	See Att. 2
New	262	04D	T/U CAP-L TANK 1-4	PF	655.35	16	0.01	TBD	TBD	
New	263	04D	T/U CAP-L TANK 5-8	PF	655.35	16	0.01	TBD	TBD	
New	264	04D	T/U CAP - L TANK 9-12	PF	655.35	16	0.01	TBD	TBD	
New	265	04D	T/U CAP - L TANK 13-14	PF	655.35	16	0.01	TBD	TBD	
New	266	04D	T/U CAP - C TANK 1-4	PF	655.35	16	0.01	TBD	TBD	
New	267	04D	T/U CAP - C TANK 5-8	PF	655.35	16	0.01	TBD	TBD	
New	270	04D	T/U CAP - C TANK 9	PF	655.35	16	0.01	TBD	TBD	
New	271	04D	T/U CAP - A TANK 1-4	PF	655.35	16	0.01	TBD	TBD	
New	272	04D	T/U CAP - A TANK 5-8	PF	655.35	16	0.01	TBD	TBD	
New	273	04D	T/U CAP -A TANK 9-11	PF	655.35	16	0.01	TBD	TBD	
New	274	04D	T/U CAP - R TANK 1-4	PF	655.35	16	0.01	TBD	TBD	
New	275	04D	T/U CAP - R TANK 5-8	PF	655.35	16	0.01	TBD	TBD	
New	276	04D	T/U CAP - R TANK 9-12	PF	655.35	16	0.01	TBD	TBD	
New	277	04D	T/U CAP - R TANK 13-14	PF	655.35	16	0.01	TBD	TBD	
New	310	04D	COMP CAP-TANK	PF	327.67	15	0.01	TBD	TBD	See Att. 6 for SDI encoding
New	320	04D	DENSITY-TANK	LB/GAL	8.191	13	0.001	TBD	TBD	See Att. 6 for SDI encoding
New	324	04D	TANK VSO QUANTITY	GALS	32767	15	1	TBD	TBD	See Att. 6 for SDI encoding
New	326	04D	UPLIFT QUANTITY	LBS	1638300	14	100	TBD	TBD	
New	327	04D	UPLIFT DENSITY	LB/GAL	8.181	13	0.001	TBD	TBD	
New	341	04D	I/O S/W REV 1&2		(1)	16	N/A	TBD	TBD	
New	342	04D	S/W REV-TANK		(1)	16	N/A	TBD	TBD	See Att. 6 for SDI encoding
New	344	04D	FUEL DISCRETES					50	100	See Att. 2
New	345	04D	DISCRETES STATUS 1&3					100	200	See Att. 2
New	346	04D	CABLE CAP-HI-Z	PF	65535	16	1	100	200	See Att. 6 for SDI encoding

NEW AND REVISED BNR LABEL ASSIGNMENTS

	LABEL	EQ ID	PARAMETER	BINARY UNITS	RANGE	SIG	RESOL	MIN TI	MAX TI	NOTES
New	350	04D	MAINT. DATA FQIS 1-3					100	200	See Att. 2
New	351	04D	MAINT. DATA FQIS 1&3					100	200	See Att. 2
New	352	04D	MAINT. DATA FQIS 1-4					100	200	See Att. 2
New	353	04D	MAINT. DATA FQIS 1-4					100	200	See Att. 2
New	354	04D	FQIS TANK ID					100	200	See Att. 2, Att. 6 for SDI
New	355	04D	MAINT. DATA FQIS 2-4					100	200	See Att. 2
New	357	04D	MAINT. DATA FQIS 2-3					100	200	See Att. 2
New	151	05A	LB/KG Control Word							See Att. 2
Revise	176	05A	Fuel Temperature - Set to Zero	Deg. C	512	11	0.25	100	200	
Revise	177	05A	Fuel Temp. Left Wing Tank	Deg. C	512	11	0.25	100	200	
Delete	200	05A								
Revise	201	05A	Fuel Temp. Right Wing Tank	Deg. C	512	11	0.25	100	200	
Revise	202	05A	Fuel Temperature - Set to Zero	Deg. C	512	11	0.25	100	200	
New	247	05A	Total Fuel	lb	655360	14	40	100	200	
New	250	05A	Preselected Fuel Quantity	lb	655360	14	40	100	200	
New	256	05A	Fuel Quantity - Left Outer Cell	lb	131072	15	4	100	200	Zero for A-321
New	257	05A	Fuel Quantity Left W/T Tank	lb	131072	15	4	100	200	
New	260	05A	Fuel Quantity Center Tank	lb	131072	15	4	100	200	
New	261	05A	Fuel Quantity Right I/C or W/T Tank	lb	131072	15	4	100	200	
New	262	05A	Fuel Quantity - Right Outer Cell	lb	131072	15	4	100	200	Zero for A-321
New	270	05A	Discrete Data #1					100	200	
New	271	05A	Discrete Data #2					100	200	
New	276	05A	Discrete Data #7					100	200	
New	300	05A	Internal Para. For SPARTIAAL							
New	301	05A	Internal Para. For SPARTIAAL							
New	302	05A	Internal Para. For SPARTIAAL							
New	303	05A	Internal Para. For SPARTIAAL							
New	304	05A	Internal Para. For SPARTIAAL							
New	305	05A	Internal Para. For SPARTIAAL							
New	306	05A	Internal Para. For SPARTIAAL							
New	307	05A	Internal Para. For SPARTIAAL							
New	310	05A	Internal Para. For SPARTIAAL							
New	311	05A	Internal Para. For SPARTIAAL							
New	312	05A	Fuel Quantity ACT 1	lb	131072	15	4	100	200	
New	313	05A	Fuel Quantity ACT 2	lb	131072	15	4	100	200	
New	314	05A	Internal Para. For SPARTIAAL							
New	315	05A	Internal Para. For SPARTIAAL							
New	316	05A	Internal Para. For SPARTIAAL							
New	317	05A	Internal Para. For SPARTIAAL							
New	324	05A	Effective Pitch Angle	Deg./180	+-180	14	0.01			
New	325	05A	Effective Roll Angle	Deg./180	+-180	14	0.01			
New	356	05A	Maintenance Word							
Revise	244	08D	Fuel Flow Rate		32768					

NEW AND REVISED BNR LABEL ASSIGNMENTS

	LABEL	EQ ID	PARAMETER	BINARY UNITS	RANGE	SIG	RESOL	MIN TI	MAX TI	NOTES
New	155	0BB	Maintenance Data #6							
New	156	0BB	Maintenance Data #7							
New	157	0BB	Maintenance Data #8							
New	160	0BB	Maintenance Data #9							
New	276	0BB	Discrete Data #5							
New	354	0BB	Maintenance Data #5							
New	005	0D0	Engine Discrete							Bit 11-Chan. A/Bit 12-Chan. B
New	006	0D0	Engine Discrete							
New	073	0D0	Engine Oil Quantity	US Pint	128	9	0.25			SDI1 = L/SD12 = R
New	173	0d0	Hydraulic Oil Quantity	US Pint	128	9	0.25			SDI1 = L/SD12 = B
New	174	0D0	Hydraulic Oil Pressure	PSI	4096	12	1			SDI1 = A/SD12 = B
New	316	0D0	Engine Oil Temperature	Deg. C	2048	12	0.5			SDI1 = L/SD12 = R
New	317	0D0	Engine Oil Pressure	PSI	4096	14	0.25			SDI1 = L/SD12 = R
New	344	0D0	N2	%RPM	256	13	0.03			SDI1 = L/SD12 = R
New	345	0D0	EGT	Deg. C	2048	12	0.5			SDI1 = L/SD12 = R
New	346	0D0	N1	%RPM	256	13	0.03			SDI1 = L/SD12 = R
New	347	0D0	Fuel Flow	Lb/Hr	32768	12	8			SDI1 = L/SD12 = R
New	353	0D0	Vibration	Scalar	5.12	8	0.02			SDI1 = L/SD12 = R
Revise	360	10A	Throttle Rate of Change		16	9/9				
New	146	112	TACAN Control	See Section 3.1.4				180	220	
New	222	112	TACAN Control	Deg/180	+-180	12	0.05	180	220	
New	101	114	C/G Target	%	164	8	0.01	100	200	
Revise	270	115	Stored TACAN Control Word					25	50	See Att. 2
New	221	12C	Indicated Angle of Attack (Ave.)	Deg/180	+-180	12	0.05	31.3	62.5	
New	222	12C	Indicated Angle of Attack (#1 left)	Deg/180	+-180	12	0.05	31.3	62.5	
New	223	12C	Indicated Angle of Attack (#1 right)	Deg/180	+-180	12	0.05	31.3	62.5	
New	224	12C	Indicated Angle of Attack (#2 left)	Deg/180	+-180	12	0.05	31.3	62.5	
New	225	12C	Indicated Angle of Attack (#2 right)	Deg/180	+-180	12	0.05	31.3	62.5	
New	114	13A	Ambient Pressure	PSIA	32	14	0.002	100	200	
New	130	13A	Inlet Temperature	Deg. C	128	11	0.0625	100	200	
New	131	13A	Inlet Pressure	PSIA	32	13	0.004	100	200	
New	134	13A	Throttle Lever Angle	Deg/180	+-180	12	0.05	25	50	
New	254	13A	N1 Cruise	%N1 Nom	256	14	0.015	100	200	
New	255	13A	N1 Climb	%N1 Nom	256	14	0.015	100	200	
New	264	13A	Burner Pressure	PSIA	512	14	0.031	100	200	
New	340	13A	N1 Take Off	%N1 Nom	256	14	0.015	25	50	
New	341	13A	N1 Reference	%N1 Nom	256	14	0.015	25	50	
New	344	13A	N2 Speed	%RPM	256	14	0.015	25	50	
New	345	13A	EGT Trimmed	Deg. C	2048	12	0.5	25	50	
New	346	13A	N1 Speed Actual	%N1 Nom	256	14	0.015	25	50	
New	347	13A	Fuel Flow	Lb/Hr	32768	14	2	50	100	
New	364	13A	N1 APR Rating	%N1 Nom	256	14	0.015	100	200	
New	365	13A	N1 Max Reverse	%N1 Nom	256	14	0.015	100	200	

NEW AND REVISED BNR LABEL ASSIGNMENTS

	LABEL	EQ ID	PARAMETER	BINARY UNITS	RANGE	SIG	RESOL	MIN TI	MAX TI	NOTES
New	366	13A	IGV Position	Deg./180	+-180	12	0.05	100	200	
New	367	13A	IGV Request	Deg./180	+-180	12	0.05	100	200	
New	341	160	Tank Unit Data							
New	147	xxx	TACAN Control Word					100	200	
Correction	171	xxx	Manu. Specific Status Word							See Att. 6
New	214	xxx	ICAO Aircraft Address (part 1)							See Att. 6
New	316	xxx	ICAO Aircraft Address (part 2)							
New	375	xxx	GPS Differential Correction Word A							See ARINC 743A
New	376	xxx	GPS Differential Correction Word B							See ARINC 743A
Revised	021	002	Selected EPR	EPR	0-3	4	0.001	100	200	
New	027	002	TACAN Selected Course	Degrees	0-359	3	1	167	333	
Revised	020	020	Selected Vertical Speed	Ft/Min	0-6000	4	1	100	200	
Revised	021	020	Selected EPR	EPR	0-3	4	0.001	100	200	
New	047	020	VHF Com Frequency	See Chap. 3				100	200	
New	047	024	VHF Com Frequency	See Chap. 3				100	200	
Revised	155	027	MLS Selected GP Angle	Degrees				100	200	
Revised	065	037	Gross Weight		0-19999					
New	163	037	Zero Fuel Weight (lb)	Lbs	0-19999	5	1	100	200	
New	243	037	Zero Fuel Weight (kg)	KG	0-19999	5	1	100	200	
New	52	037	Long. Zero Fuel CG	%MAC	0-100.00	5	0.01	100	200	
New	012	04D	QTY-LD SEL (LB)	Lbs	0-79999	19	100			
New	013	04D	QTY - FLT DECK (LB)	Lbs	0-79999	19	100			
New	017	04D	TOTAL-FLT DECK (LB)	Lbs	0-79999	19	100			
New	020	04D	TNK-LD SEL(LB)	Lbs	0-79999	19	100			
New	022	04D	QTY-LD SEL (KG)	KG	0-79999	19	100			
New	023	04D	QTY-FLT DECK (KG)	KG	0-79999	19	100			
New	027	04D	TOTAL-FLT DECK (KG)	KG	0-79999	19	100			
New	030	04D	TNK-LD SEL(KG)	KG	0-79999	19	100			
New	135	05A	ACT 1 Fuel Quan. Display	KG/LB	0-9999	16	100	100	200	
New	136	05A	ACT 2 Fuel Quan. Display	KG/LB	0-9999	16	100	100	200	
New	137	05A	Center+ACT+ACT FQ Display	KG/LB	0-9999	16	100	100	200	
New	140	05A	Actual Fuel Quan. Display	KG/LB	0-9999	16	100	100	200	
New	141	05A	Preselected Fuel Quan. Display	KG/LB	0-9999	16	100	100	200	
New	142	05A	Left Wing Fuel Quan. Display	KG/LB	0-9999	16	100	100	200	
New	143	05A	Center Wing Fuel Quan. Display	KG/LB	0-9999	16	100	100	200	
New	144	05A	Right Wing Fuel Quan. Display	LG/LB	0-9999	16	100	100	200	
New	272	05A	Fuel Density	KG/M3	0-9999	16	0.0001	100	200	
New	273	05A	Sensor Values Left Wing Tank	pF	0-100	13	0.1	100	200	
New	274	05A	Sensor Values Center Wing Tank	pF	0-100	13	0.1	100	200	
New	275	05A	Sensor Values Right Wing Tank	pF	0-100	13	0.1	100	200	
New	047	086	VHF Com Frequency	See Chap. 3				100	200	
Revised	021	0A1	Selected EPR	EPR	0-3	4	0.001	100	200	
New	201	112	TACAN Distance	N.M.	0-399.99	5	0.01	190	210	

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SUPPLEMENT 16

TO

ARINC SPECIFICATION 429

MARK 33 DIGITAL INFORMATION TRANSFER SYSTEM (DITS)

Published: September 27, 2001

Prepared by the Airlines Electronic Engineering Committee

Adopted by the Airlines Electronic Engineering Committee: November 14, 2000

A. PURPOSE OF THIS SUPPLEMENT

This Supplement introduces new label assignments, equipment IDs, and System Address Labels (SAL) to ARINC Specification 429.

B. ORGANIZATION OF THIS SUPPLEMENT

The material in Supplement 16 is integrated into ARINC Specification 429 to form an updated version of the standard. Changes introduced by Supplement 16 are identified using change bars and are labeled by a "c-16" symbol in the margin.

C. CHANGES TO ARINC SPECIFICATION 429 INTRODUCED BY THIS SUPPLEMENT

This section presents a complete tabulation of the changes and additions to the Specification introduced by this Supplement. Each change or addition is defined by the section number and the title currently employed in the Specification or by the section name and title that will be employed when the Supplement is eventually incorporated. In each case a brief description of the change or addition is included.

ATTACHMENT 1-1 - LABEL CODES

Attachment 1-1 was updated to include new label assignments, of these new assignments 35 labels were revised and 3 label assignment deletions. A summary of label codes added by Supplement 16 is reproduced as Attachment 1-16 to this Supplement.

The deleted labels are:

Label Code	PARAMETER
053	Track Angle Magnetic
217	Average Static Pressure
231	Total Air Temperature

ATTACHMENT 1-2 - EQUIPMENT CODES

Attachment 1-2 was updated to include new equipment codes:

EQ ID	EQUIPMENT TYPE
055	Multi-Mode Receiver (MMR) (755)
056	GNSS Navigation Landing Unit (GNLU) (756)
057	Cockpit Voice Recorder (CVR) (757)
058	Communication Management Unit Mark 2 (758)
060	GNSS Navigation Unit (GNU) (760)
061	Satellite Terminal Unit (STU) (761)
0BB	Flap Control Unit (B747-400)/Flap Slat Electronics Unit (B767-400)
108	Electronic Engine Control (EEC) Channel A (B737-700)
109	Electronic Engine Control (EEC) Channel B (B737-700)
122	Ground Auxiliary Power Unit (A320/319/321)
12D	Logic Drive Control Computer (B747/B767)
12E	Cargo Control Logic Unit (B767)
12F	Cargo Electronics Interface Unit (B767)
13B	Audio Entertainment System (AES) Controller (Boeing)
13F	Camera Interface Unit (A340/B777)
130	Load Management Unit (LMU) Airbus
140	Supersonic Air Data Computer (Honeywell)
142	ADS-B Link Display Processor Unit (LPDU)
143	Vertical/Horizontal Gyro (Litton)
167	Air Traffic Service Unit (Airbus)
168	Integrated Standby Instrument System (A340/330, A320/319/321)
169	Data Link Control and Display Unit (A340/330)
200	Versatile Integrated Avionics Unit (B717/MD-10)
201	Electronic Spoiler Control Unit (B717)
202	Brake Control Unit (B717)
203	Pneumatic Overheat Detection Unit (B717)
204	Proximity Switch Electronics Unit (B717)
205	APU Electronic Control Unit (B717)
206	Aircraft Interface Unit (MD-10)
207	Fuel Quantity Gauging Unit (MD-10)

ATTACHMENT 2 - DATA STANDARDS

Attachment 2 was updated to reflect new data standards. The basis of the changes introduced in Supplement 16 are reproduced as Attachment 1-16 to this Supplement.

ATTACHMENT 4 - INPUT/OUTPUT CIRCUIT STANDARDS

Text was added to identify the drawing as defining total system characteristics.

ATTACHMENT 6 - GENERAL WORD FORMATS AND ENCODING EXAMPLES

The text describing Label 150 bit 11 was revised to reflect the contents of ARINC Characteristic 743A, GNSS Sensor.

The text describing Label 214 and Label 216 was revised to reflect the contents of ARINC Characteristic 758, Communications Management Unit.

ATTACHMENT 8 - OUTPUT SIGNAL TIMING TOLERANCES

The text was modified to define pulse rise and fall times.

ATTACHMENT 11 - SYSTEM ADDRESS LABELS

The following System Address Labels were added:

SAL OCTAL LABEL	SYSTEM
157	CVR
210	FCMC Com A340-500/600
211	FCMC Mon A340-500/600
212	FCMC Int A340-500/600
225	HUD
241	APM-MMR
242	MMR
244	ILS
245	MLS
246	AHRS
251	VDR #1
252	VDR #2
253	VDR #3
310	GPWS
311	GNLU 1
312	GNLU 2
313	GNLU 3
314	GNU 1
315	GNU 2
316	GNU 3
321	AUTOTHROTTLE COMPUTER
322	FCC 1
323	FCC 2
324	FCC 3
325	APU
326	APU CONTROLLER
327	Mode Control Panel (MCP)
330	FMC 3
331	ATC TRANSPONDER
332	DADC
362	Passenger Services System (PSS) 767-300,400
363	Cabin Service System (CSS) 747-400
364	Audio Entertainment System (AES) Boeing
366	Multicast
367	Bridge

APPENDIX E – GUIDELINES FOR LABEL ASSIGNMENTS

Labels 171, 172, 214 and 216 were removed from spare labels (item 3).

ATTACHMENT 1-16
SUPPLEMENT 16 UPDATES TO LABEL CODES

Code No. (Octal)	Data	Eqpt. ID (Hex)	Parameter	Units	Range	Sig Bits	Resolution	MIN TX	MAX TX
001	BCD	056	Distance To Go	The Same Parameters as the FMS EQ ID 002					
001	BCD	060	Distance To Go	The Same Parameters as the FMS EQ ID 002					
002	BCD	056	Time To Go	The Same Parameters as the FMS EQ ID 002					
002	BCD	060	Time To Go	The Same Parameters as the FMS EQ ID 002					
012	BCD	056	Ground Speed	The Same Parameters as the FMS EQ ID 002					
012	BCD	060	Ground Speed	The Same Parameters as the FMS EQ ID 002					
017	BCD	055	Selected Runway Heading	Degrees	0-359.9	4	0.1		
020	Discrete	06D	Landing Gear Position Infor & System Status					90	100
021	Discrete	06D	Landing Gear Position Infor & System Status					90	100
022	Discrete	06D	Landing Gear Position Infor & System Status					90	100
023	Discrete	06D	Landing Gear Position Infor & System Status					90	100
024	Discrete	06D	Landing Gear Position Infor & System Status					90	100
027	BCD	056	TACAN Selected Course	The Same Parameters as the FMS EQ ID 002					
027	BCD	060	TACAN Selected Course (Bcd)	The Same Parameters as the FMS EQ ID 002					
033	BCD	055	Landing System Mode/Frequency						
033	BCD	056	ILS Frequency	The Same Parameters as the FMS EQ ID 002					
033	BCD	060	ILS Frequency	The Same Parameters as the FMS EQ ID 002					
034	BCD	056	VOR/ILS Frequency	The Same Parameters as the FMS EQ ID 002					
034	BCD	060	VOR/ILS Frequency #1	The Same Parameters as the FMS EQ ID 002					
035	BCD	055	Paired DME Frequency	MHz	1008-135.9	4	0.05		
035	BCD	056	DME Frequency	The Same Parameters as the FMS EQ ID 002					
035	BCD	060	DME Frequency #1	The Same Parameters as the FMS EQ ID 002					
036	BCD	055	MLS Channel Selection		500-600	3	1		
036	BCD	056	MLS Frequency Channel	The Same Parameters as the FMS EQ ID 002					
036	BCD	060	MLS Frequency/Channel	The Same Parameters as the FMS EQ ID 002					
041	BCD	056	Set Latitude	The Same Parameters as the FMS EQ ID 002					
041	BCD	060	Set Latitude	The Same Parameters as the FMS EQ ID 002					
042	BCD	056	Set Longitude	The Same Parameters as the FMS EQ ID 002					
042	BCD	060	Set Longitude	The Same Parameters as the FMS EQ ID 002					
043	BCD	056	Set Magnetic Heading	The Same Parameters as the FMS EQ ID 002					
043	BCD	060	Set Magnetic Heading	The Same Parameters as the FMS EQ ID 002					
052	BNR	004	Body Pitch Accel	Deg/Sec^2	± 64	15	0.002	50 Hz	117 Hz
052	BNR	038	Body Pitch Accel	Deg/Sec^2	± 64	15	0.002	50 Hz	117 Hz
~~053~~	~~BCD~~	~~004~~	~~Track Angle Magnetic~~	~~Degree~~	~~1~~	~~3~~	~~1~~	~~250~~	~~500~~
053	BNR	004	Body Roll Accel	Deg/Sec^2	± 64	15	0.002	50 Hz	117 Hz
053	BNR	038	Body Roll Accel	Deg/Sec^2	± 64	15	0.002	50 Hz	117 Hz
054	BNR	004	Body Yaw Accel	Deg/Sec^2	± 64	15	0.002	50 Hz	117 Hz
054	BNR	038	Body Yaw Accel	Deg/Sec^2	± 64	15	0.002	50 Hz	117 Hz
056	BCD	056	ETA (Active Waypoint)	The Same Parameters as the FMS EQ ID 002					
056	BCD	060	ETA (Active Waypoint)	The Same Parameters as the FMS EQ ID 002					
061	BNR	00B	Pseudo Range	Meters	±268435456	20	256	200	1200
061	BNR	056	ACMS Information	The Same Parameters as the FMS EQ ID 002					
061	BNR	060	ACMS Information	The Same Parameters as the FMS EQ ID 002					
062	BNR	00B	Pseudo Range Fine	Meters	256	11	0.125	200	1200
062	BNR	056	ACMS Information	The Same Parameters as the FMS EQ ID 002					
062	BNR	060	ACMS Information	The Same Parameters as the FMS EQ ID 002					
063	BNR	00B	Range Rate	M/S	±4096	20	0.0039	200	1200
063	BNR	056	ACMS Information	The Same Parameters as the FMS EQ ID 002					
063	BNR	060	ACMS Information	The Same Parameters as the FMS EQ ID 002					
064	BNR	00B	Delta Range	Meters	±4096	20	0.0039	200	1200
065	BNR	00B	SV Position X	Meters	±67108864	20	64	200	1200
066	BNR	00B	SV Position X Fine	Meters	64	14	0.0039	200	1200
070	BNR	00B	SV Position Y	Meters	±67108864	20	64	200	1200
070	BNR	056	Reference Airspeed (Vref)	The Same Parameters as the FMS EQ ID 002					
070	BNR	060	Reference Airspeed (Vref)	The Same Parameters as the FMS EQ ID 002					
071	BNR	00B	SV Position Y Fine	Meters	64	14	0.0039	200	1200
072	BNR	00B	SV Position Z	Meters	±67108864	20	64	200	1200
073	BNR	00B	SV Position Z Fine	Meters	64	14	0.0039	200	1200
074	BNR	00B	UTC Measure Time	Seconds	10.0	20	9.536743µs	200	1200

ATTACHMENT 1-16
SUPPLEMENT 16 UPDATES TO LABEL CODES

Code No. (Octal)	Data	Eqpt. ID (Hex)	Parameter	Units	Range	Sig Bits	Resolution	MIN TX	MAX TX
074	BNR	056	Zero Fuel Weight	The Same Parameters as the FMS EQ ID 002					
074	BNR	060	Zero Fuel Weight	The Same Parameters as the FMS EQ ID 002					
074	BNR	114	Zero Fuel Weight	Pounds	1310680	15	40	100	400
075	Discrete	008	Maximum Hazard Alert Level Output						
075	BNR	114	Aircraft Gross Weight	Pounds	1310680	15	40	100	200
076	BNR	00B	GNSS Altitude (Msl)	Feet	±131072	20	0.125	200	1200
076	Discrete	008	Hazard Azimuth Output						
076	BNR	114	Aircraft Longitudinal Center Of Gravity	Percent	163.83%	14	0.01%	100	200
077	Discrete	008	Hazard Range Output						
077	BNR	056	Target Airspeed	The Same Parameters as the FMS EQ ID 002					
077	BNR	060	Target Airspeed	The Same Parameters as the FMS EQ ID 002					
077	BNR	114	Zero Fuel Center Of Gravity	Percent	163.83%	14	0.01%	100	200
100	BNR	056	Selected Course #1	The Same Parameters as the FMS EQ ID 002					
100	BNR	060	Selected Course #1	The Same Parameters as the FMS EQ ID 002					
101	BNR	00B	HDOP	N/A	1024	15	0.031	200	1200
102	BNR	00B	VDOP	N/A	1024	15	0.031	200	1200
102	BNR	056	Selected Altitude	The Same Parameters as the FMS EQ ID 002					
102	BNR	060	Selected Altitude	The Same Parameters as the FMS EQ ID 002					
103	BNR	00B	GNSS Track Angle	Degrees	±108°	15	0.0055°	200	1200
103	BNR	056	Selected Airspeed	The Same Parameters as the FMS EQ ID 002					
103	BNR	060	Selected Airspeed	The Same Parameters as the FMS EQ ID 002					
104	BNR	056	Selected Vertical Speed	The Same Parameters as the FMS EQ ID 002					
104	BNR	060	Selected Vertical Speed	The Same Parameters as the FMS EQ ID 002					
105	BNR	055	Selected Runway Heading	Degrees	± 180	11	0.1		
105	BNR	056	Selected Runway Heading	The Same Parameters as the FMS EQ ID 002					
105	BNR	060	Selected Runway Heading	The Same Parameters as the FMS EQ ID 002					
106	BNR	060	Selected Mach	The Same Parameters as the FMS EQ ID 002					
106	BNR	056	Selected Mach	The Same Parameters as the FMS EQ ID 002					
107	BNR	056	Selected Cruise Altitude	The Same Parameters as the FMS EQ ID 002					
107	BNR	060	Selected Cruise Altitude	The Same Parameters as the FMS EQ ID 002					
110	BNR	00B	GNSS Latitude	Degrees	±108°	20	0.000172°	200	1200
111	BNR	00B	GNSS Longitude	Degrees	±108°	20	0.000172°	200	1200
112	BNR	00B	GNSS Ground Speed	Knots	4096	15	0.125	200	1200
114	BNR	056	Desired Track	The Same Parameters as the FMS EQ ID 002					
114	BNR	060	Desired Track	The Same Parameters as the FMS EQ ID 002					
115	BNR	056	Waypoint Bearing	The Same Parameters as the FMS EQ ID 002					
115	BNR	060	Waypoint Bearing	The Same Parameters as the FMS EQ ID 002					
116	BNR	00B	Horizontal GLS Deviation Rectilinear	Feet	± 24000	18	.00915		100
116	BNR	055	Horizontal GLS Deviation Rectilinear	Feet	± 24000	18	00915		100
116	BNR	056	Cross Track Distance	The Same Parameters as the FMS EQ ID 002					
116	BNR	060	Cross Track Distance	The Same Parameters as the FMS EQ ID 002					
117	BNR	00B	Vertical GLS Deviation Rectilinear	Feet	± 1024	14	.0625		100
117	BNR	055	Vertical GLS Deviation Rectilinear	Feet	± 1024	14	.0625		100
117	BNR	056	Vertical Deviation	The Same Parameters as the FMS EQ ID 002					
117	BNR	060	Vertical Deviation	The Same Parameters as the FMS EQ ID 002					
120	BNR	00B	GNSS Latitude Fine	Degrees	0.000172°	11	8.38-E-8°	200	1200
120	BNR	056	Range to Altitude	The Same Parameters as the FMS EQ ID 002					
120	BNR	060	Range To Altitude	The Same Parameters as the FMS EQ ID 002					
121	BNR	00B	GNSS Longitude Fine	Degrees	0.000172°	11	8.38-E-8°	200	1200
121	BNR	056	Horizontal Command Signal	The Same Parameters as the FMS EQ ID 002					
121	BNR	060	Horizontal Command Signal	The Same Parameters as the FMS EQ ID 002					
122	BNR	056	Vertical Command Signal	The Same Parameters as the FMS EQ ID 002					
122	BNR	060	Vertical Command Signal	The Same Parameters as the FMS EQ ID 002					
124	Discrete	00B	Digital Time Mark	-				200	1200
125	BCD	00B	UTC	Hr:Min	23:59.9	5	0.1 Min	200	1200
125	BCD	002	Universal Coordinate Time	Hr-Min	0-23.59.9	4	0.1	100	200
125	BCD	056	Universal Coordinated Time (UTC)	The Same Parameters as the FMS EQ ID 002					
125	BCD	060	Universal Coordinated Time (UTC)	The Same Parameters as the FMS EQ ID 002					

ATTACHMENT 1-16
SUPPLEMENT 16 UPDATES TO LABEL CODES

Code No. (Octal)	Data	Eqpt. ID (Hex)	Parameter	Units	Range	Sig Bits	Resolution	MIN TX	MAX TX
126	BNR	056	Vertical Deviation (Wide)	The Same Parameters as the FMS EQ ID 002					
126	BNR	060	Vertical Deviation (Wide)	The Same Parameters as the FMS EQ ID 002					
130	BNR	00B	Aut Horiz Integ Limit	NM	16	17	1.2E-4	200	1200
133	BNR	00B	Aut Vert Integ Limit	Feet	32, 768	18	0.125	200	1200
136	BNR	00B	Vertical Figure Of Merit	Feet	32, 768	18	0.125	200	1200
137	BNR	140	Flap Angle	Degrees	180	12	0.05	62.5	200
140	BNR	00B	UTC Fine	Seconds	1	20	0.953674µs	200	1200
140	Discrete	114	Pump Contactor States						
141	BNR	00B	UTC Fine Fractions	Seconds	0.9536743µs	10	0.9313225ns	200	1200
141	Discrete	114	Pump Contactor and Pushbutton States						
142	Discrete	114	Pump Push Button and LP Switch State						
143	Discrete	114	Pump LP Switch State and FCMC Commands						
144	Discrete	114	Valve Feedback						
145	Discrete	114	Valve Feedback						
146	Discrete	114	Valve Feedback						
147	Discrete	114	Valve Feedback						
150	BNR	00B	UTC	Hr:Min:S	±23:59:59	17	1.0 sec	200	1200
150	BNR	056	Universal Coordinated Time	The Same Parameters as the FMS EQ ID 002					
150	BNR	060	Universal Coordinated Time	The Same Parameters as the FMS EQ ID 002					
150	Discrete	114	FCMC Valve Commands						
151	BNR	055	MLS AZ Deviation	mV	± 2400	15	0.0732		
151	BNR	056	Localizer Bearing (True)	The Same Parameters as the FMS EQ ID 002					
151	BNR	060	Localizer Bearing (True)	The Same Parameters as the FMS EQ ID 002					
151	Discrete	114	FCMC Valve Commands						
152	BNR	055	MLS GP Deviation	mV	± 2400	15	0.0732		
152	Discrete	114	Overhead Panel Switch/ Pushbutton & Refuel Panel Battery Power Supply Switch States						
153	BNR	055	MLS Selected Azimuth	Degrees	0-359	9	1		
153	Discrete	114	Level States						
154	BNR	055	MLS Max Selectable GP	Degrees	±51.1	9	1		
154	BNR	056	Runway Heading (True)	The Same Parameters as the FMS EQ ID 002					
154	BNR	060	Runway Heading (True)	The Same Parameters as the FMS EQ ID 002					
154	Discrete	114	Level States and Low Warning and Transfer Indications						
155	BNR	055	MLS Selected Glide Path	Degrees	±51.1	9	0.01		
155	Discrete	114	XFR Pump Faults & Wing Imbalance Warning						
156	BNR	055	MLS Basic Data Wd 1	N/A	N/A	N/A	N/A		
156	Discrete	114	Refuel Panel Switch States						
157	SAL		System Address Label For CVR						
157	BNR	055	MLS Basic Data Wd 2	N/A	N/A	N/A	N/A		
157	BCD	114	Trim Tank Probe Capacitance	pf	0-400	14	0.1		
160	BNR	055	MLS Basic Data Wd 3	N/A	N/A	N/A	N/A		
160	Discrete	114	Valve Feedback						
161	BNR	055	MLS Basic Data Wd 4	N/A	N/A	N/A	N/A		
161	Discrete	114	Indicated Pump Status						
162	BNR	055	MLS Basic Data Wd 5	N/A	N/A	N/A	N/A		
162	Discrete	114	Indicated Pump Status						
162	BNR	140	Density Altitude	Feet	131072	16	2	250	500
163	BNR	055	MLS Basic Data Wd 6	N/A	N/A	N/A	N/A		
163	Discrete	114	Indicated Pump Status						
164	BNR	055	MLS ABS GP Angle	Degrees	± 41	15	0.00125		
164	Discrete	114	Indicated Pump Status						
165	BNR	00B	Vertical Velocity	Feet/Min	±32768	15	1.0	200	1200
165	BNR	055	MLS ABS Azimuth Angle	Degrees	± 82	16	0.00125		
165	Discrete	114	Indicated Valve Status						
166	BNR	00B	North/South Velocity	Knots	±4096	15	0.125	200	
166	Discrete	114	Indicated Valve Status						
167	BNR	002	EPU Estimate Position Uncertainty/ (ANP) Actual Navigation Performance	NM	0-128	16	0.00195		

ATTACHMENT 1-16
SUPPLEMENT 16 UPDATES TO LABEL CODES

Code No. (Octal)	Data	Eqpt. ID (Hex)	Parameter	Units	Range	Sig Bits	Resolution	MIN TX	MAX TX
167	Discrete	114	Indicated Valve Status						
170	Discrete	114	Wing Imbalance And FQI Failure Warning						
171	BNR	002	RNP Reduced Navigation Performance	NM	0-128	16	0.001953		
171	BNR	056	Current RNP	The Same Parameters as the FMS EQ ID 002					
171	BNR	060	Current RNP	The Same Parameters as the FMS EQ ID 002					
172			Subsystem Identifier						
173	BNR	055	Localizer Deviation	DDM	± 0.4	12	0.0001		
174	BNR	00B	East/West Velocity	Knots	±4096	15	0.125	200	1200
174	BNR	055	Glide Slope Deviation	DDM	± 0.8	12	0.0002		
~~176~~	~~BNR~~	~~00B~~	~~GLONASS Satellite Deselection W #1~~			~~17~~			
176	BNR	0AD	Static Pressure Left, Uncorrected, mb	mb	2048	18	0.008	20	200
176	BNR	038	Left Static Pressure Uncorrected, mb	mb	2048	18	0.008	20	200
176	BNR	114	Left Outer Tank Fuel Temp & Advisory Warn	Degree C	±512	11	0.025		
~~177~~	~~BNR~~	~~00B~~	~~GLONASS Satellite Deselection W #2~~			~~17~~			
177	BNR	0AD	Static Pressure Right, Uncorrected, mb	mb	2048	18	0.008	20	200
177	BNR	038	Right Static Pressure, Uncorrected, mb	mb	2048	18	0.008	20	200
177	BNR	055	Distance To Runway Threshold	Nmiles	1024	16	0.007812		
177	BNR	114	Inner Tank 1 Fuel Temp & Advisory Warning	Degree C	±512	11	0.025		
200	BCD	056	Drift Angle	The Same Parameters as the FMS EQ ID 002					
200	BCD	060	Drift Angle	The Same Parameters as the FMS EQ ID 002					
200	BNR	114	Inner Tank 2 Fuel Temp & Advisory Warning	Degree C	±512	11	0.025		
201	BNR	114	Inner Tank 3 Fuel Temp & Advisory Warning	Degree C	±512	11	0.025		
201	BNR	140	Mach Maximum Operation (Mmo)	Mach	4.096	12	0.001	62.5	125
201	BNR	142	Projected Future Latitude	Degrees	± 180	20	0.000172	150	400
202	BNR	114	Inner Tank 4 Fuel Temp & Advisory Warning	Degree C	±512	11	0.025		
202	BNR	140	Mach Rate	M/minute	4.096	12	0.001	62.5	125
202	BNR	142	Projected Future Latitude Fine	Degrees	.000172	11	2-E-32 Cir	150	400
203	BNR	114	Trim Tank Fuel Temp & Advisory Warning	Degree C	±512	11	0.025		
203	BNR	140	Altitude	Feet	131072	17	1	31.25	62.5
204	BNR	056	Baro Altitude	The Same Parameters as the FMS EQ ID 002					
204	BNR	060	Baro Altitude	The Same Parameters as the FMS EQ ID 002					
204	BNR	114	Right Outer Tank Fuel Temp & Advisory Warning	Degree C	±512	11	0.025		
204	BNR	140	Baro Corrected Altitude	Feet	131072	17	1	31.25	62.5
205	BNR	140	Mach	Mach	4.096	16	0.0000625	62.5	125
206	BNR	056	Computed Airspeed	The Same Parameters as the FMS EQ ID 002					
206	BNR	060	Computed Airspeed	The Same Parameters as the FMS EQ ID 002					
206	BNR	140	Computed Airspeed (CAS)	Knots	1024	14	0.0625	62.5	125
207	BNR	140	Airspeed Maximum Operating (VMO)	Knots	1024	12	.025	62.56	125
210	BNR	140	True Airspeed	Knots	2048	15	0.0625	62.5	125
210	SAL		FCMC Com A340-500/600						
211	BNR	0AD	Total Air Temperature Indicated	Degree C	512	12	0.125	250	500
211	BNR	140	Total Air Temp (TAT)	Degree C	512	11	0.25	250	500
211	BNR	142	Projected Future Longitude	Degrees	± 180	20	0.000172	150	400
211	SAL		FCMC M on A340-500/600						
212	BNR	056	Alititude Rate	The Same Parameters as the FMS EQ ID 002					
212	BNR	060	Alititude Rate	The Same Parameters as the FMS EQ ID 002					
212	BNR	140	Altitude Rate	Ft/Min	32768	11	16	31.25	62.5
212	BNR	142	Projected Future Longitude Fine	Degrees	.000172	11	2E -32 Cir	150	400
212	SAL		FCMC Int A340-500/600						
213	BNR	140	Static Air Temp (SAT)	Degree C	512	11	0.25	250	500
213	BNR	142	Vertical Time Interval	Minute	265 min	10	.25 mile	500	2000
215	BNR	OAD	Impacted Pressure, Uncorrected, mb	mb	512	16	0.008	20	40
215	BNR	O38	Impacted Pressure, Uncorrected, mb	mb	512	14	0.03125	62.5	125
215	BNR	006	Impacted Pressure, Uncorrected, mb	mb	512	14	0.03125	62.5	125
215	BNR	140	Impact Pressure Subsonic	mb	512	14	0.03125	62.5	125
~~217~~	~~BNR~~	~~0AD~~	~~Average Static Pressure~~	~~mb~~	~~2048~~	~~18~~	~~0.008~~	~~20~~	~~200~~
217	BNR	002	Geometric Vertical Rate	Ft/Min	20000	11	16		

ATTACHMENT 1-16
SUPPLEMENT 16 UPDATES TO LABEL CODES

Code No. (Octal)	Data	Eqpt. ID (Hex)	Parameter	Units	Range	Sig Bits	Resolution	MIN TX	MAX TX
217	BNR	006	Static Pressure, Corrected (In. Hg)	Inches Hg	64	16	0.001	20	200
217	BNR	038	Static Pressure, Average, Corrected (In. Hg)	Inches Hg	64	16	0.001	20	200
217	BNR	140	Static Pressure Corrected (In. Hg)	Inches Hg	64	16	0.001	62.5	125
220		056	MCDU #1 Address Label	The Same Parameters as the FMS EQ ID 002					
220		060	MCDU #1 Address Label	The Same Parameters as the FMS EQ ID 002					
220	BNR	140	Baro Corrected Altitude #2	Feet	131072	17	1	31.25	62.5
221		056	MCDU #2 Address Label	The Same Parameters as the FMS EQ ID 002					
221		060	MCDU #2 Address Label	The Same Parameters as the FMS EQ ID 002					
221	BNR	140	Angle Of Attack Indicated Average	Degrees	180	12	0.05	31.25	62.5
222		056	MCDU #3 Address Label	The Same Parameters as the FMS EQ ID 002					
222		060	MCDU #3 Address Label	The Same Parameters as the FMS EQ ID 002					
222	BNR	140	Angle Of Attack, Indicated #1 Left	Degrees	180	12	0.05	31.5	62.5
223		056	Printer #1 Address Label	The Same Parameters as the FMS EQ ID 002					
223		060	Printer #1 Address Label	The Same Parameters as the FMS EQ ID 002					
223	BNR	140	Angle Of Attack, Indicated #1 Right	Degrees	180	12	0.05	31.5	62.5
224		056	Printer #2 Address Label	The Same Parameters as the FMS EQ ID 002					
224		060	Printer #2 Address Label	The Same Parameters as the FMS EQ ID 002					
224	BNR	140	Angle Of Attack, Indicated #2 Left	Degrees	180	12	0.05	31.5	62.5
225	SAL		System Address Label For HUD						
225	BNR	056	Minimum Maneuvering Air Speed	The Same Parameters as the FMS EQ ID 002					
225	BNR	060	Minimum Maneuvering Air Speed	The Same Parameters as the FMS EQ ID 002					
225	BNR	140	Angle Of Attack, Indicated #2 Right	Degrees	180	12	0.05	31.5	62.5
226		00B	Data Loader Responses					200	1200
227	Discrete	019	CFDS Bite Command Summary For HFDR						
227	Discrete	053	CFDS Bite Command Word For HFDU						
230	BCD	114	Left Outer Probes Capacitance	pf	0-400	14	0.1		
~~231~~	~~BCD~~	~~0AD~~	~~Total Air Temperature~~	~~Degree C~~	~~512~~	~~12~~	~~20~~	~~200~~	
231	BCD	114	Inner 2 Tank Probe Capacitance	pf	0-400	14	0.1		
232	File Format	002	Active Intent Data Block						
232	DISC	055	GLS Airport ID						
232	Discrete	056	Active Intent Data Block						
232		060	Active Intent Data Block	The Same Parameters as the FMS EQ ID 002					
232	BCD	114	Inner 4 Tank Probe Capacitance	pf	0-400	14	0.1		
233	BNR	056	ACMS Information	The Same Parameters as the FMS EQ ID 002					
233	BNR	060	ACMS Information	The Same Parameters as the FMS EQ ID 002					
233	BCD	114	Right Outer Probe Capacitance	pf	0-400	14	0.1		
234	BNR	056	ACMS Information	The Same Parameters as the FMS EQ ID 002					
234	BNR	060	ACMS Information	The Same Parameters as the FMS EQ ID 002					
235	BNR	056	ACMS Information	The Same Parameters as the FMS EQ ID 002					
235	BNR	060	ACMS Information	The Same Parameters as the FMS EQ ID 002					
236	BNR	056	ACMS Information	The Same Parameters as the FMS EQ ID 002					
236	BNR	060	ACMS Information	The Same Parameters as the FMS EQ ID 002					
237	BNR	00B	Horizontal Uncertainty Level	Nm	16	17	0.000122		1200
237	BNR	002	ACMS Information						
237	BNR	056	ACMS Information	The Same Parameters as the FMS EQ ID 002					
237	BNR	060	ACMS Information	The Same Parameters as the FMS EQ ID 002					
241	SAL		System Address Label For APM-MMR						
241	BNR	056	Min. Airspeed for Flap Extension	The Same Parameters as the FMS EQ ID 002					
241	BNR	060	Min. Airspeed for Flap Extension	The Same Parameters as the FMS EQ ID 002					
241	BNR	140	Angle Of Attack, Corrected	Degrees	180	12	0.05	31.5	62.5
242	SAL		System Address Label for MMR						
242	BNR	0AD	Total Pressure, Uncorrected, mb						
242	File Format	002	Modified Intent Data Block						
242	BNR	056	Modified Intent Data Block	The Same Parameters as the FMS EQ ID 002					
242		060	Modified Intent Data Block	The Same Parameters as the FMS EQ ID 002					
242	BNR	140	Total Pressure	mb	2048	16	0.03125	62.5	125
243	DISC	055	GLS Runway Selection						

ATTACHMENT 1-16
SUPPLEMENT 16 UPDATES TO LABEL CODES

Code No. (Octal)	Data	Eqpt. ID (Hex)	Parameter	Units	Range	Sig Bits	Resolution	MIN TX	MAX TX
244	SAL		System Address Label for ILS						
244	BNR	140	Angle Of Attack, Normalized	Ratio	2	11	0.001	62.5	125
245	SAL		System Address Label For MLS						
245	BNR	0AD	Average Static Pressure mb, Uncorrected	mb	2048	18	0.008	20	200
245	BNR	038	Average Static Pressure mb, Uncorrected						
245	BNR	056	Minimum Airspeed	The Same Parameters as the FMS EQ ID 002					
245	BNR	060	Minimum Airspeed	The Same Parameters as the FMS EQ ID 002					
245	BNR	140	Static Pressure, Uncorrected	mb	2048	16	0.03125	62.5	125
246	SAL		System Address Label for AHRS						
246	BNR	038	Average Static Pressure mb, Corrected						
246	BNR	056	General Max Speed (Vcmax)	The Same Parameters as the FMS EQ ID 002					
246	BNR	060	General Max Speed (Vcmax)	The Same Parameters as the FMS EQ ID 002					
246	BNR	140	Static Pressure, Corrected	mb	2048	16	0.03125	62.5	125
247	BNR	00B	Horizontal Figure Of Merit	NM	16	18	6.1 E-5	200	1200
247	BNR	056	Control Minimum Speed (Vcmin)	The Same Parameters as the FMS EQ ID 002					
247	BNR	060	Control Minimum Speed (Vcmin)	The Same Parameters as the FMS EQ ID 002					
247	BNR	114	Fuel On Board	Pounds	655320	13	40		
247	BNR	140	Airspeed Minimum Vmc	Knots	512	11	0.25	62.5	125
250	BNR	0AD	Indicated Side Slip Angle or AOS	Deg/180	±180	14	0.01	31.3	200
250	BNR	114	Preselected Fuel Quantity	Pounds	655320	13	40		
251	SAL		System Address Label VDR #1						
252	SAL		System Address Label VDR #2						
253	SAL		System Address Label VDR #3						
254	Discrete	055	GBAS ID						200
254	BNR	140	Altitude Rate	Ft/Min	131072	13	16	31.25	62.5
255	Discrete	055	GBAS Airport ID						200
255	BNR	140	Impact Pressure	mb	4096	17	0.03125	62.5	125
256	BLOCK	055	MLS Station ID #1						
256	BNR	056	Time For Climb	The Same Parameters as the FMS EQ ID 002					
256	BNR	060	Time For Climb	The Same Parameters as the FMS EQ ID 002					
256	BNR	114	Left Outer Tank Fuel Quantity	Pounds	131068	15	4		
256	BNR	140	Equivalent Airspeed	Knots	1024	14	0.0625	62.5	125
257	BLOCK	055	MLS Station ID #2						
257	BNR	056	Time For Descent	The Same Parameters as the FMS EQ ID 002					
257	BNR	060	Time For Descent	The Same Parameters as the FMS EQ ID 002					
257	BNR	114	Inner Tank 1 Fuel Quantity	Pounds	131068	15	4		
257	BNR	140	Total Pressure (High Range)	mb	4096	17	0.03125	62.5	125
260	BCD	00B	Date	dd:Mo:Yr	dd:mm:yr	6	1 day	200	1200
260	BCD	056	Date/Flight Leg	The Same Parameters as the FMS EQ ID 002					
260	BCD	060	Date/Flight Leg	The Same Parameters as the FMS EQ ID 002					
260	BNR	114	Collector Cell 1 and 2 Fuel Quantity	Pounds	131068	15	4		
261	BCD	056	Flight Number (BCD)	The Same Parameters as the FMS EQ ID 002					
261	BCD	060	Flight Number (BCD)	The Same Parameters as the FMS EQ ID 002					
261	BNR	114	Fuel On Board At Engine Start	Pounds	131068	15	4		
262	BNR	056	Documentary Data	The Same Parameters as the FMS EQ ID 002					
262	BNR	060	Documentary Data	The Same Parameters as the FMS EQ ID 002					
262	BNR	114	Center Tank Fuel Quantity	Pounds	131068	15	4		
263	BLOCK	055	Ground Station/Approach						
263	BNR	056	Min. Airspeed For Flap Retraction	The Same Parameters as the FMS EQ ID 002					
263	BNR	060	Min. Airspeed For Flap Retraction	The Same Parameters as the FMS EQ ID 002					
263	BNR	114	Collector Cell 3 And 4 Fuel Quantity	Pounds	131068	15	4		
264	BLOCK	055	Ground Station/Approach						
264	BNR	056	Time To Touchdown	The Same Parameters as the FMS EQ ID 002					
264	BNR	060	Time To Touchdown	The Same Parameters as the FMS EQ ID 002					
264	BNR	114	Spare						
265	BNR	056	Min. Buffet Airspeed	The Same Parameters as the FMS EQ ID 002					
265	BNR	060	Min. Buffet Airspeed	The Same Parameters as the FMS EQ ID 002					
265	BNR	114	Inner Tank 3 Fuel Quantity	Pounds	131068	15	4		

ATTACHMENT 1-16
SUPPLEMENT 16 UPDATES TO LABEL CODES

Code No. (Octal)	Data	Eqpt. ID (Hex)	Parameter	Units	Range	Sig Bits	Resolution	MIN TX	MAX TX
266	BNR	114	Inner Tank 2 Fuel Quantity	Pounds	131068	15	4		
267	BNR	056	Max. Maneuver Airspeed	The Same Parameters as the FMS EQ ID 002					
267	BNR	060	Max. Maneuver Airspeed	The Same Parameters as the FMS EQ ID 002					
267	BNR	114	Inner Tank 4 Fuel Quantity	Pounds	131068	15	4		
270	Discrete	024	MU Output Data Word, Communication Link Status						
270	Discrete	039	MCDU Normal Discrete Word						
270	Discrete	041	SDU To ACARS MU/CMU Status Word						
270	Discrete	050	VDR Status Word						
270	Discrete	053	HFDL Status Word						
270	DISC	055	MLS Discrete						
270	Discrete	056	Status Discretes						
270	Discrete	058	Output Status Word #1						
270	DISC	060	Intent Status						
270	DISC	060	Status Discretes						
270	DISC	060	Discrete Data #1						
270	Discrete	114	Unusable, and Empty Warning						
270	Discrete	140	Discrete Data # 1					250	500
270	Discrete	142	Aircraft Category (Disc Data 1)					5000	15000
271	Discrete	041	SDU To ACARS MU/CMU Join /Leave Message						
271	DISC	055	MMR Discrete						
271	Discrete	056	Discrete Data #2						
271	DISC	060	Discrete Data #2						
271	Discrete	114	Fuel Transfer Indication						
271	Discrete	140	Discrete Data # 2					250	500
271	Discrete	142	Altitude Filter Limits (Disc Data 2)					500	2000
272	Discrete	053	HFDL Slave (Disc Data 3)						
272	Discrete	056	Discrete Data #3						
272	DISC	060	Discrete Data #3						
272	Discrete	114	Fuel Transfer Indication						
272	Discrete	140	Discrete Data # 3					250	500
273	DIS	00B	GNSS Sensor Status	N/A				200	1200
273	DISC	055	GNSS Status						
273	Discrete	114	Memos And Status						
274	Discrete	114	Fuel Transfer Indications						
275	Discrete	038	IR Discrete Word #2						
275	Discrete	056	Discrete Data #6						
275	DISC	060	Discrete Data #6						
275	Discrete	114	Miscellaneous Warning						
276	Discrete	024	MU Output Data Word, Pin Program Status						
276	Discrete	041	SDU To EICAS/ECAM/EDU For Dual SATCOM						
276	Discrete	050	VDR Mode Command						
276	Discrete	056	Discrete Data #7						
276	Discrete	058	Output Status Word #2						
276	DISC	060	Discrete Data #7						
276	Discrete	114	Miscellaneous Discrete						
277	Discrete	004	IRS Maintenance Discrete						
277	Discrete	114	Fuel Transfer and CG Status						
301		056	Application Dependent	The Same Parameters as the FMS EQ ID 002					
301		060	Application Dependent						
302		056	Application Dependent	The Same Parameters as the FMS EQ ID 002					
302		060	Application Dependent						
303		056	Application Dependent	The Same Parameters as the FMS EQ ID 002					
303		060	Application Dependent						
310	SAL		System Address Label for GPWS						
310	BNR	056	Present Position Latitude	The Same Parameters as the FMS EQ ID 002					
310	BNR	060	Present Position Latitude	The Same Parameters as the FMS EQ ID 002					

ATTACHMENT 1-16
SUPPLEMENT 16 UPDATES TO LABEL CODES

Code No. (Octal)	Data	Eqpt. ID (Hex)	Parameter	Units	Range	Sig Bits	Resolution	MIN TX	MAX TX
310	BNR	114	Right Outer Tank Fuel Quantity	Pounds	131068	15	4		
311	SAL		System Address Label for GNLU 1						
311	BNR	056	Present Position Longitude	The Same Parameters as the FMS EQ ID 002					
311	BNR	060	Present Position Longitude	The Same Parameters as the FMS EQ ID 002					
311	BNR	114	Trim Tank Fuel Quantity	Pounds	131068	15	4		
312	SAL		System Address Label for GNLU 2						
312	BNR	056	Ground Speed	The Same Parameters as the FMS EQ ID 002					
312	BNR	060	Ground Speed	The Same Parameters as the FMS EQ ID 002					
312	BNR	114	Additional Center Tank (Act 1) Fuel Quantity	Pounds	131068	15	4		
313	SAL		System Address Label For GNLU 3						
313	BNR	056	Track Angle True	The Same Parameters as the FMS EQ ID 002					
313	BNR	060	Track Angle True	The Same Parameters as the FMS EQ ID 002					
313	BNR	114	Additional Center Tank (Act 2) Fuel Quantity	Pounds	131068	15	4		
314	SAL		System Address Label For GNU 1						
314	BNR	114	Rear Center Tank (RCT) Fuel Quantity	Pounds	131068	15	4		
315	SAL		System Address Label For GNU 2						
315	BNR	056	Wind Speed	The Same Parameters as the FMS EQ ID 002					
315	BNR	060	Wind Speed	The Same Parameters as the FMS EQ ID 002					
316	SAL		System Address Label For GNU 3						
316	BNR	056	Wind Direction (True)	The Same Parameters as the FMS EQ ID 002					
316	BNR	060	Wind Direction (True)	The Same Parameters as the FMS EQ ID 002					
317	BNR	056	Track Angle Magnetic	The Same Parameters as the FMS EQ ID 002					
317	BNR	060	Track Angle Magnetic	The Same Parameters as the FMS EQ ID 002					
320	BNR	05A	Fuel Quantity Act 3						
320	BNR	056	Magnetic Heading	The Same Parameters as the FMS EQ ID 002					
320	BNR	060	Magnetic Heading	The Same Parameters as the FMS EQ ID 002					
321	SAL		System Address Label for Autothrottle Computer						
321	BNR	056	Drift Angle	The Same Parameters as the FMS EQ ID 002					
321	BNR	060	Drift Angle	The Same Parameters as the FMS EQ ID 002					
322	SAL		System Address Label for FCC 1						
322	BNR	056	Flight Path Angle	The Same Parameters as the FMS EQ ID 002					
322	BNR	060	Flight Path Angle	The Same Parameters as the FMS EQ ID 002					
323	SAL		System Address Label For FCC 2						
323	BNR	002	Geometric Altitude	Feet	50000	17	1		
323	BNR	056	Geometric Altitude	The Same Parameters as the FMS EQ ID 002					
323	BNR	060	Geometric Altitude	The Same Parameters as the FMS EQ ID 002					
324	SAL		System Address Label For FCC 3						
324	BNR	056	Estimated Position Uncertainty	The Same Parameters as the FMS EQ ID 002					
324	BNR	060	Estimated Position Uncertainty	The Same Parameters as the FMS EQ ID 002					
324	BNR	114	Effective Pitch Angle	Degrees	±180	13	0.02		
325	SAL		System Address Label For APU						
325	BNR	114	Effective Roll Angle	Degrees	±180	13	0.02		
326	SAL		System Address Label For APU Controller						
327	SAL		SAL Mode Control Pane (MCP)						
330	SAL		System Address Label For FMC 3						
331	SAL		System Address Label For ATC Transponder						
332	SAL		System Address Label For DADC						
335	BNR	002	Track Angle Rate	Deg/Sec	32	11	0.015	10	20
335	BNR	056	Track Angle Rate	The Same Parameters as the FMS EQ ID 002					
335	BNR	060	Track Angle Rate	The Same Parameters as the FMS EQ ID 002					
340	BNR	004	Inertial Yaw Rate	Deg/Sec	128	13	0.015	10	20
340	BNR	004	Track Angle Grid	Degree	± 180	15	0.0055	20 Hz	110 Hz
340	BNR	005	Inertial Yaw Rate	Deg/Sec	128	13	0.015	10	20
340	BNR	140	Pressure Ratio (Pt/Ps)	Ratio	16	14	0.001	62.5	125
341	BNR	004	Grid Heading	Degree	± 180	15	0.0055	20 Hz	110 Hz
341	BNR	038	Grid Heading	Degree	± 180	15	0.0055	20 Hz	110 Hz
341	BNR	140	Pressure Ratio (Ps/Pso)	Ratio	4	12	0.001	62.5	125

ATTACHMENT 1-16
SUPPLEMENT 16 UPDATES TO LABEL CODES

Code No. (Octal)	Data	Eqpt. ID (Hex)	Parameter	Units	Range	Sig Bits	Resolution	MIN TX	MAX TX
342	BNR	140	Air Density Ratio	Ratio	4	12	0.001	250	500
350	Discrete	004	IRS Maintenance Discrete						
350	Discrete	018	Maintenance Data #1						
350	Discrete	019	CFDS Bite Fault Summary Word For HFDR						
350	Discrete	024	MU Output Data Word Failure Status						
350	Discrete	038	IRS Maintenance Word #1						
350	Discrete	050	VDR Fault Summary Word						
350	Discrete	053	CFDS Bite Fault Summary Word For HFDU						
350	DISC	055	ILS Maintenance Word						
350	Discrete	058	Maintenance Word #1						
350	BCD	114	Fuel Density	kg/l	0-.999	4	0.01		
350	Discrete	140	Maintenance Data # 1					250	500
351	Discrete	024	MU Output Data Word, Failure Status						
351	Discrete	038	IRS Maintenance Word #2						
351	DISC	055	MMR Maintenance Word						
351	Discrete	058	Maintenance Word #2						
351	BCD	114	Inner Tank 1 Probe Capacitance	pf	0-400	14	0.1		
351	Discrete	140	Maintenance Data # 2					250	500
352	DISC	055	MLS Bite Status						
352	Discrete	058	Maintenance Word						
352	BCD	114	Center, ACT & RCT Probe Capacitance	pf	0-400	14	0.1		
352	Discrete	140	Maintenance Data # 3 Flight Count		524287			250	500
353	Discrete	038	IRS Maintenance Word #3						
353	BCD	114	Inner Tank 3 Probe Capacitance	pf	0-400	14	0.1		
354		056	Maintenance Data #5	The Same Parameters as the FMS EQ ID 002					
354		060	Maintenance Data #5						
355	DIS	00B	GNSS Fault Summary	-		21		200	1200
355	Discrete	038	IRS Maintenance Word #4						
357	ISO-5	056	ISO Alphabet #5 Message	The Same Parameters as the FMS EQ ID 002					
357	ISO-5	060	ISO Alphabet #5 Message	The Same Parameters as the FMS EQ ID 002					
360	BNR	056	Flight Information	The Same Parameters as the FMS EQ ID 002					
360	BNR	060	Flight Information	The Same Parameters as the FMS EQ ID 002					
360	BNR	142	RAIM Status Word	NM	16	13	0.00195		
362	SAL		System Address Label For PSS						
363	SAL		System Address Label For CSS						
364	SAL		System Address Label For AES						
366	SAL		System Address Label For Multicast						
367	SAL		System Address Label For Bridge						
370	BNR	00B	GNSS Height WGS-84 (Hae)	Feet	±131,072	20	0.125		1200
370	BNR	00B	GNSS Height	Feet	±131,072	20	0.125	200	1200
375	BNR	004	Along Hdg Accel	Gs	4	18	1.53E-5	50 Hz	110Hz
375	BNR	038	Along Hdg Accel	Gs	4	18	1.53E-5	50 Hz	110Hz
376	BNR	004	Cross Hdg Accel	Gs	4	18	1.53E-5	50 Hz	110Hz
376	BNR	038	Cross Hdg Accel	Gs	4	18	1.53E-5	50 Hz	110Hz

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SUPPLEMENT 17

TO

ARINC SPECIFICATION 429 P1

MARK 33 DIGITAL INFORMATION TRANSFER SYSTEM (DITS)

PART 1

FUNCTIONAL DESCRIPTION, ELECTRICAL INTERFACE,

LABEL ASSIGNMENTS AND WORD FORMATS

Published: May 17, 2004

Prepared by the Airlines Electronic Engineering Committee

Adopted by the Airlines Electronic Engineering Committee: May 5, 2004

A. PURPOSE OF THIS DOCUMENT

This Supplement introduces new label assignments, equipment IDs, system address labels and updates to ARINC Specification 429.

B. ORGANIZATION OF THIS SUPPLEMENT

The material in Supplement 17 is integrated into ARINC Specification 429 to form an updated version of the standard.

Changes introduced by Supplement 17 are identified using change bars and are labeled by a "c-17" symbol in the margin.

C. CHANGES TO ARINC SPECIFICATION 429 INTRODUCED BY THIS SUPPLEMENT

This section presents a complete tabulation of the changes and additions to the Specification introduced by this Supplement. Each change or addition is defined by the section number and the title currently employed in the Specification or by the section name and title that will be employed when the Supplement is eventually incorporated. In each case a brief description of the change or addition is included.

3.1.4.6 VHF Communications

The Frequency Range and Frequency Selection Increments were revised to reflect 8.33 kHz spacing.

ATTACHMENT 1-1 LABEL CODES

This Attachment was updated according to ARINC 429 New and Revised Label Assignments Table on page 3.

A Note was added to label 377 to clarify the SSM.

ATTACHMENT 1-2 - EQUIPMENT CODES

The following Equipment Codes were added:

EQ ID	EQUIPMENT TYPE
061	High-Speed Data Unit (HSDU)
0C4	A429W SDU Controller
11E	Integrated Static Probe
120	Multifunctional Air Data Probe
144	CDTI Display Unit
14A	Slide Slip Angle (SSA)
171	Electronic Flight Bag
1E2	ADS-B LDPU Controller

ATTACHMENT 2 - DATA STANDARDS

This Attachment was updated according to ARINC 429 New and Revised Label Assignments Table on page 3.

ATTACHMENT 6 – GENERAL WORD FORMATS AND ENCODING EXAMPLES

Table 6-17 was revised to correct the error in the SSM.

Table 6-24 was revised to correctly identify SPI. In addition, bit 17 was revised to indicate Hijack Mode.

Table 6-39 (ICAO Address) will be removed from Part I and added to Part II

Tables 6-49, 6-50, and 6-51 were added by this Supplement.

ATTACHMENT 10 – MANUFACTURER-SPECIFIC STATUS

Bits 9 and 10 were revised to indicate SDI and Note B was added.

Company identification was added for RYAN.

ATTACHMENT 11 - SYSTEM ADDRESS LABELS

The following System Address Labels were added or revised:

SAL OCTAL LABEL	SYSTEM
156	CVR #2
174	HGA/IGA HPA
~~175~~	~~HGA/HPA Starboard~~
177	LGA HPA
247	High-Speed Data (HSDU #1)
250	High-Speed Data (HSDU #2)
254	Network Server System
255	Electronic Flight Bag Left
256	Electronic Flight Bag Right
345	Remote Data Concentrator

APPENDIX E – GUIDELINES FOR LABEL ASSIGNMENTS

Item 2 was revised to clarify the confusion on the SSM for label 377 Equipment Identification.

ARINC 429 NEW AND REVISED LABEL ASSIGNMENTS

	LABEL	Data	EQ ID	PARAMETER	UNITS	RANGE	SIG Bits	RESOL	MIN TX	MAX TX
New	101	Binary	05A	FQIC	Lbs	4- 65532	14	4	900	1100
New	124	Binary	1E2	Horizontal Alarm Limit	Meters	0 – 8190	13	1meter	800	1200
New	124	Binary	0A5	Client Device for GNSS Receiver	Meters	8192	13	1 meter		200
New	127	Binary	1E2	Vertical Alarm Limit	Meters	0 – 255	8	1 meter	800	1200
Revised	141	Binary	00B	UTC Fine Fractions	Seconds	0.9536743µs	10	0.931225ns	200	1200
New	152	Binary	038	Cabin Pressure	mB	2048	16	0.03125	62.5	125
New	152	Binary	0AD	Cabin Pressure	mB	2048	18	0.008	20	200
Revised	155	Discrete	05A	FQIC					900	1100
New	156	SAL		CVR #2						
Revised	171			Manufacturer-Specific Status						
New	171	BINARY	0A5	Vertical Alarm limit (VAL) and SBAS System Identifier	Meters	256	8	1 meter		200
Revised	214	Discrete	xxx	ICAO Aircraft Address Part 1						
Revised	216	Discrete	xxx	ICAO Aircraft Address Part 2						
New	247	SAL		High-Speed Data Unit #1 (HSDU #1)						
New	250	SAL		High-Speed Data Unit #2 (HSDU #2)						
New	254	SAL		Network Server System (NSS)						
New	255	SAL		Electronic Flight Bag – Left						
New	256	SAL		Electronic Flight Bag – Right						
New	261	Binary	144	Range Ring Radius	NM	512	15	1/64 NM	800	1200
New	262	Binary	144	Display Range	NM	512	14	1/32 NM	800	1200
New	270	Discrete	144	Display Mode					800	1200
New	271	Discrete	144	Altitude Filter Setting					800	1200
New	272	Discrete	144	Target Selection Word					800	1200
New	272	Discrete	005	Air Data AHARS					250	500
New	276	Discrete	058	VDR Mode					250	500
deleted	~~320~~	~~Binary~~	~~05A~~	~~Fuel Quantity ACT 3~~						
New	345	SAL		Remote Data Concentrator						
New	350	Discrete	144	CDTI Fault Summary Word					800	1200
New	357	Discrete	05A	Part Number (manufacturer-Specific)						
New	377	Discrete	xxx	Equipment Identification						

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SUPPLEMENT 18
TO
ARINC SPECIFICATION 429

DIGITAL INFORMATION TRANSFER SYSTEM (DITS)

PART 1

FUNCTIONAL DESCRIPTION, ELECTRICAL INTERFACES, LABEL ASSIGNMENTS AND WORD FORMATS

Published: November 29, 2012

Prepared by the AEEC

Adopted by the AEEC Executive Committee: October 4, 2012

A. PURPOSE OF THIS DOCUMENT

Supplement 18 represents a significant update to ARINC 429. It provides new ARINC 429 word assignments, as well as updates to the general format of the document, label assignments, equipment IDs, and System Address Labels (SAL). Editorial changes are made for improved readability.

B. ORGANIZATION OF THIS SUPPLEMENT

In this document **blue bold** text is used in some instances to indicate those areas of text changed by the current Supplement only.

C. CHANGES TO ARINC SPECIFICATION 429 INTRODUCED BY THIS SUPPLEMENT

This section presents a complete listing of the changes to the document introduced by this Supplement. Each change is identified by the section number and the title as it will appear in the complete document. Where necessary, a brief description of the change is included.

Section 1 – Introduction

This section was updated to reflect the latest ARINC Standard format. Editorial changes were made for improved readability.

Section 2 – Digital Information Transfer System Standards

This section was updated to reflect the latest ARINC Standard format. Editorial changes were made for improved readability.

Section 3 – Application Notes

This section was updated to reflect the latest ARINC Standard format. Editorial changes were made for improved readability.

Attachment 1-1 – LABEL CODES

ARINC 429 labels codes have been added as follows:

Code No. (Octal)	Equip ID (Hex)	Parameter	Data
045	055	Message Block Start	BLK – BNR
046	055	Message Block Data	BLK – BNR
076	0F1	Fire Warning Computer	BNR
114	055	Lateral Protection Level	BNR
115	055	Vertical Protection Level	BNR
127	055	FAS Vertical Alarm Limit	BNR
130	055	MLS Aux Data Part 1 Group A	BNR
131	055	MLS Aux Data Part 2 Group A	BNR
132	055	MLS Aux Data Part 3 Group A	BNR
133	055	MLS Aux Data Part 4 Group A	BNR
134	035	Relative Altitude of the Most Threatening Traffic	BNR
134	055	MLS Aux Data Part 1 Group B	BNR
135	055	MLS Aux Data Part 2 Group B	BNR
136	055	MLS Aux Data Part 3 Group B	BNR
137	055	MLS Aux Data Part 4 Group B	BNR
140	055	MLS Aux Data Part 1 Group C	BNR
140		MFP-1 (Multi-Functional Probe)	SAL
141		SSA-1 (Side Slip Angle Probe)	SAL
141	055	MLS Aux Data Part 2 Group C	BNR
142		ISP1-1 (Integrated Static Probe)	SAL
143		ISP1-2 (Integrated Static Probe)	SAL
144		MFP-2 (Multi-Functional Probe)	SAL

Code No. (Octal)	Equip ID (Hex)	Parameter	Data
144	181	Satcom Antenna Control/SDU Status Word	DISC-VARIOUS
145		SSA-2 (Side Slip Angle Probe)	SAL
146		ISP2-1 (Integrated Static Probe)	SAL
147		ISP2-2 (Integrated Static Probe)	SAL
150		MFP-3 (Multi-Functional Probe)	SAL
151		SSA-3 (Side Slip Angle Probe)	SAL
152	181	Open Loop Steering Word SDU/Satcom Antenna	DISC
153		ISP3-1 (Integrated Static Probe)	SAL
154		ISP3-2 (Integrated Static Probe)	SAL
155		On-board Airport Navigation System (OANS)	SAL
161	131	Density Altitude - Derived	BNR
163	035	Display Application Status	BNR
164	0E3	Radar Altitude	BNR
167	055	DAS Altitude Alarm Limit	BNR
172		SDU Satellite System Type	DISC
175	055	MLS Selected Back AZ Angle	BNR
205	055	SBAS FAS Datablock Word # 1	BLK – BNR
206	055	SBAS FAS Datablock Word # 2	BLK – BNR
207	055	SBAS FAS Datablock Word # 3	BLK – BNR
211	055	SBAS FAS Datablock Word # 4	BLK – BNR
213	055	SBAS FAS Datablock Word # 5	BLK – BNR
215	055	SBAS FAS Datablock Word # 6	BLK – BNR
217	055	SBAS FAS Datablock Word # 7	BLK – BNR
220	055	SBAS FAS Datablock Word # 8	BLK – BNR
220		Inmarsat Swift64 Base Forward ID Word 1	DISC
221		Inmarsat 24-Bit Swift64 Base Forward ID Word 2	DISC
221	055	SBAS FAS Datablock Word # 9	BLK – BNR
223	055	SBAS FAS Datablock Word # 10	BLK – BNR
224	055	SBAS FAS Datablock Word # 11	BLK – BNR
225	055	SBAS FAS Datablock Word # 12	BLK – BNR
227	181	SDU/Antenna Command Summary Word	BLK – BNR
230	024	Uplink VHF Frequency	BCD
231	024	Uplink Beacon Code	BCD
231	055	SBAS FAS Datablock Word # 13	BLK – BNR
231		SDU ORT #1	SAL
232		SDU ORT #2	SAL
235	114	Fuel Permittivity	BNR
237	024	Uplink HF Frequency	BCD
240	055	Selected Glide Path Angle	BNR
241	055	Threshold Crossing Height	BNR
242	055	SBAS FAS Datablock Word # 14	BLK – BNR
244	055	SBAS FAS Datablock Word # 15	BLK – BNR
245	055	FTP to GARP Distance	BNR
246	055	SBAS FAS Datablock Word # 16	BLK – BNR
250	055	Unflagged Horizontal Deviation - Rectilinear	BNR
251	055	Unflagged Vertical Deviation - Rectilinear	BNR
252	114	Right Inner Tank Forward Fuel Quantity	BNR
253	114	Right Inner Tank Aft Fuel Quantity	BNR
254	114	Left Inner Tank Forward Fuel Quantity	BNR
255	114	Left Inner Tank Aft Fuel Quantity	BNR
274	055	GLS Status	DISC
275	055	DGPS Status	DISC
276	055	Selected/Achieved GBAS Approach Service Type	DISC
300	055	Data Load Address	DISC
317		AFIRS (Automated Flight Information Reporting System)	SAL
320	055	Aircraft Altitude	BNR

Code No. (Octal)	Equip ID (Hex)	Parameter	Data
325	055	Anchor Point Latitude	BNR
326	055	Anchor Point Longitude	BNR
327	055	Anchor Point Altitude	BNR
330	055	FLS Beam Slope	BNR
331	055	Local Magnetic Deviation	BNR
333	055	Runway Threshold Latitude	BNR
334	055	Runway Threshold Longitude	BNR
335		Cursor Control Device (CCD) - Left (1)	SAL
335	055	Aircraft Latitude Fine	BNR
336		Cursor Control Device (CCD) - Right (2)	SAL
336	055	Aircraft Longitude Fine	BNR
337		Smoke Detection System (B767)	SAL
346		Integrated Air System Controller	SAL
347		Landing Gear Control & Interface Unit (LGCIU) (Airbus)	SAL
350	181	Satellite Antenna Maintenance Word	DISC
353	055	GLS Maintenance Word	DISC
354	035	Program Pin Status	DISC
354	055	MMR Identification	BLK - DISC
355	055	GNSS Fault Summary	DISC
356	055	MMR Fault Message	BLK - DISC
366	035	Display Traffic Information File (DTIF)	DISC – BNR
370	055	GNSS Height	BNR

Attachment 1-2 – EQUIPMENT CODES

Equipment ID codes have been added as follows:

Equip ID (Hex)	Equipment Type
068	Integrated Surveillance System (ARINC 768)
09A	On-Board Airport Ground Navigation (Airbus)
0A5	AHRS Controller (ARINC 705)
0E1	Cargo Door Control (Boeing 777)
0E2	Enhanced Vision System
0E3	AN/APN-232 Radar Altimeter (C-135)
0F1	Fire Detection and Suppression System
131	Primary Flight Display
139	Cockpit Door Surveillance System
148	Airline Network Infrastructure (Airbus)
14D	Integrated Air System Controller (Boeing 747-8)
15F	Cooled Service Air System (CSAS)
172	Lateral Control Electronics Unit (Boeing 747-8)
17D	Master Galley Control (MGC) (A330,A340, A380)
17E	On-board Oxygen Generation System (OBOGS) (A330, A340, A380)
17F	Nitrogen Generation System Control
181	Satellite Communication Antenna (ARINC 781)
1AE	Yaw Damper Stabilizer Trim Module (Boeing 747-8)
2BA	GENx-2B Electronic Engine Control (EEC) Channel A
2BB	GENx-2B Electronic Engine Control (EEC) Channel B

Attachment 2A – DATA STANDARDS - BCD Data

The following labels were modified:

Label	Equip ID (Hex)	Parameter Name	Range (Scale)	Sig Bits	Transmit Interval	Pos Sense
017	055	Selected Runway Heading	0-359.9	4	167 – 333 msec	Always Positive
035	055	Paired DME Frequency		4	100 – 200 msec	Always Positive
036	055	MLS Channel Selection	500-699	3	100 – 200 msec	Always Positive

Attachment 2B – DATA STANDARDS - BNR Data

The following labels were added or modified:

Label	Equip ID (Hex)	Parameter Name	Units	Range (Scale)	Sig Bits	Resolution	Transmit Interval	Pos Sense
105	055	Selected Runway Heading	Degrees	±180	11	0.1	167 – 333 msec	CW-N
114	055	Lateral Protection Level	Meters	0 – 163.83	14	0.01	66.6 – 240 msec	Always Positive
115	055	Vertical Protection Level	Meters	0 – 163.83	14	0.01	66.6 – 240 msec	Always Positive
116	055	Horizontal GLS Deviation rectilinear	Feet	±24000	18	0.0915	33.3 – 66.6 msec	Fly Right
117	055	Vertical GLS Deviation rectilinear	Feet	±1024	14	0.0625	33.3 – 66.6 msec	Fly Down
127	055	FAS Vertical Alarm Limit	Meters	0 – 102.3	10	0.1	66.6 – 240 msec	Always Positive
130	055	MLS Aux Data Part 1 Group A	N/A	N/A	N/A	N/A	125 – 250 msec	N/A
131	055	MLS Aux Data Part 2 Group A	N/A	N/A	N/A	N/A	125 – 250 msec	N/A
132	055	MLS Aux Data Part 3 Group A	N/A	N/A	N/A	N/A	125 – 250 msec	N/A
133	055	MLS Aux Data Part 4 Group A	N/A	N/A	N/A	N/A	125 – 250 msec	N/A
134	055	MLS Aux Data Part 1 Group B	N/A	N/A	N/A	N/A	125 – 250 msec	N/A
135	055	MLS Aux Data Part 2 Group B	N/A	N/A	N/A	N/A	125 – 250 msec	N/A
136	055	MLS Aux Data Part 3 Group B	N/A	N/A	N/A	N/A	125 – 250 msec	N/A
137	055	MLS Aux Data Part 4 Group B	N/A	N/A	N/A	N/A	125 – 250 msec	N/A
140	055	MLS Aux Data Part 1 Group C	N/A	N/A	N/A	N/A	125 – 250 msec	N/A
141	055	MLS Aux Data Part 2 Group C	N/A	N/A	N/A	N/A	125 – 250 msec	N/A
151	055	MLS AZ Deviation	mV	±2400	15	0.0732		Flight Right
152	055	MLS GP Deviation	mV	±2400	15	0.0732		Flight Down
164	055	MLS Absolute Glide Path Angle	Degrees	±41	15	0.00125	25 – 66.6 msec	Above Horizon
165	055	MLS Absolute Azimuth Angle	Degrees	±82	16	0.00125	25 – 100 msec	L of Course
167	055	FAS Lateral Alarm Limit	Meters	0 – 102.3	10	0.1	66.6 – 240 msec	Always Positive

173	055	Localizer Deviation	DDM	±0.4	12	0.0001	33.3 – 66.6 msec	Fly Right
174	055	Glide Slope Deviation	DDM	±0.8	12	0.0002	33.3 – 66.6 msec	Fly Down
177	055	Distance to LTP/FTP	Nmiles	±512	16	0.007812	83.3 – 167 msec	Positive
240	055	Selected Glide Path Angle	Degrees	0 – 180	15	0.0055	800 – 1600 msec	Always Positive
241	055	Threshold Crossing Height	Meters	0 – 1638.35	20	0.00156	800 – 1600 msec	Always Positive
245	055	FTP to GARP Distance	Meters	0 – 104857.5	20	0.1	800 – 1600 msec	Always Positive
250	055	Unflagged Horizontal Deviation Rectilinear	Feet	±24000	18	0.0915	33.3 – 66.6 msec	Fly Right
251	055	Unflagged Vertical Deviation Rectilinear	Feet	±1024	14	0.0625	33.3 – 66.6 msec	Fly Down
320	055	Aircraft Altitude	Feet	131072	20	0.125	100 – 200 msec	Positive
325	055	Anchor Point Latitude	Degrees	±180	20	0.000172	800 – 1200 msec	North
326	055	Anchor Point Longitude	Degrees	±180	20	0.000172	800 – 1200 msec	East
327	055	Anchor Point Altitude	Feet	131072	20	0.125	800 – 1200 msec	Up
330	055	FLS Beam Slope	Degrees	±10	10	0.01	800 – 1200 msec	Always Negative
331	055	Local Magnetic Deviation	degrees	±180	18	0.000687	800 – 1200 msec	East
333	055	Runway Threshold Latitude	Degrees	±180	20	0.000172	800 – 1200 msec	North
334	055	Runway Threshold Longitude	Degrees	±180	20	0.000172	800 – 1200 msec	East
335	002	Track Angle Rate	Deg/Sec	±32	11			CW
335	004	Track Angle Rate	Deg/Sec	±32	11			CW
335	005	Track Angle Rate	Deg/Sec	±32	11			CW
335	038	Track Angle Rate	Deg/Sec	±32	11			CW
335	055	Aircraft Altitude Fine	Degrees	0.000172	11	8.38E-8	100 – 200 msec	Positive
335	056	Track Angle Rate	Deg/Sec	±32	11			CW
335	060	Track Angle Rate	Deg/Sec	±32	11			CW
336	055	Aircraft Longitude Fine	Degrees	0.000172	11	8.38E-8	100 – 200 msec	Positive
370	055	GNSS Height	Feet				500 – 1200 msec	

Attachment 9A – GENERAL AVIATION LABELS AND DATA STANDARDS

The content of this attachment was deleted by Supplement 18. Note added to refer to GAMA website.

Attachment 9B – GENERAL AVIATION WORD EXAMPLES

The content of this attachment was deleted by Supplement 18. Note added to refer to GAMA website.

Attachment 9C – EQUIPMENT IDENTIFIERS

The content of this attachment was deleted by Supplement 18. Note added to refer to GAMA website.

Attachment 11 – SYSTEM ADDRESS LABELS

The following System Address Labels (SALs) are added by Supplement 18:

System Address Label (Octal)	System
140	MFP-1 (Multi-Functional Probe)
141	SSA-1 (Side Slip Angle Probe)
142	ISP1-1 (Integrated Static Probe)
143	ISP1-2 (Integrated Static Probe)
144	MFP-2 (Multi-Functional Probe)
145	SSA-2 (Side Slip Angle Probe)
146	ISP2-1 (Integrated Static Probe)
147	ISP2-2 (Integrated Static Probe)
150	MFP-3 (Multi-Functional Probe)
151	SSA-3 (Side Slip Angle Probe)
153	ISP3-1 (Integrated Static Probe)
154	ISP3-2 (Integrated Static Probe)
155	On-board Airport Navigation System (OANS)
231	SDU ORT #1
232	SDU ORT #2
317	AFIRS (Automated Flight Information Reporting System)
335	Cursor Control Device (CCD) Left - 1
336	Cursor Control Device (CCD) Right - 2
337	Smoke Detection System (B767)
346	Integrated Air System Controller
347	Landing Gear Control & Interface Unit (LGCIU) (Airbus)

APPENDIX X – CHRONOLOGY AND BIBLIOGRAPHY

This appendix deleted by Supplement 18.

Supplements to ARINC Specification 429 Part 2

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SUPPLEMENT 16

TO

ARINC SPECIFICATION 429

MARK 33 DIGITAL INFORMATION TRANSFER SYSTEM (DITS)

PART 2

DISCRETE WORD DATA STANDARDS

Published: December 17, 2004

Prepared by the Airlines Electronic Engineering Committee

Adopted by the Airlines Electronic Engineering Committee: October 27, 2004

A. PURPOSE OF THIS DOCUMENT

This supplement introduces new discrete label assignments.

B. ORGANIZATION OF THIS SUPPLEMENT

The revision material introduced by this supplement, described in Part C, was integrated into the body of this specification to form an updated version of the standard.

C. CHANGES TO ARINC SPECIFICATION 429 PART 2 INTRODUCED BY THIS SUPPLEMENT

This section presents a complete tabulation of the changes, additions, and deletions to this ARINC Specification introduced by Supplement 16. Each change is identified by at least two elements:

- the section number and title currently employed in specification prior to the incorporation of the change
- a brief description of the change.

1.1.1 Relationship to Other Documents

New section added.

Data Standards

The following discrete labels were added by Supplement 16:

Octal	EQ ID
140	114
141	114
142	114
143	114
144	114
145	114
146	114
147	114
150	114
151	114
152	114
153	114
154	114
155	114
160	114
161	114
162	114
163	114
164	114

Octal	EQ ID
214	xxx
216	xxx
270	114
270	142
270	144
271	114
271	142
271	144
272	114
272	144
273	114
274	114
275	114
276	114
277	114
350	018
350	144
377	xxx

Supplements to ARINC Specification 429 Part 3

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SUPPLEMENT 15
TO
ARINC SPECIFICATION 429

MARK 33 DIGITAL INFORMATION TRANSFER SYSTEM (DITS)
PART 3
FILE DATA TRANSFER TECHNIQUES

Published: August 31, 1995

Prepared by the AEEC

Adopted by the AEEC Executive Committee: April 18, 1995

A. PURPOSE OF THIS SUPPLEMENT

This portion of Supplement 15 provides corrections and additions to the file transfer provisions of ARINC Specification 429. The reader should note that the organization of ARINC 429 has been described in Section B below.

Appendix C was added to assist designers in establishing connectivity between LRUs designed to different versions of Specification 429. Appendix D comprises the Specification and Description Language (SDL) diagrams that reflect the intent of the textual material. The SDL diagrams have not been fully proofed, and remain advisory in nature. Therefore, the text material has precedence over the SDL diagrams. When the SDL diagrams have been validated, they will be moved to an Attachment.

B. ORGANIZATION OF THIS SUPPLEMENT

The portion of this document, printed on goldenrod paper, contains descriptions of changes introduced into this Specification by this Supplement. In the text, printed on white paper, the modified and added material on each page is identified by a c-15 in the margins. In view of the document reorganization, existing copies of ARINC 429 cannot be updated.

This Supplement is the first in which ARINC Specification 429 is divided into three parts. This part, Part 3, contains the definition of the protocols used for file data transfer. Typically, file data transfer is non-periodic in nature.

The fundamental physical layer descriptions of the wire, voltage levels and coding of data are contained in Part 1. Part 1 also contains the listing of data word labels assigned for the transmission of broadcast periodic data.

Part 2 contains a tabulation of the ever-increasing list of Discrete data words used to provide status information.

C. CHANGES TO ARINC SPECIFICATION 429 INTRODUCED BY THIS SUPPLEMENT

This section presents a complete tabulation of the changes and additions to the Specification introduced by this Supplement. Each change and addition is defined by the section number and the title currently employed in the Specification or by the section name and title that will be employed when the Supplement is eventually incorporated. In each case, a brief description of the change or addition is included. A tabulation of sections is included with this supplement to enable the reader to correlate the previous section assignments with the new Part 3 Supplement 15 section number assignments.

The following changes affect only ARINC Specification 429-15, Part 3, File Data Transfer Techniques. Refer to Parts 1 and 2 for changes impacting the broadcast provisions of ARINC Specification 429.

ATTACHMENT 10 - VARIABLES OF BIT-ORIENTED PROTOCOL

Revised Notes 1 and 4.

Table 10-3 BIT-ORIENTED PROTOCOL OPTIONS - Added Option 012.

Table 10-5 VARIABLES OF HIGH SPEED BIT-ORIENTED PROTOCOL - Revised Time T10 min and max values.

ATTACHMENT 11 - BIT-ORIENTED DATA FILE TRANSFER WORD FORMATS

Table 11-6A GENERAL FORMAT IDENTIFIER (GFI) - Revised “Reserved ISO 9577” to “ISO 9577”

ATTACHMENT 11A - DESTINATION CODES

Added Cabin Packet Data Function. Corrected Ground Station bit encoding.

ATTACHMENT 11B - STATUS CODES

Revised description of Code 86. Added entries for Code 8E through 95.

ATTACHMENT 14 - SYSTEM ADDRESS LABELS

The following labels were added:

170 DFDAU (Mandatory Load Function)

266 Cabin Video System (Airshow)

334 Cabin Telecommunications Unit (CTU)

340 HF Data Radio/Data Unit #1

344 HF Data Radio/Data Unit #2

The following labels were revised:

175 HGA HPA

176 Spare

177 LGA HPA

APPENDIX 8 - INTEROPERABILITY OF BIT-ORIENTED LINK LAYER PROTOCOL

Appendix added.

APPENDIX 9 - SDL DIAGRAMS OF THE WILLIAMSBURG PROTOCOL

Appendix added.

ARINC Specification 429 is now available in three separate parts: Part 1 “Functional Description and Word Formats”, Part 2 “Digital Information Transfer System Standards” and Part 3 “File Data Transfer Techniques.” The changes are described in Supplements printed on goldenrod colored paper. The following pages provided a record of the section numbering of the text now included in Part 3.

Old Number (Supp 14)	**New Number (Supp 15)**	**Section Title**
1.1	1.1	Purpose of this Document
1.2	1.2	Relationship to ARINC Specification 419 changed to 429
1.3	1.3	“Mark 33 Digital Information Transfer System”_ - Basic Philosophy **changed to: “File Data Transfer Techniques”**
1.3.1	1.3.1	Number Data Transfer **changed to: Data Transfer**
1.3.2	1.3.2	ISO Alphabet No. 4 Data Transfer **changed to: Broadcast Data**
1.3.3	1.3.3	Graphic Data Transfer
2.3.1.5	2.1	File Data Transfer
2.3.1.5.1	2.3	Bit-Oriented Protocol Determination
2.3.2	2.2	Transmission Order
2.5	Chapter 3.0	Bit-Oriented Communications Protocol **changed to: Bit Oriented File Transfer Protocol**
2.5	3.1	Bit-Oriented File Transfer Protocol
2.5.1	3.2	Link Data Units (LDU)

Old Number (Supp 14)	New Number (Supp 15)	Section Title
2.5.2	3.3	Link Data Unit (LDU) Size and Word Count
2.5.3	3.4	System Address Labels (SAL)
2.5.4	3.5	Bit Rate and Word Timing
2.5.5	3.6	Word Type
2.5.6	3.7	Protocol Words
2.5.6.1	3.7.1	Protocol Identifier
2.5.6.2	3.7.2	Destination Code
2.5.6.3	3.7.3	Word Count
2.5.7	3.8	Request To Send (RTS)
2.5.7.1	3.8.1	Clear To Send (CTS)
2.5.7.2	3.8.2	Not Clear To Send (NCTS)
2.5.7.3	3.8.3	Destination Busy (BUSY)
2.5.7.4	3.8.4	No Response to RTS
2.5.8	3.9	Conflicting RTS Transmissions
2.5.8.1	3.9.1	Half Duplex Mode
2.5.8.2	3.9.2	Full Duplex Mode
2.5.9	3.10	Unexpected RTS
2.5.10	3.11	Start of Transmission (SOT)

Old Number (Supp 14)	New Number (Supp 15)	Section Title
2.5.10.1	3.11.1	General Format Identifier (GFI)
2.5.10.2	3.11.2	File Sequence Number
2.5.10.3	3.11.2	LDU Sequence Number
2.5.11	3.12	Data
2.5.11.1	3.12.1	Full Data Word(s)
2.5.11.2	3.12.2	Partial Data Word(s)
2.5.12	3.13	End of Transmission (EOT)
2.5.12.1	3.13.1	CRC Encoding
2.5.12.2	3.13.2	CRC Decoding
2.5.13	3.14	Negative Acknowledgement (NAK)
2.5.13.1	3.14.1	Missing SOT Word
2.5.13.2	3.14.2	Missing EOT Word
2.5.13.3	3.14.3	Parity Errors
2.5.13.4	3.14.4	Word Count Errors
2.5.13.5	3.14.5	CRC Errors
2.5.13.6	3.14.6	Time Out Errors
2.5.14	3.15	LDU Transfer Acknowledgement (ACK)
2.5.14.1	3.15.1	Duplicate LDU
2.5.14.2	3.15.2	Auto-Synchronized Files
2.5.14.3	3.15.3	Incomplete File Time
2.5.15	3.16	SYN Word
2.5.16	3.17	Response to ACK/NAK/SN
2.5.17	3.18	Solo Word
2.5.17.1	3.18.1	Test Word and Loop Word
2.5.17.2	3.18.2	Optional Solo Word Definitions
2.5.18	3.19	Optional End-to-End Message Verification
2.5.19	3.20	Protocol Initialization
2.5.19.1	3.20.1	Bit-Oriented Protocol Version
2.5.19.1.1	3.20.1.1	ALOHA
2.5.19.1.2	3.20.1.2	ALOHA Response
2.5.19.2	3.20.2	Williamsburg/File Transfer Determination
2.6	Chapter 4.0	Window Bit-Oriented Protocol **change to:** **Window Bit-Oriented File Transfer Protocol**
2.6	4.1	Windowed Bit-Oriented Protocol **change to:** **Windowed Bit-Oriented Communications Protocol**
2.6.1	4.2	Window Size
2.6.2	4.3	Window Definition

Old Number (Supp 14)	New Number (Supp 15)	Section Title
2.5.10.1	3.11.1	General Format Identifier (GFI)
2.5.10.2	3.11.2	File Sequence Number
2.5.10.3	3.11.2	LDU Sequence Number
2.5.11	3.12	Data
2.5.11.1	3.12.1	Full Data Word(s)
2.5.11.2	3.12.2	Partial Data Word(s)
2.5.12	3.13	End of Transmission (EOT)
2.5.12.1	3.13.1	CRC Encoding
2.5.12.2	3.13.2	CRC Decoding
2.5.13	3.14	Negative Acknowledgement (NAK)
2.5.13.1	3.14.1	Missing SOT Word
2.5.13.2	3.14.2	Missing EOT Word
2.5.13.3	3.14.3	Parity Errors
2.5.13.4	3.14.4	Word Count Errors
2.5.13.5	3.14.5	CRC Errors
2.5.13.6	3.14.6	Time Out Errors
2.5.14	3.15	LDU Transfer Acknowledgement (ACK)
2.5.14.1	3.15.1	Duplicate LDU
2.5.14.2	3.15.2	Auto-Synchronized Files
2.5.14.3	3.15.3	Incomplete File Time
2.5.15	3.16	SYN Word
2.5.16	3.17	Response to ACK/NAK/SN
2.5.17	3.18	Solo Word
2.5.17.1	3.18.1	Test Word and Loop Word
2.5.17.2	3.18.2	Optional Solo Word Definitions
2.5.18	3.19	Optional End-to-End Message Verification
2.5.19	3.20	Protocol Initialization
2.5.19.1	3.20.1	Bit-Oriented Protocol Version
2.5.19.1.1	3.20.1.1	ALOHA
2.5.19.1.2	3.20.1.2	ALOHA Response
2.5.19.2	3.20.2	Williamsburg/File Transfer Determination
2.6	Chapter 4.0	Window Bit-Oriented Protocol **change to:** **Window Bit-Oriented File Transfer Protocol**
2.6	4.1	Windowed Bit-Oriented Protocol **change to:** **Windowed Bit-Oriented Communications Protocol**
2.6.1	4.2	Window Size
2.6.2	4.3	Window Definition

Old Number (Supp 14)	New Number (Supp 15)	Section Title
ATT 11B	ATT 4	Status Codes
ATT 11C	ATT 5	ALOHA/ALOHA Response Protocol Word Definition
Table 11C-1	Table 5-1	ALOHA Initial (ALO) Protocol Word
Table 11C-2	Table 5-2	ALOHA Response (ALR) Protocol Word
Table 11C-3	Table 5-3	Version Number for ALO/ALR Protocol Words
ATT 12	ATT 6	File Transfer Example
ATT 12A	ATT 7	Field Mapping Exchange
ATT 13	ATT 8	Protocol Determination procedure Diagrams
Diagram 13-1	Diagram 8-1	Protocol Determination Procedure Diagram (Two Bilingual Units)
Diagram 13-2	Diagram 8-2	Protocol Determination Procedure Diagram (One Bilingual Unit and One Character-Only Unit)
Diagram 13-3	Diagram 8-3	
ATT 13A	ATT 9	ALOHA Version Determination Sequence
ATT 15	ATT 10	Link Layer CRC Data Example
ATT 16	ATT 11	Sequence of Protocol and Data Words in Window Transfer
ATT 17	ATT 12	Flow Diagram Used to Determine Character-Oriented vs Bit-Oriented Protocol
APPENDIX 6	APPENDIX A	Former AIM and File Data Transfer Techniques
A6-2.1.5	A2.1.5	Sign/Status Matrix
A6-2.1.5.2	A2.1.5.2	AIM Data
A6-2.1.5.3	A2.1.5.3	Character-Oriented File Transfer
A6-2.3.1	A2.3.1	Digital Language
A6-2.3.1.4	A2.3.1.4	AIM Data
A6-2.3.1.5	A2.3.1.5	File Data Transfer
A6-2.3.1.5.1	A2.3.1.5.1	Command/Response Protocol
A6-2.3.1.5.2	A2.3.1.5.2	Initial Word Types
A6-2.3.1.5.3	A2.3.1.5.3	Intermediate Words
A6-2.3.1.5.4	A2.3.1.5.4	Final Words
A6-2.3.1.5.5	A2.3.1.5.5	Word Type Encoding
A6-2.3.1.5.6	A2.3.1.5.6	File Data Formats
A6-2.3.1.5.7	A2.3.1.5.7	File Data Labels
A6-3.2	A-3.2	AIM Information Transfer
A6-3.2.1	A3.2.1	Acknowledgement Data
A6-3.2.2	A3.2.2	ISO Alphabet No. 5 Data
A6-3.2.3	A3.2.3	Maintenance Data
APPENDIX 7	APPENDIX B	Mathematical Example of CRC Encoding/Decoding
APPENDIX 8	APPENDIX C	Interoperability of Bit-oriented Link Layer Protocol
APPENDIX 9	APPENDIX D	SDL Diagrams of Williamsburg Protocol

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SUPPLEMENT 16
TO
ARINC SPECIFICATION 429

MARK 33 DIGITAL INFORMATION TRANSFER SYSTEM (DITS)
PART 3
FILE DATA TRANSFER TECHNIQUES

Published: June 30, 1997

Prepared by the AEEC

Adopted by the AEEC Executive Committee: June 24, 1997

A. PURPOSE OF THIS SUPPLEMENT

This Supplement reorganizes Part 3 to be consistent with previous published versions of ARINC Specification 429. It also restores several paragraphs missing from Supplement 15.

The technical changes include clarification of the Version 1 (Williamsburg) protocol, deletion of the Version 2 protocol, and creation of the Version 3 protocol. The definition of the Version 3 protocol will be completed in a future Supplement.

B. ORGANIZATION OF THIS SUPPLEMENT

The first part of this document, printed on goldrod colored paper, contains descriptions of the changes introduced into this Specification by this Supplement. The second part, printed on white paper, contains the changes made to the specification. The modified and added material on each page is identified by a c-16 in the margins. In view of the document reorganization, ARINC Specification 429, Part 3, is reprinted in its entirety as ARINC Specification 429-16, Part 3.

C. CHANGES TO ARINC SPECIFICATION 429, INTRODUCED BY THIS SUPPLEMENT

This section presents a complete tabulation of the changes and additions to the Specification introduced by this Supplement. Each change and addition is defined by the Section number and the title that will be employed when the Supplement is eventually incorporated. In each case, a brief description of the change or addition is included.

1.0 Introduction

This section contains a reorganization of the material previously in Section 1.0 and 2.0 of ARINC Specification 419P3-15 with the following exceptions.

The section on Graphic Data Transfer (formerly 1.3.4) is deleted, Sections 1.3, 1.3.1, 1.3.2, and 1.3.4 include minor changes clarifying the background for file data transfer, and Section 1.3.6 on Bit-Oriented Protocol Determination (formerly 1.3.7) was revised to refer to Section 2.5.19.

2.0 Bit-Oriented File Transfer Protocol

Section number 2.1 – 2.4 have been inserted as placeholders to re-establish section numbering consistency with ARINC Specification 429-14 and its predecessors.

Section 2.5 and subsections contain the material previously published in Section 3.0 of ARINC Specification 429P3-15, as modified below.

2.5 Bit-Oriented Communications Protocol

References to Attachments 12 and 12A updated.

2.5.1 Link Data Units (LDU)

The definition of LDU is clarified.

2.5.3 System Address labels (SALs)

Commentary on use of SALs clarified.

2.5.4 Bit Rate and Word Timing

Commentary on use of word gap criteria clarified.

2.5.6.2 Destination Code

Introduction to section added, and use of Destination Code clarified.

2.5.6.3 Word Count

Introduction to section added.

2.5.7.3 Destination Busy (BUSY)

The use of Option 3 (Send Auto CTS) and Option 4 (Accept Auto CTS) is clarified.

2.5.81 Half Duplex Mode

This section restores text missing from the published version of Part 3, Supplement 15.

2.5.11.2 Partial Data Word

Location of the length of a partial data word is clarified.

2.5.14.1 Duplicate LDU

The definition of a duplicate LDU is clarified.

2.5.15 SYN Word

The definition of a duplicate LDU is clarified.

2.5.19 Protocol Initialization

The protocol version determination is clarified.

2.5.19.1 Bit-Oriented Protocol Version

The protocol version determination is clarified.

2.5.19.1.1 ALOHA

The protocol version determination is clarified.

2.5.19.1.2 ALOHA Response

This section restores text missing from the published version of Part 3, Supplement 15.

2.5.19.2 Williamsburg/File Transfer Determination

This section restores text missing from the published version of Part 3, Supplement 15, and commentary is added on use of a NAK in the protocol determination logic.

2.6 Windowed Bit-Oriented Communications Protocol

Section 2.6 and subsections have been deleted. Section 2.6 contained the definition of Version 2 of the Williamsburg protocol. Version 2 of the Williamsburg protocol has been superseded by Version 3. Section 2.6 and subsections contained the material previously published in Section 4.0 of ARINC Specification 429P3-15.

3.0 Bit-Oriented Media Access Control (MAC)

An introduction to the Bit-Oriented Media Access Control (Williamsburg Version 3) protocol is added.

ATTACHMENTS 1-17

Attachment numbers 1-9 have been inserted as placeholders to re-establish section numbering consistency with ARINC Specification 429-14 and its predecessors.

Attachments 10-17 contain material published in Attachments 1-12 of ARINC Specification 429P3-15, as modified below.

ATTACHMENT 10 - VAIABLES OF BIT-ORIENTED PROTOCOL

Table 10-3 is replaced with Table 10-3A, containing options for Version 1. Tables 10-3B, 10-6 and 10-7 are added as placeholders for Version 3 Williamsburg. Variables for the Version 2 protocol in Tables 10-1 and 10-3A are deleted.

ATTACHMENT 11 - BIT-ORITENTED DATA FILE TRANSFER WORD FORMATS

The general word format in Table 11-1 is clarified.

The LCW protocol word format in Table 11-4 is modified.

Table 11-4 is modified to add the Service Class Identifier to the LCW format.

Table 11-4B is deleted as part of the Version 2 protocol.

Table 11-4A is modified to add the version number for Version 3, and delete references to Version 2.

ATTACHMENT 11A - DESTINATION CODES

The destination Code N for FMC, Center, is added.

ATTACHMENT 11C - ALOHA/ALOHA RESPONSE PROTOCOL WORD DEFINTION

The ALOHA and ALOHA Response protocol word definitions are revised to be consistent with other changes made to the protocol, and the titles of the tables modified to indicate they are examples.

ATTACHMENT 12 - VERSION 1 FILE TRANSFER EXAMPLE

The title is changed to indicate Version 1.

ATTACHMENT 12A - FIELD MAPPING EXAMPLE

Attachment 12A is replaced with an updated example

ATTACHMENT 15 - LINK LAYER CRC DATA EXAMPALE

This section is deleted as part of the Version 2 protocol.

ATTACHMENT 16 - SEQUENCE OF PROTOCOL AND DATA WORDS IN WINDOWN TRANSFER

This section is deleted as part of the Version 2 protocol.

APPENDICES A-K

Appendix numbers A-E have been inserted as placeholders to re-establish section numbering consistency with ARINC Specification 429-14 and its predecessor.

Appendices F-J contain the material published in Appendices A-D of ARINC 429P3-15.

Appendix H was revised to reflect the deletion of the Version 2 protocol and creation of the Version 3 protocol.

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SUPPLEMENT 17
TO
ARINC SPECIFICATION 429

MARK 33 DIGITAL INFORMATION TRANSFER SYSTEM (DITS)
PART 3
FILE DATA TRANSFER TECHNIQUES

Published: May 17, 1999

Prepared by the AEEC

Adopted by the AEEC Executive Committee: May 31, 1999

A. PURPOSE OF THIS SUPPLEMENT

This Supplement introduces the definition of a new bit-oriented file data transfer protocol. The protocol is designed to be consistent with the IEEE-802 Media Access Control (MAC) protocol definition. Version 3 fills the role intended for Version 2 of the Williamsburg protocol by providing a high throughput avionics file data transfer interface. Version 2 was deleted by Supplement 16. Version 3 is intended to be capable of being bridged to other common data bus protocols, most significantly, Ethernet.

B. ORGANIZATION OF THIS SUPPLEMENT

Changes introduced by Supplement 17 were deemed sufficiently significant to issue an entirely new publication of Specification 429 Part 3. There is no standalone Supplement.

This part, printed on goldenrod colored paper, contains a list of descriptions of changes introduced into this Specification by this Supplement 17.

In the body of the document, the changes (.i.e., the modified and added material) introduced by Supplement 17 are identified by c 17 change bars in the margins.

C. CHANGES TO ARINC SPECIFICATION 429, PART 3 INTRODUCED BY THIS SUPPLEMENT

This section presents a complete tabulation of the changes and additions to the Specification introduced by this Supplement. In the text below, the Section number and title of each affected Section, Attachment or Appendix is listed, followed by a brief description of the change or addition.

1.3.5 Transmission Order

Transmission order of bits was clarified.

1.4 Relationship to Other Standards

A new section was added. It discusses the relationship of this document to other AEEC documents and to other industry documents.

3.0 Bit-Oriented Media Access Control Protocol

The definition of the bit-oriented Media Access Control (Williamsburg Version 3) protocol was added, replacing introductory text inserted by Supplement 16 as a placeholder.

ATTACHMENT 10 - VARIABLES OF BIT-ORIENTED PROTOCOL

Table 10-3B, containing options for Version 3, was added.

Table 10-6, containing timer values for the ARINC 429 high-speed Version 3 bus, was added.

Table 10-7, containing a placeholder for low speed bus timers associated with Version 3 protocol was deleted because the low speed implementation is not recommended.

ATTACHMENT 11 - BIT ORIENTED DATA FILE TRANSFER WORD FORMATS

Table 11-1A was updated to add Version 3 SOF and EOF words.

Table 11-8 was added defining the command frame SOF.

Table 11-9 was added defining the command frame EOF.

Table 11-10 was added defining the information frame SOF.

Table 11-11 was added defining the information frame EOF.

ATTACHMENT 18 – MAC SUBLAYER SUPPORT DIAGRAMS

New Attachment added.

ATTACHMENT 19 – COMMAND FRAME DATA UNIT (FDU) STRUCTURE AND EXAMPLES

New Attachment added.

ATTACHMENT 20 – INFORMATION FRAME DATA UNIT (FDU) STRUCTURE AND EXAMPLES

New Attachment added.

APPENDIX 8 - INTEROPERABILITY OF BIT-ORIENTED LINK LAYER PROTOCOL

Appendix 8 is updated to discuss interoperability between Version 1 and Version 3.

APPENDIX 10 - ARINC 429 WILLIAMSBURG PROTOCOL LAYER DIAGRAM

A new Appendix was added providing a general overview of the protocol structure over different communication stacks.

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SUPPLEMENT 18
TO
ARINC SPECIFICATION 429

MARK 33 DIGITAL INFORMATION TRANSFER SYSTEM (DITS)
PART 3
FILE DATA TRANSFER TECHNIQUES

Published: October 12, 2001

Prepared by the AEEC

Adopted by the AEEC Executive Committee: July 18, 2001

A. PURPOSE OF THIS SUPPLEMENT

This Supplement introduces the assignment of 3 new satellite links, HFDR Right, TAWS, and CVR into the Destination Code table.

A Table was added to define the Variables of Low Speed Connectionless Bit-Oriented Protocol.

Typographical errors were corrected in the text.

B. ORGANIZATION OF THIS SUPPLEMENT

The first part of this document printed on golden-rod paper contains descriptions of changes introduced into this Specification by this Supplement.

The changes introduced by Supplement 18 have been identified using change bars and are labeled in the margin by a “c-18” indicator.

C. CHANGES TO ARINC SPECIFICATION 429, PART 3 INTRODUCED BY THIS SUPPLEMENT

This section presents a complete tabulation of the changes and additions to the Specification to be introduced by this Supplement. Each change or addition is identified by the section number and the title that will be employed for that section when the Supplement is eventually incorporated. In each case a brief description of the change or addition is included.

3.4.3 System Address Labels (SAL)

Corrected the reference to the table of SAL assignments (from Attachment 14 to Attachment 11) in ARINC Specification 429 Part 1.

3.4.4 Bit Rate and Word Timing

Provision was added to specify that the Williamsburg version 3 protocol may be operated at low speed.

ATTACHMENT 10 – VARIABLES TO BIT-ORIENTED PROTOCOL

Added new Table 10-7 to support low speed operation of Williamsburg protocol at low speed. Later modified the value of the variables.

ATTACHMENT 11A – DESTINATION CODES

The assignment of ‘T” for the transponder was deleted. Six new entries, HFDR Right, TAWS, CVR Inmarsat, ICO, and Globalstar satellite link identifiers were added as destination codes. The format and content of the table was aligned with the corresponding Table 3-1 of Attachment 3 to ARINC Specification 619 to improve consistency.

APPENDIX A – J

These appendices were formerly identified as Appendix 1 –10. During the regeneration of Specification Description Language (SDL) diagrams in Appendix I, references to Section 1.3.7 were revised to Section 2.5.19.

APPENDIX K

New Appendix added.

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SUPPLEMENT 19
TO
ARINC SPECIFICATION 429

MARK 33 DIGITAL INFORMATION TRANSFER SYSTEM (DITS)
PART 3
FILE DATA TRANSFER TECHNIQUES

Published: June 25, 2009

Prepared by the AEEC

Adopted by the AEEC Executive Committee: October 22, 2008

A. PURPOSE OF THIS DOCUMENT

This Supplement provides an addition two destination codes to Attachment 11A to align it with ARINC 619.

B. ORGANIZATION OF THIS SUPPLEMENT

In the past, changes introduced by a Supplement to an ARINC Standard were identified by vertical change bars with an annotation indicating the change number. Electronic publication of ARINC Standards has made this mechanism impractical.

In this document **blue bold** text is used to indicate those areas of text changed by the current Supplement only.

C. CHANGES TO ARINC SPECIFICATION 429 INTRODUCED BY THIS SUPPLEMENT

This section presents a complete listing of the changes to the document introduced by this Supplement. Each change is identified by the section number and the title as it will appear in the complete document. Where necessary, a brief description of the change is included.

1.3 Development of File Data Transfer

The clarification “aperiodic file data transfer” was added.

1.3.4 File Data Transfer

The definition of the acronym BOP (Bit-Oriented Protocol) was added.

1.3.5 Transmission Order

Existing text was moved to COMMENTARY.

2.5 Bit-Oriented Communications Protocol

The clarification “conventional broadcast data words” was added.

2.5.3 System Address Labels (SALs)

The clarification “~~conventional~~ broadcast ~~data words~~**communications**” was added to the last sentence of the commentary.

2.5.7.4 No Response to RTS

Clarification by adding “The No Response counter (N_3) should be reset upon receiving a valid response to the RTS.”

2.5.12 End of Transmission (EOT)

Clarification: “The ARINC 429 physical connection ~~data link~~ is a twisted shielded pair of wires…”

3.3.1.2.2 Type

Outdated commentary was removed: ~~At the time this text was written, ARINC Specification 664 was in draft state i.e., Project Paper 664.~~

ATTACHMENT 10 – VARIABLES OF BIT-ORIENTED PROTOCOL

An editorial change was made: the strike-out text of “1 sec” was removed from the T_{17} entry in Table 10-7 – Variables Of Low Speed Connectionless Bit-Oriented Protocol - Version 3. This change was intended to be made by Supplement 18. A new Note 2 was added to explain the intended omission of a maximum time value for T_{17}.

ATTACHMENT 11A – DESTINATION CODES

This Supplement provides additions to the Destination Code table of:

- Dialogue Service Interface (DSI) = 9 (reference new Note 8)
- EFB #1 = Y
- EFB #2 = Z
- Iridium Satellite Link = Control Code FF (reference Notes 3, 4)

Added reference to Note 4 to existing entry for Satellite Link (Character Code S).

New Notes 7 and 8 were added.