DIGITAL INFORMATION TRANSFER SYSTEM (DITS) PART 1 FUNCTIONAL DESCRIPTION, ELECTRICAL INTERFACES, LABEL ASSIGNMENTS AND WORD FORMATS

ARINC SPECIFICATION 429P1-18

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Specification 429P1-13	October 8, 1991	December 30, 1991
Specification 429P1-14	November 4, 1992	January 4, 1993
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Specification 429P1-17	May 5, 2004	May 17, 2004
Specification 429P1-18	October 4, 2012	November 29, 2012

A description of the changes introduced by each supplement is included in ARINC Specification 429, Part 4.

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.

c) ARINC Reports – Provide guidelines or general information found by the airlines to be good practices, often related to avionics maintenance and support.

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.

TABLE OF CONTENTS

ATTACHMENTS

APPENDICES

1.0 INTRODUCTION

1.1 Purpose of this Document

This document defines the air transport industry standards for the transfer of digital information between avionics system elements. Adherence to these standards is desired for all inter-systems communication in which the Line Replaceable Units (LRUs) are defined by the relevant ARINC Characteristics. The use of these standards for intra-system communication is not necessary, although it may be convenient.

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 Formats

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 Part 1 Supplements (1 to 17) as published over the years. It was introduced as part of the update to ARINC 429 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 Relationship to ARINC Specification 419

ARINC Specification 419: *Digital Data System Compendium* is a catalog of several early digital data transmission interfaces that have found application during the emergent period of digital avionics technology. The use of digital buses in the early days demonstrated a clear need for a general purpose digital information transfer system standard. ARINC Specification 429 draws on the experience gained from ARINC Specification 419, but is otherwise separate and distinct from it.

1.4 Digital Information Transfer System - Basic Philosophy

This document describes a method in which an avionics system element having information to transmit does so from a designated output port, over a single twisted shielded pair of wires, to all other system elements having need of that information. Bi-directional data flow on a given twisted and shielded pair of wires is not permitted.

1.4.1 Numeric Data Transfer

ARINC 429 numeric data transmission characteristics have been developed from many successful methods of digital information transfer used in industry. Data for transmission is encoded in either two's complement fractional Binary (BNR) notation or in Binary Coded Decimal (BCD) notation. The data is supplied from source systems at data rates sufficiently high to ensure small incremental value changes between updates. Transmission is made open-loop, i.e., sinks are not required to inform sources that information has been received.

A parity bit is transmitted as part of each data word to permit simple error checks to be performed by the sinks. These, together with data reasonableness checks which may be performed by the sinks, may be used to prevent the display or other utilization of an erroneous or suspect word. The inherently high integrity of the twisted and shielded wire transmission medium ensures that drop-outs are few. The low rates of change of the data ensure the drop outs, when they do occur, are of no consequence.

1.4.2 ISO Alphabet No. 5 (ISO 5) Data Transfer

In addition to the transfer of BNR and BCD numeric data, ARINC 429 can transfer alpha and numeric data encoded per ISO 5. The same broadcast transmission philosophy is used, even though system operation may differ slightly to accommodate the particular needs associated with this type of data. These differences are addressed individually in this document as they arise.

1.4.3 Graphic Data Transfer

A third type of data which may be handled by ARINC 429 is graphic data, i.e., the lines, circles, randomly positioned alpha/numeric text and other symbols used on a map and similar displays. The technique employed for this purpose can be basically similar to that used for ISO 5 alpha/numeric data transfer. **ARINC Characteristic 744A:** *Full-Format Printer with Graphics Capability* provides additional information and example graphic characters that may be transferred using ARINC 429.

2.0 DIGITAL INFORMATION TRANSFER SYSTEM STANDARDS

2.1 Message Related Elements

This section describes the digital data transfer system elements considered to be principally related to the message itself or the manner in which it is handled.

2.1.1 Direction of Information Flow

The information output of an avionics system element should be transmitted from a designated port (or ports) to which the receiving ports of other system elements in need of that information are connected. In no case does information flow into a port designated for transmission.

COMMENTARY

A separate data bus for each direction of transfer is used when data is required to flow both ways between two avionics systems elements (see Section 2.2.1).

2.1.2 Information Element

The basic ARINC 429 information element is a digital word containing 32 bits. There are five types of basic words:

- Binary (BNR)
- Binary Coded decimal (BCD)
- Discrete
- Maintenance (general)
- Acknowledgement, ISO 5, Maintenance (AIM)

Word formats for these words are shown in Attachment 6. The data handling rules are set forth in Section 2.3.1. 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, in the case of BNR/BCD numeric data, valid data bits. If valid data bits are used, the information resolution may exceed that called for in this specification (See Section 2.1.6).

COMMENTARY

To permit the use of identical error-checking hardware elements in the handling of BNR and BCD numeric data words, the format for ARINC 429 BCD words differ from that used formerly for this type of data. Bit 32 is assigned to parity, Bits 31 and 30 to the sign/status matrix, Bit 29 is the Most Significant Bit (MSB) of the data field, and the maximum decimal value of the most significant character is 7.

Also, latitude and longitude can only be encoded in the ARINC 429 word with the formerly specified resolution of 0.1 minute of arc if Bits 9 and 10 are used for data rather than the SDI function described in Section 2.1.4 of this document, and the word is structured differently from the standard shown in Attachment 6. Restructuring the word involves limiting the maximum value of the most significant character to 1 and moving the remaining BCD characters towards the MSB by two bit positions. It is possible, 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, with its own data processor using BNR data. If this proves to be the case, these special provisions for BCD encoding will not be required.

2.1.3 Information Identifier

The type of information contained in a word is identified by a six-character label. ARINC 429 label code assignments are shown in Attachment 1-1 to this document. The first three characters are octal characters coded in binary in the first eight bits of the word. The eight bits are used as follows:

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

The last three characters of the six-character label are hexadecimal characters used to provide for identification of ARINC 429 bus source. Each triplet of hexadecimal characters identifies a unit with one or more ARINC 429 ports. Each three character code (and LRU) may have up to 255 eight bit labels assigned to it. The code is used administratively to retain distinction between unlike parameters having like labels assignments.

COMMENTARY

Some users desire a means for identifying label sets and buses associated with a particular equipment ID code. Octal label 377 has been assigned for this purpose. The code appears in the three least significant characters of the BCD word. The transmission of the equipment identifier word on a bus enables receivers attached to the bus to recognize the source of the information. Since the transmission of the equipment identifier word is optional, receivers should not depend on that word for correct operation.

In some ARINC 429 applications, a bus may 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 development may need 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

Adherence to the label code assignments of Attachment 1-1 is essential to ensure proper inter-system and intra-system communications. The assignment of ARINC 429 label codes is coordinated by ARINC Industry Activities (IA) for the air transport industry.

When a manufacturer finds that Attachment 1-1 does not specify the label he needs for a particular system application, the user should contact ARINC for assistance. A page on the IA website has been developed for this purpose:

http://www.aviation-ia.com/aeec/projects/429/index.html

2.1.4 Source/Destination Identifier

Bits 9 and 10 of numeric data words are reserved for the Source Destination Identification (SDI). However, these bits are not available for this function in alpha/numeric (i.e., ISO 5) data words or when the resolution needed for numeric (BNR/BCD) data necessitates their use of valid data. The SDI may be used 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 ARINC 429 word content. When the SDI is used, source equipment should encode the aircraft installation number in Bits 9 and 10 as shown in Table 2-1. Sink equipment should recognize words containing its own installation number code and words containing code 00, the all-call code. When the SDI is not used, binary zeros or valid data should be transmitted in Bits 9 and 10.

Table 2-1 – Source/Destination Identifier

Bit Number		Installation Number
10	9	
0	0	all-call
0	1	1
1	0	2
1	1	3

COMMENTARY

Equipment falls into one of three categories: source only, sink only, or both source and sink. Equipment functioning as both a source and a sink should recognize the SDI bits on the inputs and should also encode the SDI bits, as applicable, on the outputs. DME, VOR, ILS, and other sensors are examples of source and sink equipment generally considered to be only source equipment. These are actually sinks for their own control panels. Many other types of equipment are also misconstrued as source only or sink only. A simple rule of thumb is the following: If a unit has an ARINC 429 input port and an ARINC 429 output port, then it is both a source and a sink. With the increase of equipment consolidation, e.g., centralized control panels, the correct use of the SDI bits cannot be overstated.

With regards to all-call, users should be aware that in some installations, the SDI all-call is forfeited and code 00 is used as the installation Number 4 identifier.

This document does not address the practical question of how the SDI bits are set in multi-installation systems. One possible method is to wire program pins on the individual LRU to set the installation code. The ARINC Characteristic devoted to an individual system defines the method actually used.

2.1.5 Sign/Status Matrix

This section describes the coding of the Sign/Status Matrix (SSM) field. The SSM field uses Bits 30 and 31 in all cases. For BNR data words, the SSM field also includes Bit 29.

The SSM field may be used to report hardware equipment status, such as Normal Operation, Failure Warning, Functional Test, Verified Data, and No Computed Data (NCD).

The following definitions apply:

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.

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.

The system indicators should always be flagged during a Failure Warning condition.

When a No Computed Data condition exists, the source system should annunciate its outputs to be invalid by setting the sign/status matrix of the affected words to the No Computed Data code, as defined in the subsections which follow. The system indicators may optionally be flagged, depending on system requirements.

While the unit is in the functional test mode, all output data words generated within the unit (i.e., pass through words are excluded) should be coded for Functional Test. Pass through data words are those words received by the unit and retransmitted without alteration.

When the SSM code is used to transmit status and more than one reportable condition exists, the condition with the highest priority should be encoded in Bits 30 and 31. The order of condition priorities to be used is shown in Table 2-2.

Table 2-2 – SSM Condition Priority

Condition	Priority
Failure Warning	1
No Computed Data	2
Functional Test	3
Normal Operation	4

Each data word type has its own unique utilization of the SSM field. These various formats are described in the following subsections.

2.1.5.1 BCD Numeric

When a failure is detected within a system which would cause one or more of the words normally output by that system to be unreliable, the system should stop transmitting the affected word or words on the data bus.

Some avionic systems are capable of detecting a fault condition which results in less than normal accuracy. In these systems, when a fault of this nature (for instance, partial sensor loss) which results in degraded accuracy is detected, each unreliable BCD digit should be encoded 1111 when transmitted on the data bus. For equipment having a display, the 1111 code should, when received, be recognized as representing an inaccurate digit and a dash or equivalent symbol should be displayed in place of the inaccurate digit. Parameters for which such a degraded mode of operation is possible are identified in the Note column of Attachment 2.

The sign (e.g., plus/minus, north/south, etc.) of BCD Numeric Data should be encoded in Bits 30 and 31 of the word as shown in Table 2-3. Bits 30 and 31 of BCD Numeric Data words should be set to zero where no sign is needed.

The No Computed Data code should be annunciated in the affected BCD Numeric 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 in Bits 30 and 31 of an instruction input data word, it should be interpreted as a command to perform a functional test.

COMMENTARY

> A typical instruction input to a radio, for example, would be a channel change command word. When this command word is received with the Functional Test coding in the SSM field, the radio should exercise its functional test.

When the Functional Test code appears as a system output, it should be interpreted as advice that the data in the BCD Numeric Data word contents are the result of the execution of a functional test. A functional test should produce indications of 1/8 of positive full-scale values unless indicated otherwise in the associated ARINC Characteristic.

Table 2-3 – BCD Status Matrix

Bit Number		Meaning
31	30	
0	0	Plus, North, East, Right, To, Above
0	1	No Computed Data
1	0	Functional Test
1	1	Minus, South, West, Left, From, Below

2.1.5.2 BNR Numeric Data Words

The status of the transmitter hardware should be encoded in the Status Matrix field (Bits 30 and 31) of BNR Numeric Data words as shown in Table 2-4.

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 Bits 30 and 31 in the affected word(s) to the Failure Warning code. Words containing this code should continue to be supplied to the data bus during the failure condition.

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

When it appears 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 functional test should produce indications of 1/8 of positive full-scale values unless indicated otherwise in the associated ARINC Characteristic.

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 30 and 31 in the affected words such that the Functional Test annunciation is replaced with Failure Warning annunciation.

Table 2-4 – BNR Status Matrix

Bit Number		Meaning
31	**30**	
0	0	Failure Warning
0	1	No Computed Data
1	0	Functional Test
1	1	Normal Operation

The sign (e.g., plus, minus, north, south, etc.) of BNR Numeric Data words should be encoded in the Sign Matrix field (Bit 29) as shown in Table 2-5. Bit 29 should be set to zero when no sign is needed.

Table 2-5 – Sign Matrix

Bit Number	Meaning
29	
0	Plus, North, East, Right, To, Above
1	Minus, South, West, Left, From, Below

Some avionic systems are capable of detecting a fault condition which results in less than normal accuracy. In these systems, when a fault of this nature (for instance, partial sensor loss) which results in degraded accuracy is detected, the equipment should continue to report Normal for the sign status matrix while indicating the degraded performance by coding bit 11 as shown in Table 2-6.

Table 2-6 – Accuracy Status

Bit Number	Meaning
11	
0	Nominal Accuracy
1	Degraded Accuracy

This implies that degraded accuracy can be coded only in BNR words not exceeding 17 bits of data. Parameters for which such a degraded mode of operation is possible are identified in the Notes column of Attachment 2.

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 Bits 30 and 31 in the affected word(s) to the Failure Warning code defined in Table 2-7. 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. Designers should use this method when the display or use of the discrete data by a system is undesirable. 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 Characteristic to determine proper SSM reporting. Designers should preclude mixing operational and BITE data in the same word.

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.

Table 2-7 – Discrete Data Words

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

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 ARINC 429 bus 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 MSB of the data field represents one half of the maximum value chosen for the parameter being defined. Successive bits represent the increments of a binary fraction series. Negative numbers are encoded as the two's complements of positive value 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 are first determined in that order. The Least Significant Bit (LSB) 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 LSB value. For example, to transfer altitude in 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., 131,072 -1).

The resolution provided in an ARINC 429 word should equal or exceed the accuracy of the parameter, so not to degrade it.

Because data accuracy is a quality of the measurement process and not the data transfer process, accuracy plays no part in the selection of word characteristics.

For the binary representation of angular data, ARINC 429 employs degrees divided by 180^o as the unit of data transfer and ±1 (semi-circle) as the range for two's complement fractional notation encoding (ignoring, for the moment, the subtraction of the LSB value). Thus the angular range 0 through 359.xxx degrees is encoded as 0 through ±179.xxx degrees, the value of the MSB is one half semi-circles and there are no discontinuities in the code.

This is illustrated as follows. Consider encoding the angular range 0^o to 360^o in 1^o increments. Per the general encoding rules above, the positive semi-circle will cover the range 0^o to 179^o (one LSB less than full range). All the bits of the code are zeros for 0^o and ones for 179^o, and the sign/status matrix will indicate the positive sign. The negative semi-circle will cover the range 180^o to 359^o. All bits are set to zero for 180^o. The code for angles between 181^o to 359^o is determined by taking the two's complements of the fractional binary series for the result of subtracting each value from 360. Thus, the code for 181^o is the two's complement of the code for 179^o. Throughout the negative semi-circle, which includes 180^o, the sign/status matrix contains the negative sign.

For convenience, all binary word ranges in Attachment 2 are shown as whole binary numbers rather than such numbers less one LSB 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.

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 5 code (see Attachment 5 to this document) using Bits 1 through 4 of the seven-bit-per-character code. Alpha/numeric data is encoded using all seven bits per character of the ISO 5 code and is transmitted using the special word format described in Section 2.3.1.3 of this document.

2.2 Electrically Related Elements

This section describes the digital transfer system elements considered to be principally related to the electrical aspects of the signal circuit.

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 to an aircraft ground close to the rack connector and at all production breaks in the cable.

COMMENTARY

Cable characteristics and electrical mismatches can produce distortion of the digital data pulses. Likewise, noise due to electrical interference perturbs digital signals.

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

This specification places no restrictions on the number of stubs or length of stubs installed on an aircraft. The voltage and impedance parameters set forth in this document were specified following a thorough analysis of the pulse distortion likely to be encountered in a typical ARINC 429 installation. See Appendix A to this document for a complete 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. Protection against non-annunciated system operation is desired in this mode. This protection may consist of additional circuitry to detect and annunciate the fault or to increase the receiver threshold to above 5.5 Vdc, which is the maximum signal level under this one-wire fault condition.

ARINC 429 receivers should discontinue operation when the voltage thresholds fall into the undefined regions between NULL and HI, or NULL and LO. Manufacturers building ARINC 429 receivers are urged to incorporate this feature in their circuitry.

2.2.2 Modulation

Return-to Zero (RZ) bipolar modulation should be used. This is tri-level state modulation consisting of HI, NULL, and LO states.

2.2.3 Voltage Levels

2.2.3.1 Transmitter Voltage Levels

The differential output signal across the specified output terminals (balanced to ground at the transmitter) should be as shown in Table 2-8 when the transmitter is open circuit.

Table 2-8 – ARINC 429 Voltage Levels

Measurement	State and Voltage (Vdc)		
	HI	NULL	LO
Line A to Line B	+10 ±1.0	0 ±0.5	-10 ±1.0
Line A to Ground	+5 ±0.5	0 ±0.25	-5 ±0.5
Line B to Ground	-5 ±0.5	0 ±0.25	+5 ±0.5

2.2.3.1 Receiver Voltage Levels

The differential voltage presented at the receiver input terminals is dependent upon line length, stub configuration, and the number of receivers connected. In the absence of noise, the normal range of voltage presented to the receiver terminals (Line A to Line B) should be as shown in Table 2-9.

Table 2-9 – ARINC 429 Receiver Input

State	Voltage (Vdc)
HI	+7.25 to +11
NULL	+0.5 to -0.5
LO	-7.25 to -11

In practice, the nominal voltages will be perturbed by noise and pulse distortion. Thus, receivers should associate the following voltage ranges with the three states indicated in Table 2-10.

Table 2-10 – ARINC 429 Receiver Tolerance

State	Voltage (Vdc)
HI	+6.5 to +13
NULL	+2.5 to -2.5
LO	-6.5 to -13

COMMENTARY

Receiver reaction is undefined for voltages that fall in the range just above and below the NULL range. It is desirable that all ARINC 429 receivers 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.

There is a possibility that transmission lines may encounter conditions that will require receivers to operate with less than the above defined minimum difference of 4.0 Vdc 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 Vdc 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.

2.2.4 Impedance Levels

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. This output impedance should be present for the HI, NULL and LO transmitter output conditions and also during transitions between these levels.

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 impedances which may be encountered due to the variety of conductor wire gauges and insulation properties. Measurements on a few samples of wire showed a spread of characteristic impedance of 63 to 71 ohms. An extrapolation over the wire gauges 20 to 26 for wrapped and extruded insulation indicate an expected characteristic impedance spread of 60 to 80 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

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

Table 2-11 – Receiver Input Impedance

Characteristic	Measurement
Differential Input Resistance	R_I = 12,000 ohms minimum
Differential Input Capacitance	C_I = 50pF maximum
Resistance to Ground	R_H and $R_G \geq$ 12,000 ohms
Capacitance to Ground	C_H and $C_G \leq$ 50pF

The total receiver input resistance including the effects of RI, RH, and RG in parallel should be 8,000 ohms minimum (400 ohms minimum for twenty receiver loads).

No more than twenty receivers should be connected on to one 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 description of the input and output circuit 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.

2.2.5 Fault Tolerance

2.2.5.1 Receiver External Fault Voltage Tolerance

Receivers should withstand without sustaining damage the following steady-state voltages being applied to their terminals, superimposed upon a normally operating bus. Operation within specification limits is not required under these conditions.

a. 30 Vac RMS applied across terminals A and B, or
b. ±29 Vdc applied between terminal A and ground, or
c. ±29 Vdc applied between terminal B and ground.

2.2.5.2 Transmitter External Fault Voltage

Transmitter failures caused by external fault voltages should not cause other transmitters or other circuitry in the unit to function outside of their specification limits or to fail.

2.2.5.3 Transmitter External Fault Load Tolerance

Transmitters should indefinitely withstand without sustaining damage a short circuit applied:

- Across terminals A and B, or
- From terminal A to ground, or
- From terminal B to ground, or
- Items b and c above, simultaneously.

2.2.6 Fault Isolation

2.2.6.1 Receiver Fault Isolation

Each receiver should incorporate isolation provisions to ensure that the occurrence of any reasonably probable ARINC 429 bus receiver failure does not cause any input bus to operate outside of its specification limits (either under-voltage or over-voltage).

2.2.6.2 Transmitter Fault Isolation

Each transmitter should incorporate isolation provisions to ensure that it does not, under any reasonably probable LRU fault condition, provide an output voltage in excess of:

- 30 Vac RMS between terminal A and B, or
- ±29 Vdc between A and ground, or
- ±29 Vdc between B and ground.

2.3 Logic Related Elements

This section describes the digital transfer system elements considered to be principally related to the logic aspects of the signal circuit.

2.3.1 Digital Language

2.3.1.1 Numeric Data

An ARINC 429 bus should accommodate numeric data encoded in two digital languages, BNR expressed in two's complement fractional notation and BCD per the numerical subset of ISO 5 (see Attachment 5 to this document). An information item encoded in both languages is assigned a unique address for each (see Section 2.1.3 and Attachment 1-1). Word formats are shown in Attachment 6 to this document.

2.3.1.2 Discretes

In addition to handling numeric data as specified above, the ARINC 429 bus 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 1-1 is specified in the definition for that word in Attachment 6.

The rule to be followed in the assignment of soft bits to discrete in numeric data words is to start with the LSB of the word and to continue towards the MSB available in the word. Attachment 6 shows the generalized word structure.

There are two types of discrete words. These are general purpose discrete words, and dedicated discrete words. Seven labels (270 to 276) are assigned to the general purpose words in Attachment 1-1. These words should be used in ascending label order (starting with 270) when the system receiving the data can identify its source by reference to the port at which it arrives.

2.3.1.3 Maintenance Data (General Purpose)

The general purpose maintenance words are assigned labels in sequential order as are the labels for the general purpose discrete words. The lowest octal value label assigned to the maintenance words should be used when only one maintenance word is transmitted. When more than one word is transmitted the lowest octal value label should be used first and the other labels used sequentially until the message has been completed. The general purpose maintenance words may contain discrete, BCD, or BNR numeric data but should never contain ISO 5 coded messages. The general purpose maintenance words should be formatted according to the layouts of the corresponding BCD/BNR/discrete data words shown in Attachment 2.

2.3.1.4 AIM Data

The original contents of this section have been moved to Part 3 of ARINC Specification 429. For reference purposes, the section header is retained.

2.3.1.5 File Data Transfer

The bit-oriented protocol is defined in Part 3 of ARINC Specification 429 and is preferred for new applications. The purpose of bit-oriented communication is to enable the transparent transfer of data.

COMMENTARY

The data transparent protocol described in Part 3 was developed to facilitate ACARS Management Unit (MU) and the Satellite Data Unit (SDU) communications. The viability as a universal protocol was recognized by the Systems Architecture and Interfaces (SAI) Subcommittee, which recommended its inclusion herein as the standard means of file data transfer.

The process for determining what protocol (character-oriented or bit-oriented) should be used in the interaction between two units, where this information is not pre-determined, is described in Part 3 of ARINC 429.

2.3.1.5.1 Bit-Oriented Protocol Determination

The ALO word (for Aloha) should be sent by any system which supports the bit-oriented Link Layer protocol just after the system powers-up or performs a re-initialization for any reason. The Aloha response is in the ALR word. The ALO/ALR protocol process may also be used when a bit-oriented Link Layer protocol system needs to determine if any of its interfaces support the bit-oriented protocol. All systems that support the Link Layer bit-oriented protocol must be able to respond to the initiation of this process. Attachment 11C of Part 3 of ARINC Specification 429 shows the ALO and ALR word formats.

When a system with a bit-oriented Link Layer protocol has the need to make this determination, it should construct the ALO word and transmit this word to the device in question. The system should then wait for a maximum period of time defined by T_{12}. If the device in question has not responded within T_{12}, the initiating system should initiate another ALO word and again delay up to T_{12}. An initiating system should attempt a maximum of N_6 ALO word operations before declaring the device in question as not bit-oriented or not able to respond.

2.3.2 Transmission Order

The Least Significant Bit (LSB) and the least significant character of each word should be transmitted first. Note that the LSB of the word is the Most Significant Bit (MSB) of the label, and the label is transmitted ahead of the data in each case. This reversed label characteristic is a legacy from past systems in which the octal coding of the label field was, apparently, of no significance.

2.3.3 Data Bit Encoding Logic

A HI state after the beginning of the bit interval returning to a NULL state before the end of the same bit interval signifies a logic one.

A LO state after the beginning of the bit interval returning to a NULL state before the end of the same bit interval signifies a logic zero. This is represented graphically in Attachment 7 to this document.

2.3.4 Error Detection/Correction

The last bit of each word (Bit 32) should be encoded such that word parity is rendered odd to allow error detection in receivers. Note that the parity calculation encompasses all 31 bits assigned to label and information within a word.

COMMENTARY

Industry experience with digital information transfer systems has shown that a twisted shielded pair of wires can be regarded as a high integrity link, and unlikely to introduce bit errors into the data passing through it. For this reason, no means of error correction are specified for ARINC 429. The error detection capability specified above may be used as desired in receiving terminals. BNR data, for example, may be checked for parity by reference to the binary state of Bit 32 of each word. Also, the data may be submitted to reasonableness checks. BCD data intended for human consumption in the cockpit is normally smoothed before transmission to ensure tolerable levels of display jitter. As this process eliminates any wild data points, the need for further error detection is questionable. As pointed out in the Commentary following Section 2.1.2 of this document, the parity bit was added to the BCD word for reasons related to BCD/BNR transmitter hardware commonality, not because a need for it existed for error detection.

2.4 Timing Related Elements

This section describes the digital data transfer system elements considered to be principally related to the timing aspects of ARINC 429.

2.4.1 Bit Rate

2.4.1.1 High-Speed Operation

The bit rate for ARINC 429 high-speed operation is 100 kilobits per second (100 kbps) ±1%.

2.4.1.2 Low-Speed Operation

The bit rate for ARINC 429 low-speed operation should be within the range of 12.0 kbps to 14.5 kbps. The selected rate should be maintained within ±1%.

Note: High bit rate and low bit rate messages will not be intermixed on the same bus.

COMMENTARY

Although the bit rates specified above should be held within the stated tolerances over the long term, individual bit lengths may fall outside the limits expected from these tolerances. Bit symmetry and jitter should be within the tolerances specified in Attachment 8.

Also, notwithstanding the RFI performance described in Appendix 1 of this document, system designers are advised to avoid selection of 13.6 kbps for low-speed operations and precisely 100 kbps for high-speed operations to ensure that the system is not responsible for interference to avionics systems.

2.4.2 Information Rates

The minimum and maximum transmit intervals for each item of information transferred by ARINC 429 are specified in Attachment 2. Words with like labels but with different SDI codes should be treated as unique items of information. Each and every unique item of information should be transmitted once during an interval bounded in length by the minimum and maximum values specified in Attachment 2. Stated another way, a word having the same label and four different SDI codes should appear on the bus four times (once for each SDI code) during that time interval.

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 discrete data 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 Attachment 2 to this document are, in general, too short for the signal to be of use in driving a display device directly. For example, the display would change too rapidly for human perception. 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.

2.4.3 Clocking Method

Clocking is inherent in the data transmission. The identification of the bit interval is related to the initiation of either a HI or LO state from a previous NULL state in a bipolar RZ code.

2.4.4 Word Synchronization

The digital word should be synchronized by reference to a gap of four bit times (minimum) between the periods of word transmissions. The beginning of the first transmitted bit following this gap signifies the beginning of the new word.

2.4.5 Timing Tolerances

The waveform timing tolerances should be as shown in Attachment 8 to this document. It is important that the RF interference radiated and conducted by an ARINC 429 bus does not to exceed that permitted by **RTCA Document DO-160:** *Environmental Conditions and Test Procedures for Airborne Equipment*. Appendix 1 to this document provides additional detail.

3.0 APPLICATIONS NOTES

3.1 Radio Systems Management

One special application of the ARINC 429 data bus is radio systems frequency selection and switching. The following sections set forth the rules which should be followed in the application of ARINC 429 to ensure interoperability of radios and control sources.

3.1.1 Word Format and Digital Language

The standard 32-bit BCD word should be used, of which Bits 1 through 8 constitute the label. Bits 9 and 10 are reserved for a Source/Destination Identifier (SDI) code. Bits 11 through 29 constitute the data field. Bits 30 and 31 form the Sign/Status Matrix (SSM). Bit 32 is the word parity bit.

The label defines what radio to be tuned. The data field contains the frequency to which the radio should be tuned, as encoded in BCD characters, together with the discretes required for function switching for that radio. Attachment 6 to this document shows how the word should be structured for each radio system.

3.1.2 Update Rate

The nominal update rate for all radio systems management words should be five times per second.

3.1.3 Sign/Status Matrix (SSM)

The normal state of the SSM is binary zeros. However, the radios should recognize the codes for Functional Test and No Computed Data (see Section 2.1.5 of this document). Radios should interpret the former as an instruction to perform a Functional Test or functional test sequence. They should regard the latter as an instruction to remain tuned to the frequency contained in the last valid word received until either another valid word is decoded or their primary power is removed.

3.1.4 Frequency Ranges and Switching Functions

3.1.4.1 Automatic Direction Finder (ADF)

Frequency Range	190kHz to 1750kHz
Frequency Selection Increment	0.5kHz
Characters encoded in ARINC 429 word	1000kHz, 100kHz, 10kHz, 1kHz
Switching Functions	0.5kHz on/off, BFO on/off, ADF/ANT mode selection

3.1.4.2 Distance Measurement Equipment (DME)

Frequency Range (VOR/ILS)	108.00MHz to 135.95MHz
Frequency Selection Increment: (VOR/ILS)	50kHz
Characters encoded in ARINC 429 word	10MHz, 1MHz, 0.1MHz 0.05MHz (VOR/ILS only) 100MHz character is 1 for VOR/ILS 10MHz character is limited to 7
Switching Functions	VOR/ILS/MLS Frequency, DME modes, Directed Frequency Numbers, Display Control

3.0 APPLICATIONS NOTES

3.1.4.3 High-Frequency (HF) Communications

Frequency Range	2.8MHz to 24MHz
Frequency Selection Increment	1kHz or 0.1kHz
Characters encoded in ARINC 429 words	10MHz, 1MHz, 0.1MHz
Switching Functions	USB/LSB mode selection SB/AM mode selection

Note: Two words may be transmitted for HF frequency selection to facilitate frequency resolution of 0.1kHz.

3.1.4.4 Instrument Landing System (ILS)

Frequency Range	108.00MHz to 111.95MHz
Frequency Selection Increment	50kHz
Characters encoded in ARINC 429 words	10MHz, 1MHz, 0.1MHz, 0.01MHz (100MHz character is always decimal 1)
Switching Functions	None

3.1.4.5 VOR/ILS

Frequency Range	108.00 MHz to 117.95MHz
Frequency Selection Increment	50kHz
Characters encoded in ARINC 429 words	10MHz, 1MHz, 0.1MHz, 0.01MHz (100MHz character is always decimal 1)
Switching Functions	ILS Mode

3.1.4.6 VHF Communications

Frequency Range	117.975MHz to 137.000MHz
Frequency Selection Increment	25kHz or 8.33kHz
Characters encoded in ARINC 429 words	10MHz, 1MHz, 0.1MHz, 0.01MHz (100MHz character is always decimal 1)
Switching Functions	None

3.1.4.7 Air Traffic Control (ATC) Transponder

The ATC Transponder operates on two frequencies (one receive and one transmit) which do not require selection. Reply code selection, however, is required, and ARINC 429 supports this selection.

Reply Code Ranges	0-7 in four independent groups
Code increments	1 decimal digit per group
Characters encoded in ARINC 429 words	ALL
Switching Functions	Ident. Pulse Select, Altitude Reporting On/Off, Altitude Source Select, X-pulse Select (reserved), VFR/IFR Select (reserved), IRS/FMC Input Select (reserved)

ATTACHMENT 1-1
LABEL CODES

Code No. (Octal)	Eqpt. ID (Hex)	Transmission Order Bit Position								Parameter	Data				Notes & Cross Ref. To Tables in Att. 6
		1	2	3	4	5	6	7	8		BNR	BCD	DISC	SAL	
000	0XX	0	0	0	0	0	0	0	0	Not Used					
001	002	0	0	0	0	0	0	0	1	Distance to Go		X			6-25
	056	0	0	0	0	0	0	0	1	Distance to Go		X			
	060	0	0	0	0	0	0	0	1	Distance to Go		X			
002	002	0	0	0	0	0	0	1	0	Time to Go		X			6-25
	056	0	0	0	0	0	0	1	0	Time to Go		X			
	060	0	0	0	0	0	0	1	0	Time to Go		X			
	115	0	0	0	0	0	0	1	0	Time to Station		X			
003	002	0	0	0	0	0	0	1	1	Cross Track Distance		X			6-25
004	001	0	0	0	0	0	1	0	0	Runway Distance to Go		X			
005	0D0	0	0	0	0	0	1	0	1	Engine Discrete			X		
006	0D0	0	0	0	0	0	1	1	0	Engine Discrete			X		
007	0	0	0	0	0	0	1	1	1	Spare					
010	002	0	0	0	0	1	0	0	0	Present Position - Latitude		X			6-25-1
	004	0	0	0	0	1	0	0	0	Present Position - Latitude		X			
	038	0	0	0	0	1	0	0	0	Present Position - Latitude		X			
011	002	0	0	0	0	1	0	0	1	Present Position - Longitude		X			6-25-1
	004	0	0	0	0	1	0	0	1	Present Position - Longitude		X			
	038	0	0	0	0	1	0	0	1	Present Position - Longitude		X			
012	002	0	0	0	0	1	0	1	0	Ground Speed		X			6-25
	004	0	0	0	0	1	0	1	0	Ground Speed		X			
	005	0	0	0	0	1	0	1	0	Ground Speed		X			
	025	0	0	0	0	1	0	1	0	Ground Speed		X			
	038	0	0	0	0	1	0	1	0	Ground Speed		X			
	04D	0	0	0	0	1	0	1	0	QTY-LD SEL (LB)		X			
	056	0	0	0	0	1	0	1	0	Ground Speed		X			
	060	0	0	0	0	1	0	1	0	Ground Speed		X			
013	002	0	0	0	0	1	0	1	1	Track Angle - True		X			6-25
	004	0	0	0	0	1	0	1	1	Track Angle - True		X			
	038	0	0	0	0	1	0	1	1	Track Angle - True		X			
	04D	0	0	0	0	1	0	1	1	QTY-FLT Deck (LB)		X			
	0B8	0	0	0	0	1	0	1	1	Control Word for TCAS/Mode S			X		
014	004	0	0	0	0	1	1	0	0	Magnetic Heading		X			
	005	0	0	0	0	1	1	0	0	Magnetic Heading		X			
	038	0	0	0	0	1	1	0	0	Magnetic Heading		X			
015	002	0	0	0	0	1	1	0	1	Wind Speed		X			
	004	0	0	0	0	1	1	0	1	Wind Speed		X			
	005	0	0	0	0	1	1	0	1	Wind Speed		X			
	038	0	0	0	0	1	1	0	1	Wind Speed		X			
016	004	0	0	0	0	1	1	1	0	Wind Direction - True		X			
	038	0	0	0	0	1	1	1	0	Wind Direction - True		X			
	0B8	0	0	0	0	1	1	1	0	Control Word for TCAS/Mode S			X		
017	010	0	0	0	0	1	1	1	1	Selected Runway - True		X			
	04D	0	0	0	0	1	1	1	1	Total-FLT Deck (LB)		X			
	055	0	0	0	0	1	1	1	1	Selected Runway Heading		X			
	0A0	0	0	0	0	1	1	1	1	Selected Runway Heading		X			
	0B0	0	0	0	0	1	1	1	1	Selected Runway Heading		X			
020	020	0	0	0	1	0	0	0	0	Selected Vertical Speed		X			6-25
	04D	0	0	0	1	0	0	0	0	TNK-LD SEL (LB)		X			
	06D	0	0	0	1	0	0	0	0	Landing Gear Position Infor & System Status			X		
	0A1	0	0	0	1	0	0	0	0	Selected Vertical Speed		X			
021	002	0	0	0	1	0	0	0	1	Selected EPR		X			6-25
	002	0	0	0	1	0	0	0	1	Selected N1		X			6-25
	020	0	0	0	1	0	0	0	1	Selected EPR		X			
	06D	0	0	0	1	0	0	0	1	Selected N1		X			
	0A1	0	0	0	1	0	0	0	1	Landing Gear Position Infor & System Status			X		
	0A1	0	0	0	1	0	0	0	1	Selected EPR		X			

ATTACHMENT 1-1
LABEL CODES

Code No. (Octal)	Eqpt. ID (Hex)	Transmission Order Bit Position								Parameter	Data				Notes & Cross Ref. To Tables in Att. 6
		1	2	3	4	5	6	7	8		BNR	BCD	DISC	SAL	
022	020	0	0	0	1	0	0	1	0	Selected Mach		X			6-25
	04D	0	0	0	1	0	0	1	0	QTY-LD SEL (KG)		X			
	06D	0	0	0	1	0	0	1	0	Landing Gear Position Infor & System Status			X		
	0A1	0	0	0	1	0	0	1	0	Selected Mach		X			
023	020	0	0	0	1	0	0	1	1	Selected Heading		X			6-25
	04D	0	0	0	1	0	0	1	1	QTY-LD SEL (KG)		X			
	06D	0	0	0	1	0	0	1	1	Landing Gear Position Infor & System Status			X		
	0A1	0	0	0	1	0	0	1	1	Selected Heading		X			
024	011	0	0	0	1	0	1	0	0	Selected Course #1		X			6-25
	020	0	0	0	1	0	1	0	0	Selected Course #1		X			
	06D	0	0	0	1	0	1	0	0	Landing Gear Position Infor & System Status			X		
	0A1	0	0	0	1	0	1	0	0	Selected Course #1		X			
	0B1	0	0	0	1	0	1	0	0	Selected Course #1		X			
025	020	0	0	0	1	0	1	0	1	Selected Altitude		X			6-25
	04D	0	0	0	1	0	1	0	1	Load SEL Control	X				
	0A1	0	0	0	1	0	1	0	1	Selected Altitude		X			
026	003	0	0	0	1	0	1	1	0	Selected Airspeed		X			6-25
	020	0	0	0	1	0	1	1	0	Selected Airspeed	X				
	0A1	0	0	0	1	0	1	1	0	Selected Airspeed		X			
027	002	0	0	0	1	0	1	1	1	TACAN Selected Course		X			
	011	0	0	0	1	0	1	1	1	Selected Course # 2		X			
	020	0	0	0	1	0	1	1	1	Selected Course # 2		X			
	04D	0	0	0	1	0	1	1	1	Total-FLT Deck (KG)		X			
	056	0	0	0	1	0	1	1	1	TACAN Selected Course		X			
	060	0	0	0	1	0	1	1	1	TACAN Selected Course		X			
	0A1	0	0	0	1	0	1	1	1	Selected Course # 2		X			
	0B1	0	0	0	1	0	1	1	1	Selected Course # 2		X			
030	020	0	0	0	1	1	0	0	0	VHF COM Frequency		X			6-45
	024	0	0	0	1	1	0	0	0	VHF COM Frequency		X			
	04D	0	0	0	1	1	0	0	0	TNK-LD SEL (KG)		X			
	0B6	0	0	0	1	1	0	0	0	VHF COM Frequency		X			6-45
031	020	0	0	0	1	1	0	0	1	Beacon Transponder Code			X		6-46
	0B8	0	0	0	1	1	0	0	1	Beacon Transponder Code			X		
032	012	0	0	0	1	1	0	1	0	ADF Frequency		X			6-40
	020	0	0	0	1	1	0	1	0	ADF Frequency		X			6-40
	0B2	0	0	0	1	1	0	1	0	ADF Frequency		X			6-40
033	002	0	0	0	1	1	0	1	1	ILS Frequency		X			6-44
	010	0	0	0	1	1	0	1	1	ILS Frequency		X			
	020	0	0	0	1	1	0	1	1	ILS Frequency		X			
	055	0	0	0	1	1	0	1	1	Landing System Mode/Frequency		X			Note 3
	056	0	0	0	1	1	0	1	1	ILS Frequency		X			
	060	0	0	0	1	1	0	1	1	ILS Frequency		X			
	0B0	0	0	0	1	1	0	1	1	ILS Frequency		X			
034	002	0	0	0	1	1	1	0	0	VOR/ILS Frequency		X			6-44-1
	006	0	0	0	1	1	1	0	0	Baro Correction (mb) #3		X			
	011	0	0	0	1	1	1	0	0	VOR/ILS Frequency		X			
	020	0	0	0	1	1	1	0	0	VOR/ILS Frequency		X			
	025	0	0	0	1	1	1	0	0	VOR/ILS Frequency		X			
	056	0	0	0	1	1	1	0	0	VOR/ILS Frequency		X			
	060	0	0	0	1	1	1	0	0	VOR/ILS Frequency #1		X			
	0B0	0	0	0	1	1	1	0	0	VOR/ILS Frequency		X			
035	002	0	0	0	1	1	1	0	1	DME Frequency		X			6-41
	006	0	0	0	1	1	1	0	1	Baro Correction (ins of Hg) #3		X			
	009	0	0	0	1	1	1	0	1	DME Frequency		X			6-41
	020	0	0	0	1	1	1	0	1	DME Frequency		X			
	025	0	0	0	1	1	1	0	1	DME Frequency		X			
	055	0	0	0	1	1	1	0	1	Paired DME Frequency		X			
	056	0	0	0	1	1	1	0	1	DME Frequency		X			
	060	0	0	0	1	1	1	0	1	DME Frequency #1		X			
	0A9	0	0	0	1	1	1	0	1	DME Frequency		X			
036	002	0	0	0	1	1	1	1	0	MLS Frequency		X			
	020	0	0	0	1	1	1	1	0	MLS Frequency		X			
	055	0	0	0	1	1	1	1	0	MLS Channel Selection		X			
	056	0	0	0	1	1	1	1	0	MLS Frequency Channel		X			
	060	0	0	0	1	1	1	1	0	MLS Frequency Channel		X			
	0C7	0	0	0	1	1	1	1	0	MLS Frequency		X			

ATTACHMENT 1-1
LABEL CODES

Code No. (Octal)	Eqpt. ID (Hex)	Transmission Order Bit Position								Parameter	Data				Notes & Cross Ref. To Tables in Att. 6
		1	2	3	4	5	6	7	8		BNR	BCD	DISC	SAL	
037	002	0	0	0	1	1	1	1	1	HF COM Frequency		X			6-42
	0B9	0	0	0	1	1	1	1	1	HF COM Frequency		X			
040	0	0	0	1	0	0	0	0	0	Spare					
041	002	0	0	1	0	0	0	0	1	Set Latitude		X			
	004	0	0	1	0	0	0	0	1	Set Latitude		X			
	020	0	0	1	0	0	0	0	1	Set Latitude		X			
	056	0	0	1	0	0	0	0	1	Set Latitude		X			
	060	0	0	1	0	0	0	0	1	Set Latitude		X			
	0A4	0	0	1	0	0	0	0	1	Set Latitude		X			
042	004	0	0	1	0	0	0	1	0	Set Longitude		X			
	020	0	0	1	0	0	0	1	0	Set Longitude		X			
	056	0	0	1	0	0	0	1	0	Set Longitude		X			
	060	0	0	1	0	0	0	1	0	Set Longitude		X			
	0A4	0	0	1	0	0	0	1	0	Set Longitude		X			
043	002	0	0	1	0	0	0	1	1	Set Magnetic Heading		X			
	004	0	0	1	0	0	0	1	1	Set Magnetic Heading		X			
	020	0	0	1	0	0	0	1	1	Set Magnetic Heading		X			
	056	0	0	1	0	0	0	1	1	Set Magnetic Heading		X			
	060	0	0	1	0	0	0	1	1	Set Magnetic Heading		X			
	0A4	0	0	1	0	0	0	1	1	Set Magnetic Heading		X			
044	004	0	0	1	0	0	1	0	0	True Heading		X			
	038	0	0	1	0	0	1	0	0	True Heading		X			
045	003	0	0	1	0	0	1	0	1	Minimum Airspeed		X			
	055	**0**	**0**	**1**	**0**	**0**	**1**	**0**	**1**	**Message Block Start**					**Block - BNR**
046	033	0	0	1	0	0	1	1	0	Engine Serial No. (LSDs)		X			6-15
	055	**0**	**0**	**1**	**0**	**0**	**1**	**1**	**0**	**Message Block Data**					**Block - BNR**
	10A	0	0	1	0	0	1	1	0	Engine Serial No. (LSDs)		X			6-15
	10B	0	0	1	0	0	1	1	0	Engine Serial No. (LSDs)		X			6-15
047	020	0	0	1	0	0	1	1	1	VHF COM Frequency		X			
	024	0	0	1	0	0	1	1	1	VHF COM Frequency		X			
	033	0	0	1	0	0	1	1	1	Engine Serial No. (MSDs)		X			6-16
	0B6	0	0	1	0	0	1	1	1	VHF COM Frequency		X			
	10A	0	0	1	0	0	1	1	1	Engine Serial No. (MSDs)		X			6-16
	10B	0	0	1	0	0	1	1	1	Engine Serial No. (MSDs)		X			6-16
050	0	0	0	1	0	1	0	0	0	Spare					
051	0	0	0	1	0	1	0	0	1	Spare					
052	004	0	0	1	0	1	0	1	0	Body Pitch Acceleration	X				
	037	0	0	1	0	1	0	1	0	Longitude Zero Fuel CG		X			
	038	0	0	1	0	1	0	1	0	Body Pitch Acceleration	X				
053	004	0	0	1	0	1	0	1	1	Body Roll Acceleration	X				
	005	0	0	1	0	1	0	1	1	Track Angle - Magnetic		X			
	038	0	0	1	0	1	0	1	1	Body Roll Acceleration	X				
054	004	0	0	1	0	1	1	0	0	Body Yaw Acceleration	X				
	037	0	0	1	0	1	1	0	0	Zero Fuel Weight (KG)	X				
	038	0	0	1	0	1	1	0	0	Body Yaw Acceleration	X				
055	0	0	0	1	0	1	1	0	1	Spare					
056	002	0	0	1	0	1	1	1	0	Estimated Time of Arrival		X			
	005	0	0	1	0	1	1	1	0	Wind Direction - Magnetic		X			
	037	0	0	1	0	1	1	1	0	Gross Weight (KG)		X			
	056	0	0	1	0	1	1	1	0	ETA (Active Waypoint)		X			
	060	0	0	1	0	1	1	1	0	ETA (Active Waypoint)		X			
057	0	0	0	1	0	1	1	1	1	Spare					
060	025	0	0	1	1	0	0	0	0	S/G Hardware Part No		X			6-36
	037	0	0	1	1	0	0	0	0	Tire Loading (Left Body Main)		X			
	03C	0	0	1	1	0	0	0	0	Tire Pressure (Left Inner)	X				

ATTACHMENT 1-1
LABEL CODES

Code No. (Octal)	Eqpt. ID (Hex)	Transmission Order Bit Position								Parameter	Data				Notes & Cross Ref. To Tables in Att. 6
		1	2	3	4	5	6	7	8		BNR	BCD	DISC	SAL	
061	002	0	0	1	1	0	0	0	1	ACMS Information	X				6-29
	00B	0	0	1	1	0	0	0	1	Pseudo Range	X				
	025	0	0	1	1	0	0	0	1	S/G Software Configuration Part No.		X			6-37
	037	0	0	1	1	0	0	0	1	Tire Loading (Right Body Main)		X			
	03C	0	0	1	1	0	0	0	1	Tire Pressure (Left Outer)	X				
	056	0	0	1	1	0	0	0	1	ACMS Information	X				
	060	0	0	1	1	0	0	0	1	ACMS Information	X				
062	002	0	0	1	1	0	0	1	0	ACMS Information	X				6-29
	00B	0	0	1	1	0	0	1	0	Pseudo Range Fine	X				
	037	0	0	1	1	0	0	1	0	Tire Loading (Left Wing Main)		X			
	03C	0	0	1	1	0	0	1	0	Tire Pressure (Right Inner)	X				
	056	0	0	1	1	0	0	1	0	ACMS Information	X				
	060	0	0	1	1	0	0	1	0	ACMS Information	X				
063	002	0	0	1	1	0	0	1	1	ACMS Information	X				6-29
	00B	0	0	1	1	0	0	1	1	Range Rate	X				
	037	0	0	1	1	0	0	1	1	Tire Loading (Right Wing Main)		X			
	03C	0	0	1	1	0	0	1	1	Tire Pressure (Right Outer)	X				
	056	0	0	1	1	0	0	1	1	ACMS Information	X				
	060	0	0	1	1	0	0	1	1	ACMS Information	X				
064	00B	0	0	1	1	0	1	0	0	Delta Range	X				
	037	0	0	1	1	0	1	0	0	Tire Loading (Nose)		X			
	03C	0	0	1	1	0	1	0	0	Tire Pressure (Nose)	X				
065	003	0	0	1	1	0	1	0	1	Gross Weight		X			
	00B	0	0	1	1	0	1	0	1	SV Position X	X				
	037	0	0	1	1	0	1	0	1	Gross Weight		X			
066	002	0	0	1	1	0	1	1	0	Longitudinal Center of Gravity		X			
	00B	0	0	1	1	0	1	1	0	SV Position X Fine	X				
	037	0	0	1	1	0	1	1	0	Longitudinal Center of Gravity		X			
067	037	0	0	1	1	0	1	1	1	Lateral Center of Gravity		X			
070	002	0	0	1	1	1	0	0	0	Reference Airspeed (Vref)	X				
	00B	0	0	1	1	1	0	0	0	SV Position Y	X				
	029	0	0	1	1	1	0	0	0	AC Frequency (Engine)	X				
	037	0	0	1	1	1	0	0	0	Hard landing Magnitude #1	X				
	056	0	0	1	1	1	0	0	0	Reference Airspeed (Vref)	X				
	060	0	0	1	1	1	0	0	0	Reference Airspeed (Vref)	X				
	0CC	0	0	1	1	1	0	0	0	Brakes - Metered Hydraulic Pressure L (Normal)	X				
071	002	0	0	1	1	1	0	0	1	Take-Off Climb Airspeed (V2)	X				
	00B	0	0	1	1	1	0	0	1	SV Position Y Fine	X				
	029	0	0	1	1	1	0	0	1	AC Frequency (Alt. Sources)	X				
	033	0	0	1	1	1	0	0	1	VBV	X				
	037	0	0	1	1	1	0	0	1	Hard Landing Magnitude #2	X				
	0CC	0	0	1	1	1	0	0	1	Brakes - Metered Hydraulic Pressure L (Alt)	X				
072	002	0	0	1	1	1	0	1	0	VR (Rotation Speed)	X				
	00B	0	0	1	1	1	0	1	0	SV Position Z	X				
	01C	0	0	1	1	1	0	1	0	Stator Vane Angle	X				
	029	0	0	1	1	1	0	1	0	AC Voltage (Engine)	X				
	02F	0	0	1	1	1	0	1	0	Stator Vane Angle	X				
	033	0	0	1	1	1	0	1	0	Stator Vane Angle	X				
	0CC	0	0	1	1	1	0	1	0	Brakes - Metered Hydraulic Pressure R (Normal)	X				
073	002	0	0	1	1	1	0	1	1	V1 (Critical Engine Failure Speed)	X				
	00B	0	0	1	1	1	0	1	1	SV Position Z Fine	X				
	01C	0	0	1	1	1	0	1	1	Oil Quantity	X				
	029	0	0	1	1	1	0	1	1	Oil Quantity	X				
	0A2	0	0	1	1	1	0	1	1	V2 (Critical Engine Failure Speed)	X				
	0CC	0	0	1	1	1	0	1	1	Brakes - Metered Hydraulic Pressure R (Alt.)	X				
	0D0	0	0	1	1	1	0	1	1	Engine Oil Quantity	X				
074	002	0	0	1	1	1	1	0	0	Zero Fuel Weight	X				
	00B	0	0	1	1	1	1	0	0	UTC Measure Time	X				
	02C	0	0	1	1	1	1	0	0	Zero Fuel Weight	X				
	033	0	0	1	1	1	1	0	0	LP Compressor Bleed Position (3.0)	X				
	037	0	0	1	1	1	1	0	0	Zero Fuel Weight (lb)	X				
	056	0	0	1	1	1	1	0	0	Zero Fuel Weight	X				
	060	0	0	1	1	1	1	0	0	Zero Fuel Weight	X				
	114	0	0	1	1	1	1	0	0	Zero Fuel Weight	X				

ATTACHMENT 1-1
LABEL CODES

Code No. (Octal)	Eqpt. ID (Hex)	Transmission Order Bit Position								Parameter	Data				Notes & Cross Ref. To Tables in Att. 6
		1	2	3	4	5	6	7	8		BNR	BCD	DISC	SAL	
075	002	0	0	1	1	1	1	0	1	Gross Weight	X				
	003	0	0	1	1	1	1	0	1	Gross Weight	X				
	008	0	0	1	1	1	1	0	1	Maximum Hazard Alert Level Output			X		
	00B	0	0	1	1	1	1	0	1	Geodetic Altitude	X				
	029	0	0	1	1	1	1	0	1	AC Voltage (Alt. Sources)	X				
	02C	0	0	1	1	1	1	0	1	Gross Weight	X				
	037	0	0	1	1	1	1	0	1	Gross Weight	X				
	03E	0	0	1	1	1	1	0	1	Gross Weight	X				
	114	0	0	1	1	1	1	0	1	Aircraft Gross Weight	X				
076	008	0	0	1	1	1	1	1	0	Hazard Azimuth Output			X		
	00B	0	0	1	1	1	1	1	0	GNSS Altitude (MSL)	X				
	029	0	0	1	1	1	1	1	0	AC Voltage (Bus Bar)	X				
	037	0	0	1	1	1	1	1	0	Longitudinal Center of Gravity	X				
	03E	0	0	1	1	1	1	1	0	Longitudinal Center of Gravity	X				
	0F1	**0**	**0**	**1**	**1**	**1**	**1**	**1**	**0**	**Fire Warning Computer**	**X**				
	114	0	0	1	1	1	1	1	0	Aircraft Longitudinal Center of Gravity	X				
077	002	0	0	1	1	1	1	1	1	Target Airspeed	X				
	008	0	0	1	1	1	1	1	1	Hazard Azimuth Output			X		
	00B	0	0	1	1	1	1	1	1	GPS Hor/Vert Deviation	X				
	029	0	0	1	1	1	1	1	1	AC Load (Engine)	X				
	037	0	0	1	1	1	1	1	1	Lateral Center of Gravity	X				
	056	0	0	1	1	1	1	1	1	Target Airspeed	X				
	060	0	0	1	1	1	1	1	1	Target Airspeed	X				
	114	0	0	1	1	1	1	1	1	Zero Fuel Center of Gravity	X				
100	001	0	1	0	0	0	0	0	0	Selected Course #1	X				6-27
	002	0	1	0	0	0	0	0	0	Selected Course #1	X				
	011	0	1	0	0	0	0	0	0	Selected Course #1	X				
	020	0	1	0	0	0	0	0	0	Selected Course #1	X				
	029	0	1	0	0	0	0	0	0	AC Load (Alt. Source)	X				
	037	0	1	0	0	0	0	0	0	Gross Weight (Kilogram)	X				
	056	0	1	0	0	0	0	0	0	Selected Course #1	X				
	060	0	1	0	0	0	0	0	0	Selected Course #1	X				
	0A1	0	1	0	0	0	0	0	0	Selected Course #1	X				
	0B1	0	1	0	0	0	0	0	0	Selected Course #1	X				
	0BB	0	1	0	0	0	0	0	0	Outbound Flaps - PDU	X				
101	002	0	1	0	0	0	0	0	1	Selected Heading	X				6-27
	00B	0	1	0	0	0	0	0	1	HDOP	X				
	020	0	1	0	0	0	0	0	1	Selected Heading	X				
	025	0	1	0	0	0	0	0	1	Selected Heading	X				
	029	0	1	0	0	0	0	0	1	DC Current (TRU)	X				
	05A	0	1	0	0	0	0	0	1	FQIC	X				
	0A1	0	1	0	0	0	0	0	1	Selected Heading	X				
	0BB	0	1	0	0	0	0	0	1	Inboard Flaps - PDU	X				
	114	0	1	0	0	0	0	0	1	C/G Target	X				
102	002	0	1	0	0	0	0	1	0	Selected Altitude	X				6-27
	00B	0	1	0	0	0	0	1	0	VDOP	X				
	020	0	1	0	0	0	0	1	0	Selected Altitude	X				
	029	0	1	0	0	0	0	1	0	DC Current (Battery)	X				
	056	0	1	0	0	0	0	1	0	Selected Altitude	X				
	060	0	1	0	0	0	0	1	0	Selected Altitude	X				
	0A1	0	1	0	0	0	0	1	0	Selected Altitude	X				
103	001	0	1	0	0	0	0	1	1	Selected Airspeed	X				6-27
	002	0	1	0	0	0	0	1	1	Selected Airspeed	X				
	003	0	1	0	0	0	0	1	1	Selected Airspeed	X				
	00B	0	1	0	0	0	0	1	1	GNSS Track Angle	X				
	01B	0	1	0	0	0	0	1	1	Left/PDU Flap	X				
	020	0	1	0	0	0	0	1	1	Selected Airspeed	X				
	029	0	1	0	0	0	0	1	1	DC Voltage (TRU)	X				
	056	0	1	0	0	0	0	1	1	Selected Airspeed	X				
	060	0	1	0	0	0	0	1	1	Selected Airspeed	X				
	0A1	0	1	0	0	0	0	1	1	Selected Airspeed	X				
	0BB	0	1	0	0	0	0	1	1	Left Outboard Flap Position	X				

ATTACHMENT 1-1
LABEL CODES

Code No. (Octal)	Eqpt. ID (Hex)	Transmission Order Bit Position								Parameter	Data				Notes & Cross Ref. To Tables in Att. 6
		1	2	3	4	5	6	7	8		BNR	BCD	DISC	SAL	
104	001	0	1	0	0	0	1	0	0	Selected Vertical Speed	X				6-27
	002	0	1	0	0	0	1	0	0	Selected Vertical Speed	X				
	01B	0	1	0	0	0	1	0	0	Right/PDU Flap	X				
	020	0	1	0	0	0	1	0	0	Selected Vertical Speed	X				
	029	0	1	0	0	0	1	0	0	DC Voltage (Battery)	X				
	02B	0	1	0	0	0	1	0	0	Selected Vertical Speed	X				
	056	0	1	0	0	0	1	0	0	Selected Vertical Speed	X				
	060	0	1	0	0	0	1	0	0	Selected Vertical Speed	X				
	0A1	0	1	0	0	0	1	0	0	Selected Vertical Speed	X				
	0BB	0	1	0	0	0	1	0	0	Right Outboard Flap Position	X				
105	002	0	1	0	0	0	1	0	1	Selected Runway Heading	X				
	010	0	1	0	0	0	1	0	1	Selected Runway Heading	X				
	01B	0	1	0	0	0	1	0	1	Left/PDU Slat	X				
	020	0	1	0	0	0	1	0	1	Selected Runway Heading	X				
	029	0	1	0	0	0	1	0	1	Oil Temperature Input (IDG/CSD)	X				
	055	0	1	0	0	0	1	0	1	Selected Runway Heading	X				
	056	0	1	0	0	0	1	0	1	Selected Runway Heading	X				
	060	0	1	0	0	0	1	0	1	Selected Runway Heading	X				
	0A1	0	1	0	0	0	1	0	1	Selected Runway Heading	X				
	0B0	0	1	0	0	0	1	0	1	Selected Runway Heading	X				
	0BB	0	1	0	0	0	1	0	1	Left Inboard Flap Position	X				
106	002	0	1	0	0	0	1	1	0	Selected Mach	X				6-27
	01B	0	1	0	0	0	1	1	0	Right/PDU Slat	X				
	020	0	1	0	0	0	1	1	0	Selected Mach	X				
	029	0	1	0	0	0	1	1	0	Oil Temperature Input (IDG/CSD)	X				
	056	0	1	0	0	0	1	1	0	Selected Mach	X				
	060	0	1	0	0	0	1	1	0	Selected Mach	X				
	0A1	0	1	0	0	0	1	1	0	Selected Mach	X				
	0BB	0	1	0	0	0	1	1	0	Right Inboard Flap Position	X				
107	002	0	1	0	0	0	1	1	1	Selected Cruise Altitude	X				
	01B	0	1	0	0	0	1	1	1	Flap/Slat Lever	X				
	037	0	1	0	0	0	1	1	1	Longitude Zero Fuel C/G	X				
	056	0	1	0	0	0	1	1	1	Selected Cruise Altitude	X				
	060	0	1	0	0	0	1	1	1	Selected Cruise Altitude	X				
	0BB	0	1	0	0	0	1	1	1	Flap Lever Position - Median Value	X				
110	001	0	1	0	0	1	0	0	0	Selected Course #2	X				
	002	0	1	0	0	1	0	0	0	Selected Course #2	X				
	00B	0	1	0	0	1	0	0	0	GNSS Latitude	X				
	010	0	1	0	0	1	0	0	0	Selected Course #2	X				
	011	0	1	0	0	1	0	0	0	Selected Course #2	X				
	020	0	1	0	0	1	0	0	0	Selected Course #2	X				
	0A1	0	1	0	0	1	0	0	0	Selected Course #2	X				
	0B1	0	1	0	0	1	0	0	0	Selected Course #2	X				
	0BB	0	1	0	0	1	0	0	0	Flap Lever Position - Center	X				
111	001	0	1	0	0	1	0	0	1	Test Word A			X		
	00B	0	1	0	0	1	0	0	1	GNSS Longitude	X				
	01D	0	1	0	0	1	0	0	1	Test Word A			X		
112	002	0	1	0	0	1	0	1	0	Runway Length	X				
	00B	0	1	0	0	1	0	1	0	GNSS Ground Speed	X				
	0A1	0	1	0	0	1	0	1	0	Selected EPR	X				
	0A1	0	1	0	0	1	0	1	0	Selected N1	X				
	0BB	0	1	0	0	1	0	1	0	Flap Lever Position - Left	X				
113	0	0	1	0	0	1	0	1	1	Spare					
114	002	0	1	0	0	1	1	0	0	Desired Track	X				6-27
	029	0	1	0	0	1	1	0	0	Brake Temperature (Left Inner L/G)	X				
	02F	0	1	0	0	1	1	0	0	Ambient Pressure	X				
	03F	0	1	0	0	1	1	0	0	Pamb Sensor	X				
	055	**0**	**1**	**0**	**0**	**1**	**1**	**0**	**0**	**Lateral Protection Level**	**X**				
	056	0	1	0	0	1	1	0	0	Desired Track	X				
	060	0	1	0	0	1	1	0	0	Desired Track	X				
	0BB	0	1	0	0	1	1	0	0	Flap Lever Position - Right	X				
	0CC	0	1	0	0	1	1	0	0	Wheel Torque Output	X				
	10A	0	1	0	0	1	1	0	0	Selected Ambient Static Pressure	X				
	10B	0	1	0	0	1	1	0	0	Selected Ambient Static Pressure	X				
	13A	0	1	0	0	1	1	0	0	Ambient Pressure	X				

ATTACHMENT 1-1
LABEL CODES

Code No. (Octal)	Eqpt. ID (Hex)	Transmission Order Bit Position								Parameter	Data				Notes & Cross Ref. To Tables in Att. 6
		1	2	3	4	5	6	7	8		BNR	BCD	DISC	SAL	
115	002	0	1	0	0	1	1	0	1	Waypoint Bearing	X				
	029	0	1	0	0	1	1	0	1	Brake Temperature (Left Outer L/G)	X				
	02F	0	1	0	0	1	1	0	1	Fuel Temperature	X				
	03F	0	1	0	0	1	1	0	1	Fuel Temperature	X				
	055	**0**	**1**	**0**	**0**	**1**	**1**	**0**	**1**	**Vertical Protection Level**	**X**				
	056	0	1	0	0	1	1	0	1	Waypoint Bearing	X				
	060	0	1	0	0	1	1	0	1	Waypoint Bearing	X				
	0BC	0	1	0	0	1	1	0	1	Fuel Temperature	X				
	0CC	0	1	0	0	1	1	0	1	Wheel Torque Output	X				6-26
116	002	0	1	0	0	1	1	1	0	Cross Track Distance	X				6-27
	00B	0	1	0	0	1	1	1	0	Horizontal GLS Deviation Rectilinear	X				
	029	0	1	0	0	1	1	1	0	Brake Temperature (Right Inner L/G)	X				
	055	0	1	0	0	1	1	1	0	Horizontal GLS Deviation Rectilinear	X				
	056	0	1	0	0	1	1	1	0	Cross Track Distance	X				
	060	0	1	0	0	1	1	1	0	Cross Track Distance	X				
	0CC	0	1	0	0	1	1	1	0	Wheel Torque Output	X				6-26
117	002	0	1	0	0	1	1	1	1	Vertical Deviation	X				6-27
	00B	0	1	0	0	1	1	1	1	Vertical GLS Deviation Rectilinear	X				
	029	0	1	0	0	1	1	1	1	Brake Temperature (Right Inner L/G)	X				
	055	0	1	0	0	1	1	1	1	Vertical GLS Deviation Rectilinear	X				
	056	0	1	0	0	1	1	1	1	Vertical Deviation	X				
	060	0	1	0	0	1	1	1	1	Vertical Deviation	X				
	0CC	0	1	0	0	1	1	1	1	Wheel Torque Output	X				6-26
120	002	0	1	0	1	0	0	0	0	Range to Altitude	X				
	00B	0	1	0	1	0	0	0	0	GNSS Latitude Fine	X				
	029	0	1	0	1	0	0	0	0	Pack Bypass Turbine Position	X				
	056	0	1	0	1	0	0	0	0	Range to Altitude	X				
	060	0	1	0	1	0	0	0	0	Range to Altitude	X				
121	002	0	1	0	1	0	0	0	1	Horizontal Command Signal	X				
	00B	0	1	0	1	0	0	0	1	GNSS Longitude Fine	X				
	025	0	1	0	1	0	0	0	1	Pitch Limit	X				
	029	0	1	0	1	0	0	0	1	Pack Outlet Temperature	X				
	056	0	1	0	1	0	0	0	1	Horizontal Command Signal	X				
	060	0	1	0	1	0	0	0	1	Horizontal Command Signal	X				
122	002	0	1	0	1	0	0	1	0	Vertical Command Signal	X				
	029	0	1	0	1	0	0	1	0	Pack Turbine Inlet Temperature	X				
	056	0	1	0	1	0	0	1	0	Vertical Command Signal	X				
	060	0	1	0	1	0	0	1	0	Vertical Command Signal	X				
123	002	0	1	0	1	0	0	1	1	Throttle Command	X				
124	00B	0	1	0	1	0	1	0	0	Digital Time Mark			X		
	0A5	0	1	0	1	0	1	0	0	Client Device for GNSS Receiver	X				6-49
	1E2	0	1	0	1	0	1	0	0	Horizontal Alarm Limit	X				
125	002	0	1	0	1	0	1	0	1	Universal Time Coordinated (UTC)		X			6-25
	00B	0	1	0	1	0	1	0	1	Universal Time Coordinated (UTC)		X			
	031	0	1	0	1	0	1	0	1	Universal Time Coordinated (UTC)		X			6-25
	056	0	1	0	1	0	1	0	1	Universal Time Coordinated (UTC)		X			
	060	0	1	0	1	0	1	0	1	Universal Time Coordinated (UTC)		X			
126	002	0	1	0	1	0	1	1	0	Vertical Deviation (wide)	X				
	026	0	1	0	1	0	1	1	0	FWC Word	X				
	029	0	1	0	1	0	1	1	0	Pack Flow	X				
	056	0	1	0	1	0	1	1	0	Vertical Deviation (Wide)	X				
	060	0	1	0	1	0	1	1	0	Vertical Deviation (Wide)	X				
127	002	0	1	0	1	0	1	1	1	Selected Landing Altitude	X				
	01B	0	1	0	1	0	1	1	1	Slat Angle	X				6-11
	033	0	1	0	1	0	1	1	1	P14	X				
	055	**0**	**1**	**0**	**1**	**0**	**1**	**1**	**1**	**FAS Vertical Alarm Limit**	**X**				
	10A	0	1	0	1	0	1	1	1	Fan Discharge Static Pressure	X				
	10B	0	1	0	1	0	1	1	1	Fan Discharge Static Pressure	X				
	1E2	0	1	0	1	0	1	1	1	Vertical Alarm Limit	X				6-50

ATTACHMENT 1-1
LABEL CODES

Code No. (Octal)	Eqpt. ID (Hex)	Transmission Order Bit Position 1	2	3	4	5	6	7	8	Parameter	Data BNR	BCD	DISC	SAL	Notes & Cross Ref. To Tables in Att. 6
130	00B	0	1	0	1	1	0	0	0	Aut Horiz Integ Limit	X				
	01A	0	1	0	1	1	0	0	0	Fan Inlet Total Temperature	X				
	01C	0	1	0	1	1	0	0	0	Fan Inlet Total Temperature	X				
	02F	0	1	0	1	1	0	0	0	Fan Inlet Total Temperature	X				
	035	0	1	0	1	1	0	0	0	Intruder Range	X				6-21
	03F	0	1	0	1	1	0	0	0	Fan Inlet Total Temperature	X				
	055	**0**	**1**	**0**	**1**	**1**	**0**	**0**	**0**	**MLS Aux Data Part 1 Group A**	**X**				
	10A	0	1	0	1	1	0	0	0	Selected Total Air Temperature	X				
	10B	0	1	0	1	1	0	0	0	Selected Total Air Temperature	X				
	13A	0	1	0	1	1	0	0	0	Inlet Temperature	X				
131	01A	0	1	0	1	1	0	0	1	Fan Inlet Total Pressure	X				
	01C	0	1	0	1	1	0	0	1	Fan Inlet Total Pressure	X				
	02D	0	1	0	1	1	0	0	1	Fan Inlet Total Pressure	X				
	02F	0	1	0	1	1	0	0	1	Fan Inlet Total Pressure	X				
	033	0	1	0	1	1	0	0	1	Fan Inlet Total Pressure	X				
	035	0	1	0	1	1	0	0	1	Intruder Altitude	X				6-22
	055	**0**	**1**	**0**	**1**	**1**	**0**	**0**	**1**	**MLS Aux Data Part 2 Group A**	**X**				
	13A	0	1	0	1	1	0	0	1	Inlet Pressure	X				
132	01A	0	1	0	1	1	0	1	0	Exhaust Gas Total Pressure	X				
	01C	0	1	0	1	1	0	1	0	Exhaust Gas Total Pressure	X				
	033	0	1	0	1	1	0	1	0	Exhaust Gas Total Pressure	X				
	035	0	1	0	1	1	0	1	0	Intruder Bearing	X				6-23
	055	**0**	**1**	**0**	**1**	**1**	**0**	**1**	**0**	**MLS Aux Data Part 3 Group A**	**X**				
133	00B	0	1	0	1	1	0	1	1	Aut Vert. Integ Limit	X				
	01A	0	1	0	1	1	0	1	1	Thrust Lever Angle	X				
	02F	0	1	0	1	1	0	1	1	Thrust Lever Angle	X				
	03F	0	1	0	1	1	0	1	1	Thrust Lever Angle	X				
	055	**0**	**1**	**0**	**1**	**1**	**0**	**1**	**1**	**MLS Aux Data Part 4 Group A**	**X**				
	10A	0	1	0	1	1	0	1	1	Selected Throttle Lever Angle	X				
	10B	0	1	0	1	1	0	1	1	Selected Throttle Lever Angle	X				
134	01C	0	1	0	1	1	1	0	0	Power Lever Angle	X				
	035	**0**	**1**	**0**	**1**	**1**	**1**	**0**	**0**	**Relative Altitude of the Most Threatening Traffic**	**X**				
	055	**0**	**1**	**0**	**1**	**1**	**1**	**0**	**0**	**MLS Aux Data Part 1 Group B**	**X**				
	10A	0	1	0	1	1	1	0	0	Throttle Lever Angle	X				
	10B	0	1	0	1	1	1	0	0	Throttle Lever Angle	X				
	13A	0	1	0	1	1	1	0	0	Throttle Lever Angle	X				
135	01C	0	1	0	1	1	1	0	1	Engine Vibration #1	X				
	029	0	1	0	1	1	1	0	1	Engine Fan Vibration	X				
	055	**0**	**1**	**0**	**1**	**1**	**1**	**0**	**1**	**MLS Aux Data Part 2 Group B**	**X**				
	05A	0	1	0	1	1	1	0	1	ACT 1 Fuel Quantity Display		X			
136	00B	0	1	0	1	1	1	1	0	Vertical Figure of Merit	X				
	01C	0	1	0	1	1	1	1	0	Engine Vibration #2	X				
	029	0	1	0	1	1	1	1	0	Engine Turbine Vibration	X				
	055	**0**	**1**	**0**	**1**	**1**	**1**	**1**	**0**	**MLS Aux Data Part 3 Group B**	**X**				
	05A	0	1	0	1	1	1	1	0	ACT 2 Fuel Quantity Display		X			
137	01B	0	1	0	1	1	1	1	1	Flap Angle	X				6-11
	02A	0	1	0	1	1	1	1	1	Flap Angle	X				6-11
	02F	0	1	0	1	1	1	1	1	Thrust Reverser Position Feedback	X				
	03F	0	1	0	1	1	1	1	1	Thrust Reverser Position Feedback	X				
	055	**0**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**MLS Aux Data Part 4 Group B**	**X**				
	05A	0	1	0	1	1	1	1	1	Center+ACT1+ACT2 FQ Display		X			
	10A	0	1	0	1	1	1	1	1	Selected Thrust Reverser Position	X				
	10B	0	1	0	1	1	1	1	1	Selected Thrust Reverser Position	X				
	140	0	1	0	1	1	1	1	1	Flap Angle	X				6-11
140	001	0	1	1	0	0	0	0	0	Flight Director - Roll	X				6-27
	00B	0	1	1	0	0	0	0	0	UTC Fine	X				
	025	0	1	1	0	0	0	0	0	Flight Director - Roll	X				
	029	0	1	1	0	0	0	0	0	Precooler Output Temperature	X				
	055	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**MLS Aux Data Part 1 Group C**	**X**				
	05A	0	1	1	0	0	0	0	0	Actual Fuel Quantity Display		X			
	114	0	1	1	0	0	0	0	0	Pump Contactor States			X		
		0	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**MFP-1 (Multi Functional Probe)**				**X**	

ATTACHMENT 1-1
LABEL CODES

Code No. (Octal)	Eqpt. ID (Hex)	Transmission Order Bit Position								Parameter	Data				Notes & Cross Ref. To Tables in Att. 6
		1	2	3	4	5	6	7	8		BNR	BCD	DISC	SAL	
141	001	0	1	1	0	0	0	0	1	Flight Director - Pitch	X				6-27
	00B	0	1	1	0	0	0	0	1	UTC Fine Fractions	X				
	025	0	1	1	0	0	0	0	1	Flight Director - Pitch	X				
	029	0	1	1	0	0	0	0	1	Precooler Input Temperature	X				
	055	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**1**	**MLS Aux Data Part 2 Group C**	**X**				
	05A	0	1	1	0	0	0	0	1	Preselected Fuel Quantity Display		X			
	114	0	1	1	0	0	0	0	1	Pump Contactor and Pushbutton States			X		
		0	**1**	**1**	**0**	**0**	**0**	**0**	**1**	**SSA-1 (Side Slip Angle Probe)**				**X**	
142	002	0	1	1	0	0	0	1	0	Flight Director - Fast/Slow	X				6-27
	003	0	1	1	0	0	0	1	0	Flight Director - Fast/Slow	X				
	00B	0	1	1	0	0	0	1	0	UTC Fine Fractions	X				
	025	0	1	1	0	0	0	1	0	Flight Director - Fast/Slow	X				
	05A	0	1	1	0	0	0	1	0	Left Wing Fuel Quantity Display		X			
	114	0	1	1	0	0	0	1	0	Pump Push Button and LP Switch State			X		
		0	**1**	**1**	**0**	**0**	**0**	**1**	**0**	**ISP1-1 (Integrated Static Probe)**				**X**	
143	001	0	1	1	0	0	0	1	1	Flight Director - Yaw	X				
	041	0	1	1	0	0	0	1	1	HPA Command Word	X				
	05A	0	1	1	0	0	0	1	1	Center Wing Fuel Quantity Display		X			
	114	0	1	1	0	0	0	1	1	Pump LP Switch State and FCMC Commands			X		
	241	0	1	1	0	0	0	1	1	HPA Response Word	X				
		0	**1**	**1**	**0**	**0**	**0**	**1**	**1**	**ISP1-2 (Integrated Static Probe)**				**X**	
144	02B	0	1	1	0	0	1	0	0	Altitude Error	X				
	041	0	1	1	0	0	1	0	0	ACU/BSU Contorl Word	X				
	05A	0	1	1	0	0	1	0	0	Right Wing Fuel Quantity Display		X			
	114	0	1	1	0	0	1	0	0	Valve Feedback			X		
	181	**0**	**1**	**1**	**0**	**0**	**1**	**0**	**0**	**Satcom Antenna Control/SDU Status Word**					**Various - DISC**
	341	0	1	1	0	0	1	0	0	ACU/BSU Contorl Word	X				
		0	**1**	**1**	**0**	**0**	**1**	**0**	**0**	**MFP-2 (Multi Functional Probe)**				**X**	
145	002	0	1	1	0	0	1	0	1	TACAN Control	X				6-30
	025	0	1	1	0	0	1	0	1	Discrete Status 2 EFIS			X		
	029	0	1	1	0	0	1	0	1	Discrete Status 2 EFIS			X		
	0A1	0	1	1	0	0	1	0	1	AFS DFDR Discretes #1			X		
	114	0	1	1	0	0	1	0	1	Valve Feedback			X		
		0	**1**	**1**	**0**	**0**	**1**	**0**	**1**	**SSA-2 (Side Slip Angle Probe)**				**X**	
146	025	0	1	1	0	0	1	1	0	Discrete Status 3 EFIS			X		
	029	0	1	1	0	0	1	1	0	Discrete Data #9			X		
	0A1	0	1	1	0	0	1	1	0	AFS DFDR Discretes #2			X		
	112	0	1	1	0	0	1	1	0	TACAN Control	X				6-47
	114	0	1	1	0	0	1	1	0	Valve Feedback			X		
		0	**1**	**1**	**0**	**0**	**1**	**1**	**0**	**ISP2-1 (Integrated Static Probe)**				**X**	
147	025	0	1	1	0	0	1	1	1	Discrete Status 4 EFIS			X		
	029	0	1	1	0	0	1	1	1	Discrete Data #10			X		
	0A1	0	1	1	0	0	1	1	1	AFS DFDR Discretes #3			X		
	114	0	1	1	0	0	1	1	1	Valve Feedback			X		
	115	0	1	1	0	0	1	1	1	TACAN Control Word	X				6-48/Note 1
		0	**1**	**1**	**0**	**0**	**1**	**1**	**1**	**ISP2-2 (Integrated Static Probe)**				**X**	
150	002	0	1	1	0	1	0	0	0	Universal Time Constant (UTC)	X				6-12/6-27
	00B	0	1	1	0	1	0	0	0	Universal Time Constant (UTC)	X				
	029	0	1	1	0	1	0	0	0	Cabin Altitude Rate	X				
	031	0	1	1	0	1	0	0	0	Universal Time Constant (UTC)	X				6-12/6-27
	056	0	1	1	0	1	0	0	0	Universal Time Coordinate	X				
	060	0	1	1	0	1	0	0	0	Universal Time Coordinate	X				
	114	0	1	1	0	1	0	0	0	FCMC Valve Commands			X		
		0	**1**	**1**	**0**	**1**	**0**	**0**	**0**	**MFP-3 (Multi Functional Probe)**				**X**	
151	002	0	1	1	0	1	0	0	1	Localizer Bearing (True)	X				
	027	0	1	1	0	1	0	0	1	MLS Azimuth Deviation	X				
	029	0	1	1	0	1	0	0	1	Cabin Altitude	X				
	055	0	1	1	0	1	0	0	1	MLS Azimuth Deviation	X				
	056	0	1	1	0	1	0	0	1	Localizer Bearing (True)	X				
	05A	0	1	1	0	1	0	0	1	LB/KG Control Word			X		
	060	0	1	1	0	1	0	0	1	Localizer Bearing (True)	X				
	114	0	1	1	0	1	0	0	1	FCMC Valve Commands			X		
		0	**1**	**1**	**0**	**1**	**0**	**0**	**1**	**SSA-3 (Side Slip Angle Probe)**				**X**	
152	027	0	1	1	0	1	0	1	0	MLS Elevation Deviation	X				
	029	0	1	1	0	1	0	1	0	Cabin Pressure	X				
	038	0	1	1	0	1	0	1	0	Cabin Pressure	X				
	041	0	1	1	0	1	0	1	0	Open Loop Steering	X				
	055	0	1	1	0	1	0	1	0	MLS GP Deviation	X				

ATTACHMENT 1-1
LABEL CODES

Code No. (Octal)	Eqpt. ID (Hex)	Transmission Order Bit Position								Parameter	Data				Notes & Cross Ref. To Tables in Att. 6
		1	2	3	4	5	6	7	8		BNR	BCD	DISC	SAL	
	0AD	0	1	1	0	1	0	1	0	Cabin Pressure	X				
	114	0	1	1	0	1	0	1	0	Overhead Panel Switch/Pushbutton & Refuel Panel Battery Power Supply Switch States			X		
	181	**0**	**1**	**1**	**0**	**1**	**0**	**1**	**0**	**Open Loop Steering Word SDU/Satcom Antenna**			**X**		
		0	1	1	0	1	0	1	0	777 Cabin Interphone System - System Address Label				X	See Attachment 11
153	002	0	1	1	0	1	0	1	1	Maximum Altitude	X				
	027	0	1	1	0	1	0	1	1	Flare	X				
	029	0	1	1	0	1	0	1	1	Pressurization Valve Position (Gr. #1)	X				
	041	0	1	1	0	1	0	1	1	Closed Loop Steering	X				
	055	0	1	1	0	1	0	1	1	MLS Selected Azimuth	X				
	114	0	1	1	0	1	0	1	1	Level States			X		
		0	**1**	**1**	**0**	**1**	**0**	**1**	**1**	**ISP3-1 (Integrated Static Probe)**				**X**	
154	002	0	1	1	0	1	1	0	0	Runway Heading (True)	X				
	027	0	1	1	0	1	1	0	0	MLS Auxiliary Data	X				
	029	0	1	1	0	1	1	0	0	Pressurization Valve Position (Gr. #2)	X				
	055	0	1	1	0	1	1	0	0	MLS Max Selectable GP	X				
	056	0	1	1	0	1	1	0	0	Runway Heading (True)	X				
	060	0	1	1	0	1	1	0	0	Runway Heading (True)	X				
	114	0	1	1	0	1	1	0	0	Level States and Low Warning and Transfer Indications			X		
		0	**1**	**1**	**0**	**1**	**1**	**0**	**0**	**ISP3-2 (Integrated Static Probe)**				**X**	
155	01C	0	1	1	0	1	1	0	1	Maintenance Data #6			X		
	025	0	1	1	0	1	1	0	1	Discrete Status 5 EFIS			X		
	027	0	1	1	0	1	1	0	1	MLS Selected GP Angle		X			
	029	0	1	1	0	1	1	0	1	Discrete #1			X		
	033	0	1	1	0	1	1	0	1	Maintenance Data #6			X		
	055	0	1	1	0	1	1	0	1	MLS Selected Glide Path	X				
	05A	0	1	1	0	1	1	0	1	FQIC			X		
	0BB	0	1	1	0	1	1	0	1	Maintenance Data #6			X		
	10A	0	1	1	0	1	1	0	1	Maintenance Data #6			X		
	10B	0	1	1	0	1	1	0	1	Maintenance Data #6			X		
	114	0	1	1	0	1	1	0	1	XFR Pump Faults & Wing Imbalance Warning			X		
		0	**1**	**1**	**0**	**1**	**1**	**0**	**1**	**On-Board Airport Navigation System (OANS)**				**X**	
156	01C	0	1	1	0	1	1	1	0	Maintenance Data #7			X		
	027	0	1	1	0	1	1	1	0	MLS Dataword 1	X				
	029	0	1	1	0	1	1	1	0	Discrete #12			X		
	033	0	1	1	0	1	1	1	0	Maintenance Data #7			X		
	04D	0	1	1	0	1	1	1	0	L Tank Faults			X		
	055	0	1	1	0	1	1	1	0	MLS Basic Data Wd 1	X				
	0BB	0	1	1	0	1	1	1	0	Maintenance Data #7			X		
	10A	0	1	1	0	1	1	1	0	Maintenance Data #7			X		
	10B	0	1	1	0	1	1	1	0	Maintenance Data #7			X		
	114	0	1	1	0	1	1	1	0	Refuel Panel Switch States			X		
		0	1	1	0	1	1	1	0	CVR #2 - System Address Label				X	See Attachment 11
157	01C	0	1	1	0	1	1	1	1	Maintenance Data #8	X				
	027	0	1	1	0	1	1	1	1	MLS Dataword 2			X		
	033	0	1	1	0	1	1	1	1	Maintenance Data #8			X		
	04D	0	1	1	0	1	1	1	1	R Tank Faults			X		
	055	0	1	1	0	1	1	1	1	MLS Basic Data Wd 2	X				
	0BB	0	1	1	0	1	1	1	1	Maintenance Data #8			X		
	10A	0	1	1	0	1	1	1	1	Maintenance Data #8			X		
	10B	0	1	1	0	1	1	1	1	Maintenance Data #8			X		
	114	0	1	1	0	1	1	1	1	Trim Tank Probe Capacitance		X			
		0	1	1	0	1	1	1	1	CVR #1 - System Address Label				X	See Attachment 11
160	01C	0	1	1	1	0	0	0	0	Maintenance Data #9			X		
	025	0	1	1	1	0	0	0	0	Discrete Status 6 EFIS			X		
	027	0	1	1	1	0	0	0	0	MLS Dataword 3	X				
	033	0	1	1	1	0	0	0	0	Maintenance Data #9			X		
	04D	0	1	1	1	0	0	0	0	C Tank Faults			X		
	055	0	1	1	1	0	0	0	0	MLS Basic Data Wd 3	X				
	0BB	0	1	1	1	0	0	0	0	Maintenance Data #9			X		
	10A	0	1	1	1	0	0	0	0	Maintenance Data #9			X		
	10B	0	1	1	1	0	0	0	0	Maintenance Data #9			X		
	114	0	1	1	1	0	0	0	0	Valve Feedback			X		

ATTACHMENT 1-1
LABEL CODES

Code No. (Octal)	Eqpt. ID (Hex)	Transmission Order Bit Position								Parameter	Data				Notes & Cross Ref. To Tables in Att. 6
		1	2	3	4	5	6	7	8		BNR	BCD	DISC	SAL	
161	01C	0	1	1	1	0	0	0	1	Maintenance Data #10			X		
	025	0	1	1	1	0	0	0	1	Discrete Status 7 EFIS			X		
	027	0	1	1	1	0	0	0	1	MLS Dataword 4			X		
	033	0	1	1	1	0	0	0	1	Maintenance Data #10			X		
	04D	0	1	1	1	0	0	0	1	A Tank Faults			X		
	055	0	1	1	1	0	0	0	1	MLS Basic Data Wd 4	X				
	10A	0	1	1	1	0	0	0	1	Maintenance Data #10			X		
	10B	0	1	1	1	0	0	0	1	Maintenance Data #10			X		
	114	0	1	1	1	0	0	0	1	Indicated Pump Status			X		
	131	**0**	**1**	**1**	**1**	**0**	**0**	**0**	**1**	**Density Altitude - Derived**	**X**				
162	012	0	1	1	1	0	0	1	0	ADF Bearing	X				
	025	0	1	1	1	0	0	1	0	ADF Bearing Left/Right	X				
	027	0	1	1	1	0	0	1	0	MLS Dataword 5	X				
	029	0	1	1	1	0	0	1	0	Crew Oxygen Pressure	X				
	055	0	1	1	1	0	0	1	0	MLS Basic Data Wd 5	X				
	0DE	0	1	1	1	0	0	1	0	Stick Shaker Margin Proportional Signal	X				
	114	0	1	1	1	0	0	1	0	Indicated Pump Status			X		
	140	0	1	1	1	0	0	1	0	Density Altitude	X				
163	027	0	1	1	1	0	0	1	1	MLS Dataword 6	X				
	035	**0**	**1**	**1**	**1**	**0**	**0**	**1**	**1**	**Display Application Status**	**X**				
	037	0	1	1	1	0	0	1	1	Zero Fuel Weight (lb)		X			
	055	0	1	1	1	0	0	1	1	MLS Basic Data Wd 6	X				
	114	0	1	1	1	0	0	1	1	Indicated Pump Status			X		
		0	1	1	1	0	0	1	1	747 DFDR & A330/340 SSFDR - System Address Label				X	See Attachment 11
164	002	0	1	1	1	0	1	0	0	Minimum Descent Altitude (MDA)	X				
	003	0	1	1	1	0	1	0	0	Target Height	X				
	007	0	1	1	1	0	1	0	0	Radio Height	X				6-13/6-27
	025	0	1	1	1	0	1	0	0	Radio Height	X				6-13/6-27
	027	0	1	1	1	0	1	0	0	MLS Dataword 7	X				
	03B	0	1	1	1	0	1	0	0	Radio Height	X				
	055	0	1	1	1	0	1	0	0	MLS ABS GP Angle	X				
	0E3	**0**	**1**	**1**	**1**	**0**	**1**	**0**	**0**	**Radar Altitude**	**X**				
	114	0	1	1	1	0	1	0	0	Indicated Pump Status			X		
165	007	0	1	1	1	0	1	0	1	Radio Height		X			6-25
	00B	0	1	1	1	0	1	0	1	Vertical Velocity	X				
	027	0	1	1	1	0	1	0	1	MLS Dataword 8	X				
	055	0	1	1	1	0	1	0	1	MLS ABS Azimuth Angle	X				
	114	0	1	1	1	0	1	0	1	Indicated Valve Status			X		
166	007	0	1	1	1	0	1	1	0	RALT Check Point Dev.	X				
	055	0	1	1	1	0	1	1	0	North/South Velocity	X				
	114	0	1	1	1	0	1	1	0	Indicated Valve Status			X		
167	002	0	1	1	1	0	1	1	1	EPU Estimate Position Uncertainty/ (ANP) Actual Navi. Perf.	X				
	055	**0**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**DAS Lateral Alarm Limit**	**X**				
	114	0	1	1	1	0	1	1	1	Indicated Valve Status			X		
170	025	0	1	1	1	1	0	0	0	Decision Height Selected (EFI)		X			6-25
	0C5	0	1	1	1	1	0	0	0	Decision Height Selected (EFI)		X			6-25
	114	0	1	1	1	1	0	0	0	Wing Imbalance and FQI Failure Warning			X		
		0	1	1	1	1	0	0	0	DFDAU - System Address Label				X	See Attachment 11
171	002	0	1	1	1	1	0	0	1	RNP Required Navigation Performance	X				
	0A5	0	1	1	1	1	0	0	1	Vertical Alarm Limit (VAL) and SBAS System Identifier	X				
	XXX	0	1	1	1	1	0	0	1	Manufacturer Specific Status					See Attachment 10/Note 1
172		**0**	**1**	**1**	**1**	**1**	**0**	**1**	**0**	**SDU Satellite System Type**			**X**		
	XXX	0	1	1	1	1	0	1	0	Subsystem Identifier					6-34/Note 1
173	010	0	1	1	1	1	0	1	1	Localizer Deviation	X				6-6/6-27
	025	0	1	1	1	1	0	1	1	Localizer Deviation	X				6-6/6-27
	029	0	1	1	1	1	0	1	1	Hydraulic Quantity	X				
	03B	0	1	1	1	1	0	1	1	Localizer Deviation	X				
	055	0	1	1	1	1	0	1	1	Localizer Deviation	X				
	0BD	0	1	1	1	1	0	1	1	Hydraulic Quantity	X				
	0D0	0	1	1	1	1	0	1	1	Hydraulic Oil	X				
		0	1	1	1	1	0	1	1	SDU #2 – System Address Label				X	See Attachment 11

ATTACHMENT 1-1
LABEL CODES

Code No. (Octal)	Eqpt. ID (Hex)	Transmission Order Bit Position								Parameter	Data				Notes & Cross Ref. To Tables in Att. 6
		1	2	3	4	5	6	7	8		BNR	BCD	DISC	SAL	
174	003	0	1	1	1	1	1	0	0	Delayed Flap Approach Speed (DFA)	X				
	00B	0	1	1	1	1	1	0	0	East/West Velocity	X				
	010	0	1	1	1	1	1	0	0	Glideslope Deviation	X				6-6/6-27
	029	0	1	1	1	1	1	0	0	Hydraulic Pressure	X				
	03B	0	1	1	1	1	1	0	0	Glideslope Deviation	X				6-6/6-27
	055	0	1	1	1	1	1	0	0	Glideslope Deviation	X				
	0D0	0	1	1	1	1	1	0	0	Hydraulic Oil Pressure	X				
		0	1	1	1	1	1	0	0	RFU - System Address Label				X	See Attachment 11
175	003	0	1	1	1	1	1	0	1	Economical Speed	X				
	029	0	1	1	1	1	1	0	1	EGT (APU)	X				
	033	0	1	1	1	1	1	0	1	Hydraulic Pump Case Drain Temperature	X				
	055	**0**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**MLS Selected Back AZ Limit**	**X**				
		0	1	1	1	1	1	0	1	HGA/IGA HPA - System Address Label				X	See Attachment 11
176	003	0	1	1	1	1	1	1	0	Economical Mach	X				
	029	0	1	1	1	1	1	1	0	RPM (APU)	X				
	038	0	1	1	1	1	1	1	0	Left Static Pressure Uncorrected, mb	X				
	05A	0	1	1	1	1	1	1	0	Fuel Temperature - Set to Zero	X				
	0AD	0	1	1	1	1	1	1	0	Static Pressure Left, Uncorrected, mb	X				
	114	0	1	1	1	1	1	1	0	Left Outer Tank Fuel Temp & Advisory Warning	X				
177	003	0	1	1	1	1	1	1	1	Economical Flight Level	X				
	029	0	1	1	1	1	1	1	1	Oil Quantity (APU)	X				
	038	0	1	1	1	1	1	1	1	Right Static Pressure Uncorrected, mb	X				
	055	0	1	1	1	1	1	1	1	Distance to LTP/FTP	X				
	05A	0	1	1	1	1	1	1	1	Fuel Temperature Left Wing Tank	X				
	0AD	0	1	1	1	1	1	1	1	Static Pressure Right, Uncorrected, mb	X				
	114	0	1	1	1	1	1	1	1	Inner Tank 1 Fuel Temp & Advisory Warning	X				
		0	1	1	1	1	1	1	1	LGA/HPA - System Address Label				X	See Attachment 11
200	002	1	0	0	0	0	0	0	0	Drift Angle		X			
	004	1	0	0	0	0	0	0	0	Drift Angle		X			
	056	1	0	0	0	0	0	0	0	Drift Angle		X			
	060	1	0	0	0	0	0	0	0	Drift Angle		X			
	114	1	0	0	0	0	0	0	0	Inner Tank 2 Fuel Temp & Advisory Warning	X				
201	009	1	0	0	0	0	0	0	1	DME Distance		X			6-1-1
	05A	1	0	0	0	0	0	0	1	Fuel Temperature Right Wing Tank	X				
	112	1	0	0	0	0	0	0	1	TACAN Distance		X			
	114	1	0	0	0	0	0	0	1	Inner Tank 3 Fuel Temp & Advisory Warning	X				
	115	1	0	0	0	0	0	0	1	DME		X			6-25
	140	1	0	0	0	0	0	0	1	Mach Maximum Operation (Mmo)	X				
	142	1	0	0	0	0	0	0	1	Projected Future Latitude	X				
		1	0	0	0	0	0	0	1	GPS/GNSS Sensor - System Address Label				X	See Attachment 11
202	002	1	0	0	0	0	0	1	0	Energy Management (clean)	X				
	009	1	0	0	0	0	0	1	0	DME Distance	X				6-7/6-27
	029	1	0	0	0	0	0	1	0	Cabin Compartment Temperature (Group #1)	X				
	05A	1	0	0	0	0	0	1	0	Fuel Temperature - Set to Zero	X				
	114	1	0	0	0	0	0	1	0	Inner Tank 4 Fuel Temp & Advisory Warning	X				
	140	1	0	0	0	0	0	1	0	Mach Rate	X				
	142	1	0	0	0	0	0	1	0	Projected Future Latitude Fine	X				
203	002	1	0	0	0	0	0	1	1	Energy Management Speed Brakes	X				
	006	1	0	0	0	0	0	1	1	Altitude (1013.25mB)	X				
	018	1	0	0	0	0	0	1	1	Altitude	X				6-24/6-27
	029	1	0	0	0	0	0	1	1	Cabin Compartment Temperature (Group #2)	X				
	035	1	0	0	0	0	0	1	1	Own A/C Altitude	X				
	038	1	0	0	0	0	0	1	1	Altitude (1013.25mB)	X				
	05A	1	0	0	0	0	0	1	1	Fuel Tank #6 Temperature	X				
	10A	1	0	0	0	0	0	1	1	Ambient Static Pressure	X				
	10B	1	0	0	0	0	0	1	1	Ambient Static Pressure	X				
	114	1	0	0	0	0	0	1	1	Trim Tank Fuel Temp & Advisory Warning	X				
	140	1	0	0	0	0	0	1	1	Altitude	X				
204	002	1	0	0	0	0	1	0	0	Utitlity Airspeed	X				
	006	1	0	0	0	0	1	0	0	Baro Corrected Altitude #1	X				
	029	1	0	0	0	0	1	0	0	Cabin Duct Temperature (Group #1)	X				
	038	1	0	0	0	0	1	0	0	Baro Corrected Altitude #1	X				
	056	1	0	0	0	0	1	0	0	Baro Altitude	X				
	05A	1	0	0	0	0	1	0	0	Fuel Tank #7 Temperature	X				
	060	1	0	0	0	0	1	0	0	Baro Altitude	X				
	114	1	0	0	0	0	1	0	0	Right Outer Tank Fuel Temp & Advisory Warning	X				
	140	1	0	0	0	0	1	0	0	Baro Corrected Altitude	X				

ATTACHMENT 1-1
LABEL CODES

Code No. (Octal)	Eqpt. ID (Hex)	Transmission Order Bit Position								Parameter	Data				Notes & Cross Ref. To Tables in Att. 6
		1	2	3	4	5	6	7	8		BNR	BCD	DISC	SAL	
205	002	1	0	0	0	0	1	0	1	HF COM Frequency (New Format)		X			6-43
	006	1	0	0	0	0	1	0	1	Mach	X				6-27
	01A	1	0	0	0	0	1	0	1	Mach	X				6-27
	029	1	0	0	0	0	1	0	1	Cabin Duct Temperature (Group #2)	X				
	038	1	0	0	0	0	1	0	1	Mach	X				
	055	**1**	**0**	**0**	**0**	**0**	**1**	**0**	**1**	**SBAS FAS Datablock Word 1**					**Block - BNR**
	056	1	0	0	0	0	1	0	1	Fuel Tank #8 Temperature	X				
	060	1	0	0	0	0	1	0	1	HF COM Frequency (New Format)		X			
	0CC	1	0	0	0	0	1	0	1	Mach Number	X				
	140	1	0	0	0	0	1	0	1	Mach Number	X				
206	006	1	0	0	0	0	1	1	0	Computed Airspeed	X				6-27
	018	1	0	0	0	0	1	1	0	Altitude (Variable Resolution)	X				6-20
	029	1	0	0	0	0	1	1	0	Cabin Temp. Reg. Valve Position (Group #1)	X				
	038	1	0	0	0	0	1	1	0	Computed Airspeed	X				6-27
	055	**1**	**0**	**0**	**0**	**0**	**1**	**1**	**0**	**SBAS FAS Datablock Word 2**					**Block - BNR**
	056	1	0	0	0	0	1	1	0	Computed Airspeed	X				
	060	1	0	0	0	0	1	1	0	Computed Airspeed	X				
	0CC	1	0	0	0	0	1	1	0	Taxi Speed	X				
	140	1	0	0	0	0	1	1	0	Computed Airspeed (CAS)	X				
207	002	1	0	0	0	0	1	1	1	HF Control Word			X		
	006	1	0	0	0	0	1	1	1	Max. Allowable Airspeed	X				
	00A	1	0	0	0	0	1	1	1	Max. Allowable Airspeed	X				
	025	1	0	0	0	0	1	1	1	Operational Software Part Number		X			6-37
	029	1	0	0	0	0	1	1	1	Cabin Temp. Reg. Valve Position (Group #2)	X				
	038	1	0	0	0	0	1	1	1	Max. Allowable Airspeed	X				
	055	**1**	**0**	**0**	**0**	**0**	**1**	**1**	**1**	**SBAS FAS Datablock Word 3**					**Block - BNR**
	0B9	1	0	0	0	0	1	1	1	HF Control Word			X		
	140	1	0	0	0	0	1	1	1	Airspeed Maximum Operating (VMO)	X				
210	006	1	0	0	0	1	0	0	0	True Airspeed	X				6-27
	029	1	0	0	0	1	0	0	0	Cargo Compartment Temperature	X				
	038	1	0	0	0	1	0	0	0	True Airspeed	X				6-27
	140	1	0	0	0	1	0	0	0	True Airspeed	X				
		1	0	0	0	1	0	0	0	FCMC Com A340-500/600 - System Address Label				X	See Attachment 11
211	002	1	0	0	0	1	0	0	1	Total Air Temperature	X				6-27
	003	1	0	0	0	1	0	0	1	Total Air Temperature	X				
	006	1	0	0	0	1	0	0	1	Total Air Temperature	X				
	01A	1	0	0	0	1	0	0	1	Total Air Temperature	X				
	029	1	0	0	0	1	0	0	1	Cargo Duct Temperature	X				
	038	1	0	0	0	1	0	0	1	Total Air Temperature	X				
	055	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**1**	**SBAS FAS Datablock Word 4**					**Block - BNR**
	0AD	1	0	0	0	1	0	0	1	Total Air Temperature Indicated	X				
	10A	1	0	0	0	1	0	0	1	Total Fan Inlet Temperature	X				
	10B	1	0	0	0	1	0	0	1	Total Fan Inlet Temperature	X				
	140	1	0	0	0	1	0	0	1	Total Air Temp (TAT)	X				
	142	1	0	0	0	1	0	0	1	Projected Future Longitude	X				
		1	0	0	0	1	0	0	1	FCMC Mon A340-500/600 - System Address Label				X	See Attachment 11
212	004	1	0	0	0	1	0	1	0	Altitude Rate	X				6-27
	005	1	0	0	0	1	0	1	0	Altitude Rate	X				
	006	1	0	0	0	1	0	1	0	Altitude Rate	X				
	029	1	0	0	0	1	0	1	0	Cargo Temp. Reg. Valve Position	X				
	038	1	0	0	0	1	0	1	0	Altitude Rate	X				
	03B	1	0	0	0	1	0	1	0	Altitude Rate	X				
	056	1	0	0	0	1	0	1	0	Altitude Rate	X				
	060	1	0	0	0	1	0	1	0	Altitude Rate	X				
	140	1	0	0	0	1	0	1	0	Altitude Rate	X				
	142	1	0	0	0	1	0	1	0	Projected Future Longitude Fine	X				
		1	0	0	0	1	0	1	0	FCMC Int A340-500/600 - System Address Label				X	See Attachment 11
213	002	1	0	0	0	1	0	1	1	Static Air Temperature	X				6-27
	006	1	0	0	0	1	0	1	1	Static Air Temperature	X				6-27
	038	1	0	0	0	1	0	1	1	Static Air Temperature	X				
	055	**1**	**0**	**0**	**0**	**1**	**0**	**1**	**1**	**SBAS FAS Datablock Word 5**					**Block - BNR**
	08D	1	0	0	0	1	0	1	1	Fuel Used	X				6-27
	140	1	0	0	0	1	0	1	1	Static Air Temp (SAT)	X				
	142	1	0	0	0	1	0	1	1	Vertical Time Interval	X				
214	XXX	1	0	0	0	1	1	0	0	ICAO Aircraft Address (Part 1)			X		Note 1

ATTACHMENT 1-1
LABEL CODES

Code No. (Octal)	Eqpt. ID (Hex)	Transmission Order Bit Position								Parameter	Data				Notes & Cross Ref. To Tables in Att. 6
		1	2	3	4	5	6	7	8		BNR	BCD	DISC	SAL	
215	006	1	0	0	0	1	1	0	1	Impacted Pressure, Uncorrected, mb	X				
	01A	1	0	0	0	1	1	0	1	Impact Pressure	X				
	029	1	0	0	0	1	1	0	1	N1 Actual (EEC)	X				
	029	1	0	0	0	1	1	0	1	EPR Actual (EEC)	X				
	038	1	0	0	0	1	1	0	1	Impacted Pressure, Uncorrected, mb	X				
	055	**1**	**0**	**0**	**0**	**1**	**1**	**0**	**1**	**SBAS FAS Datablock Word 6**					**Block - BNR**
	0AD	1	0	0	0	1	1	0	1	Impacted Pressure, Uncorrected, mb	X				
	140	1	0	0	0	1	1	1	1	Impact Pressure Subsonic	X				
216	XXX	1	0	0	0	1	1	1	0	ICAO Aircraft Address (Part 2)			X		Note 1
217	002	1	0	0	0	1	1	1	1	Geometric Vertical Rate	X				
	006	1	0	0	0	1	1	1	1	Static Pressure, Corrected (In. Hg)	X				
	029	1	0	0	0	1	1	1	1	N1 Limit (EEC)	X				
	029	1	0	0	0	1	1	1	1	EPR Actual (EEC)	X				
	038	1	0	0	0	1	1	1	1	Static Pressure, Average, Corrected (In. Hg)	X				
	055	**1**	**0**	**0**	**0**	**1**	**1**	**1**	**1**	**SBAS FAS Datablock Word 7**					**Block - BNR**
	140	1	0	0	0	1	1	1	1	Static Pressure Corrected (In. Hg)	X				
220	006	1	0	0	1	0	0	0	0	Baro Corrected Altitude #2	X				
	038	1	0	0	1	0	0	0	0	Baro Corrected Altitude #2	X				
	055	**1**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**SBAS FAS Datablock Word 8**					**Block - BNR**
	140	1	0	0	1	0	0	0	0	Baro Corrected Altitude #2	X				
		1	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**INMARSAT Swift64 Base Forward ID Word 1**			**X**		
		1	0	0	1	0	0	0	0	MCDU #1 - System Address label (Recipient)				X	See Attachment 11
221	006	1	0	0	1	0	0	0	1	Indicated Angle of Attack (Average)	X				
	038	1	0	0	1	0	0	0	1	Indicated Angle of Attack (Average)	X				
		1	**0**	**0**	**1**	**0**	**0**	**0**	**1**	**INMARSAT 24-Bit Swift64 Base Forward ID Word 2**			**X**		
	055	**1**	**0**	**0**	**1**	**0**	**0**	**0**	**1**	**SBAS FAS Datablock Word 9**					**Block - BNR**
	0AD	1	0	0	1	0	0	0	1	Indicated Angle of Attack (Average)	X				
	12C	1	0	0	1	0	0	0	1	Indicated Angle of Attack (Average)					
	140	1	0	0	1	0	0	0	1	Angle of Attach Indicated Average	X				
		1	0	0	1	0	0	0	1	MCDU #2 - System Address label (Recipient)				X	See Attachment 11
222	006	1	0	0	1	0	0	1	0	Indicated Angle of Attack (#1 Left)	X				
	011	1	0	0	1	0	0	1	0	VOR Omnibearing	X				6-10
	112	1	0	0	1	0	0	1	0	TACAN Bearing	X				
	115	1	0	0	1	0	0	1	0	Bearing	X				
	12C	1	0	0	1	0	0	1	0	Indicated Angle of Attack (#1 Left)	X				
	140	1	0	0	1	0	0	1	0	Angle of Attack, Indicated (#1 Left)	X				
		1	0	0	1	0	0	1	0	MCDU #3 - System Address Label				X	See Attachment 11
223	006	1	0	0	1	0	0	1	1	Indicated Angle of Attack (#1 Right)	X				
	055	**1**	**0**	**0**	**1**	**0**	**0**	**1**	**1**	**SBAS FAS Datablock Word 10**					**Block - BNR**
	12C	1	0	0	1	0	0	1	1	Indicated Angle of Attack (#1 Right)	X				
	140	1	0	0	1	0	0	1	1	Angle of Attack, Indicated (#1 Right)	X				
		1	0	0	1	0	0	1	1	Printer #1 - System Address Label				X	See Attachment 11
224	006	1	0	0	1	0	1	0	0	Indicated Angle of Attack (#2 Left)	X				
	055	**1**	**0**	**0**	**1**	**0**	**1**	**0**	**0**	**SBAS FAS Datablock Word 11**					**Block - BNR**
	12C	1	0	0	1	0	1	0	0	Indicated Angle of Attack (#2 Left)	X				
	140	1	0	0	1	0	1	0	0	Angle of Attack, Indicated (#2 Left)	X				
		1	0	0	1	0	1	0	0	Printer #2 - System Address Label				X	See Attachment 11
225	002	1	0	0	1	0	1	0	1	Min. Maneuvering Airspeed	X				
	006	1	0	0	1	0	1	0	1	Indicated Angle of Attack (#2 Right)	X				
	02B	1	0	0	1	0	1	0	1	Compensated Altitude Rate	X				
	055	**1**	**0**	**0**	**1**	**0**	**1**	**0**	**1**	**SBAS FAS Datablock Word 12**					**Block - BNR**
	056	1	0	0	1	0	1	0	1	Minimum Maneuvering Airspeed	X				
	060	1	0	0	1	0	1	0	1	Minimum Maneuvering Airspeed	X				
	12C	1	0	0	1	0	1	0	1	Indicated Angle of Attack (#2 Right)	X				
	140	1	0	0	1	0	1	0	1	Angle of Attack, Indicated (#2 Right)	X				
		1	0	0	1	0	1	0	1	HUD - System Address Label				X	See Attachment 11
226	002	1	0	0	1	0	1	1	0	Min. Op. Fuel Temp (non-conflicting)	X				
		1	0	0	1	0	1	1	0	Data Loader - System Address Label (High Speed)				X	See Attachment 11
227	019	1	0	0	1	0	1	1	1	CFDS Bite Command Summary for HFDR			X		
	03D	1	0	0	1	0	1	1	1	AVM Command	X				6-28
	053	1	0	0	1	0	1	1	1	CFDS Bite Command Summary for HFDR			X		
	07E	1	0	0	1	0	1	1	1	BITE Command Word					
	181	**1**	**0**	**0**	**1**	**0**	**1**	**1**	**1**	**Satellite Command Summary Word**	**X**				**Block - BNR**

ATTACHMENT 1-1
LABEL CODES

Code No. (Octal)	Eqpt. ID (Hex)	Transmission Order Bit Position								Parameter	Data				Notes & Cross Ref. To Tables in Att. 6
		1	2	3	4	5	6	7	8		BNR	BCD	DISC	SAL	
230	006	1	0	0	1	1	0	0	0	True Airspeed		X			6-25
	024	**1**	**0**	**0**	**1**	**1**	**0**	**0**	**0**	**UpLink VHF Frequency**		**X**			
	038	1	0	0	1	1	0	0	0	True Airspeed		X			6-25
	114	1	0	0	1	1	0	0	0	Left Outer Probes Capacitance		X			
		1	0	0	1	1	0	0	0	MCDU #4 - System Address Label				X	See Attachment 11
231	006	1	0	0	1	1	0	0	1	Total Air Temperature		X			6-25
	024	**1**	**0**	**0**	**1**	**1**	**0**	**0**	**1**	**UPLink Beacon Code**		**X**			
	038	1	0	0	1	1	0	0	1	Total Air Temperature		X			
	055	**1**	**0**	**0**	**1**	**1**	**0**	**0**	**1**	**SBAS FAS Datablock Word 13**					**Block - BNR**
	114	1	0	0	1	1	0	0	1	Inner 2 Tank Probe Capacitance		X			
		1	**0**	**0**	**1**	**1**	**0**	**0**	**1**	**SDU ORT #1**				**X**	**See Attachment 11**
232	004	1	0	0	1	1	0	1	0	Altitude Rate		X			6-25
	005	1	0	0	1	1	0	1	0	Altitude Rate		X			
	006	1	0	0	1	1	0	1	0	Altitude Rate		X			
	055	1	0	0	1	1	0	1	0	GLS Airport ID			X		
	114	1	0	0	1	1	0	1	0	Inner 4 Tank Probe Capacitance		X			
		1	**0**	**0**	**1**	**1**	**0**	**1**	**0**	**SDU ORT #2**				**X**	**SeeAttachment 11**
233	002	1	0	0	1	1	0	1	1	ACMS Information	X				6-31
	006	1	0	0	1	1	0	1	1	Static Air Temperature		X			6-25
	038	1	0	0	1	1	0	1	1	Static Air Temperature		X			6-25
	056	1	0	0	1	1	0	1	1	ACMS Information	X				
	060	1	0	0	1	1	0	1	1	ACMS Information	X				
	114	1	0	0	1	1	0	1	1	Right Outer Probe Capacitance		X			
234	002	1	0	0	1	1	1	0	0	ACMS Information	X				6-31
	006	1	0	0	1	1	1	0	0	Baro Correction (mb) #1		X			
	038	1	0	0	1	1	1	0	0	Baro Correction (mb) #1		X			
	056	1	0	0	1	1	1	0	0	ACMS Information	X				
	060	1	0	0	1	1	1	0	0	ACMS Information	X				
		1	0	0	1	1	1	0	0	EIVMU 1 - System Address Label				X	See Attachment 11
235	002	1	0	0	1	1	1	0	1	ACMS Information	X				6-31
	006	1	0	0	1	1	1	0	1	Baro Correction (ins. Hg) #1		X			6-25
	038	1	0	0	1	1	1	0	1	Baro Correction (ins. Hg) #1		X			6-25
	056	1	0	0	1	1	1	0	1	ACMS Information	X				
	060	1	0	0	1	1	1	0	1	ACMS Information	X				
	114	**1**	**0**	**0**	**1**	**1**	**1**	**0**	**1**	**Fuel Permittivity**	**X**				
		1	0	0	1	1	1	0	1	EIVMU 2 - System Address Label				X	See Attachment 11
236	002	1	0	0	1	1	1	1	0	ACMS Information	X				6-31
	006	1	0	0	1	1	1	1	0	Baro Correction (mb) #2		X			
	038	1	0	0	1	1	1	1	0	Baro Correction (mb) #2		X			
	056	1	0	0	1	1	1	1	0	ACMS Information	X				
	060	1	0	0	1	1	1	1	0	ACMS Information	X				
		1	0	0	1	1	1	1	0	EIVMU 3 - System Address Label				X	See Attachment 11
237	002	1	0	0	1	1	1	1	1	ACMS Information	X				
	006	1	0	0	1	1	1	1	1	Baro Correction (ins. Hg) #2		X			
	00B	1	0	0	1	1	1	1	1	Horizontal Uncertainty Level	X				
	024	**1**	**0**	**0**	**1**	**1**	**1**	**1**	**1**	**UpLink HF Frequency**		**X**			
	038	1	0	0	1	1	1	1	1	Baro Correction (ins. Hg) #2		X			
	056	1	0	0	1	1	1	1	1	ACMS Information	X				
	060	1	0	0	1	1	1	1	1	ACMS Information	X				
		1	0	0	1	1	1	1	1	EIVMU 4 - System Address Label				X	See Attachment 11
240	**055**	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**Selected Glide Path Angle**	**X**				
	0	1	0	1	0	0	0	0	0	Spare					
241	002	1	0	1	0	0	0	0	1	Min. Airspeed for Flap Extension	X				
	006	1	0	1	0	0	0	0	1	Corrected Angle of Attack	X				
	02C	1	0	1	0	0	0	0	1	Reserved (Special Use)			X		
	038	1	0	1	0	0	0	0	1	Corrected Angle of Attack	X				
	04D	1	0	1	0	0	0	0	1	FQIS System Data	X				6-35
	055	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**1**	**Threshold Crossing Height**	**X**				
	056	1	0	1	0	0	0	0	1	Min. Airspeed for Flap Extension	X				
	060	1	0	1	0	0	0	0	1	Min. Airspeed for Flap Extension	X				
	140	1	0	1	0	0	0	0	1	Angle of Attack, Corrected	X				
	160	1	0	1	0	0	0	0	1	Tank Unit Data	X				6-38
		1	0	1	0	0	0	0	1	APM-MMR - System Address Label				X	See Attachment 11
242	006	1	0	1	0	0	0	1	0	Total Pressure	X				
	009	1	0	1	0	0	0	1	0	Ground Station ID (Word #1)			X		
	010	1	0	1	0	0	0	1	0	Ground Station ID (Word #1)			X		
	011	1	0	1	0	0	0	1	0	Ground Station ID (Word #1)			X		
	055	**1**	**0**	**1**	**0**	**0**	**0**	**1**	**0**	**SBAS FAS Datablock Word 14**					**Block - BNR**

ATTACHMENT 1-1
LABEL CODES

Code No. (Octal)	Eqpt. ID (Hex)	Transmission Order Bit Position 1	2	3	4	5	6	7	8	Parameter	Data BNR	BCD	DISC	SAL	Notes & Cross Ref. To Tables in Att. 6
	112	1	0	1	0	0	0	1	0	Ground Station ID (Word #1)			X		
	01A	1	0	1	0	0	0	1	0	Total Pressure	X				
	038	1	0	1	0	0	0	1	0	Total Pressure	X				
	03B	1	0	1	0	0	0	1	0	Speed Deviation	X				
	0AD	1	0	1	0	0	0	1	0	Total Pressure, Uncorrected, mb	X				
	140	1	0	1	0	0	0	1	0	Total Pressure	X				
		1	0	1	0	0	0	1	0	MMR - System Address Label				X	See Attachment 11
243	037	1	0	1	0	0	0	1	1	Zero Fuel Weight (kg)		X			
	055	1	0	1	0	0	0	1	1	GLS Runway Selection			X		
	XXX	1	0	1	0	0	0	1	1	Simulator to Avionics Control Word	X				Note 1
244	009	1	0	1	0	0	1	0	0	Ground Station ID (Word #2)			X		
	010	1	0	1	0	0	1	0	0	Ground Station ID (Word #2)			X		
	011	1	0	1	0	0	1	0	0	VOR Ground Station Ident Word #2			X		
	012	1	0	1	0	0	1	0	0	Ground Station ID (Word #2)			X		
	01C	1	0	1	0	0	1	0	0	Fuel Flow (Engine Direct)	X				
	033	1	0	1	0	0	1	0	0	Fuel Flow (Wf)	X				
	03B	1	0	1	0	0	1	0	0	Mach Error	X				
	055	**1**	**0**	**1**	**0**	**0**	**1**	**0**	**0**	**SBAS FAS Datablock Word 15**					**Block - BNR**
	08D	1	0	1	0	0	1	0	0	Fuel Flow Rate	X				
	10A	1	0	1	0	0	1	0	0	Fuel Mass Flow	X				
	10B	1	0	1	0	0	1	0	0	Fuel Mass Flow	X				
	140	1	0	1	0	0	1	0	0	Angle of Attack, Normalized	X				
		1	0	1	0	0	1	0	0	ILS - System Address Label				X	See Attachment 11
245	002	1	0	1	0	0	1	0	1	Minimum Airspeed	X				
	003	1	0	1	0	0	1	0	1	Minimum Airspeed	X				
	00A	1	0	1	0	0	1	0	1	Minimum Airspeed	X				
	029	1	0	1	0	0	1	0	1	N3 (Engine)	X				
	038	1	0	1	0	0	1	0	1	Average Static Pressure mb, Uncorrected	X				
	03B	1	0	1	0	0	1	0	1	EPR Error	X				
	055	**1**	**0**	**1**	**0**	**0**	**1**	**0**	**1**	**FTP to GARP Distance**	**X**				
	056	1	0	1	0	0	1	0	1	Minimum Airspeed	X				
	060	1	0	1	0	0	1	0	1	Minimum Airspeed	X				
	0AD	1	0	1	0	0	1	0	1	Average Static Pressure mb, Uncorrected	X				
	140	1	0	1	0	0	1	0	1	Static Pressure, Uncorrected	X				
		1	0	1	0	0	1	0	1	MLS - System Address Label				X	See Attachment 11
246	002	1	0	1	0	0	1	1	0	General Maximum Speed (VCMAX)	X				
	006	1	0	1	0	0	1	1	0	Average Static Pressure	X				
	009	1	0	1	0	0	1	1	0	DME Ground Station Ident Word #1			X		
	01C	1	0	1	0	0	1	1	0	N1 (Engine Direct)	X				
	029	1	0	1	0	0	1	1	0	N1 (Engine Direct)	X				
	038	1	0	1	0	0	1	1	0	Average Static Pressure mb, Corrected	X				
	03B	1	0	1	0	0	1	1	0	Angle of Attack Error	X				
	055	**1**	**0**	**1**	**0**	**0**	**1**	**1**	**0**	**SBAS FAS Datablock Word 16**					**Block - BNR**
		1	0	1	0	0	1	1	0	AHRS - System Address Label				X	See Attachment 11
247	002	1	0	1	0	0	1	1	1	Control Minimum Speed (VCMIN)	X				
	009	1	0	1	0	0	1	1	1	DME Ground Station Ident Word #1			X		
	00B	1	0	1	0	0	1	1	1	Horizontal Figure of Merit	X				
	01F	1	0	1	0	0	1	1	1	Total Fuel	X				
	02C	1	0	1	0	0	1	1	1	Total Fuel	X				
	03B	1	0	1	0	0	1	1	1	Speed Error	X				
	04D	1	0	1	0	0	1	1	1	Total Fuel	X				
	056	1	0	1	0	0	1	1	1	Control Minimum Speed (VCMIN)	X				
	05A	1	0	1	0	0	1	1	1	Total Fuel	X				
	060	1	0	1	0	0	1	1	1	Control Minimum Speed (VCMIN)	X				
	0EB	1	0	1	0	0	1	1	1	Fuel to Remain	X				
	114	1	0	1	0	0	1	1	1	Fuel on Board	X				
	140	1	0	1	0	0	1	1	1	Airspeed Minimum Vmc	X				
		1	0	1	0	0	1	1	1	High-Speed Data Unit #1 (HSDU #1) - SAL				X	See Attachment 11
250	002	1	0	1	0	1	0	0	0	Continuous N1 Limit	X				
	02B	1	0	1	0	1	0	0	0	Maximum Continuous EPR Limit	X				
	02C	1	0	1	0	1	0	0	0	Preselected Fuel Quantity	X				
	038	1	0	1	0	1	0	0	0	Indicated Side Slip Angle	X				
	055	**1**	**0**	**1**	**0**	**1**	**0**	**0**	**0**	**Unflagged Horizontal Deviation Rectilinear**	**X**				
	05A	1	0	1	0	1	0	0	0	Preselected Fuel Quantity	X				
	0AD	1	0	1	0	1	0	0	0	Indicated Side Slip Angle or AOS	X				
	114	1	0	1	0	1	0	0	0	Preselected Fuel Quantity	X				
	12B	1	0	1	0	1	0	0	0	Temperature Rate of Change	X				
		1	0	1	0	1	0	0	0	High-Speed Data Unit #1 (HSDU #2) - SAL				X	See Attachment 11

ATTACHMENT 1-1
LABEL CODES

Code No. (Octal)	Eqpt. ID (Hex)	Transmission Order Bit Position								Parameter	Data				Notes & Cross Ref. To Tables in Att. 6
		1	2	3	4	5	6	7	8		BNR	BCD	DISC	SAL	
251	001	1	0	1	0	1	0	0	1	Distance to Go	X				
	002	1	0	1	0	1	0	0	1	Distance to Go	X				
	006	1	0	1	0	1	0	0	1	Baro Corrected Altitude #3	X				
	055	**1**	**0**	**1**	**0**	**1**	**0**	**0**	**1**	**Unflagged Vertical Deviation Rectilinear**	**X**				
	01A	1	0	1	0	1	0	0	1	Flight Leg Counter	X				6-19
	038	1	0	1	0	1	0	0	1	Baro Corrected Altitude #3	X				
		1	0	1	0	1	0	0	1	VDR #1 - System Address Label				X	See Attachment 11
252	001	1	0	1	0	1	0	1	0	Time to Go	X				
	002	1	0	1	0	1	0	1	0	Time to Go	X				
	006	1	0	1	0	1	0	1	0	Baro Corrected Altitude #4	X				
	01A	1	0	1	0	1	0	1	0	EPR Idle	X				
	02F	1	0	1	0	1	0	1	0	EPR Idle Reference	X				
	038	1	0	1	0	1	0	1	0	Baro Corrected Altitude #4	X				
	03F	1	0	1	0	1	0	1	0	EPR Idle Reference	X				
	0EB	1	0	1	0	1	0	1	0	Time Until Jettison Complete	X				
	114	**1**	**0**	**1**	**0**	**1**	**0**	**1**	**0**	**Right Inner Tank Forward Fuel Quantity**	**X**				
		1	0	1	0	1	0	1	0	VDR #2 - System Address Label				X	See Attachment 11
253	002	1	0	1	0	1	0	1	1	Go-Around N1 Limit	X				
	01E	1	0	1	0	1	0	1	1	Go-Around EPR Limit	X				
	038	1	0	1	0	1	0	1	1	Corrected Side Slip Angle	X				
	114	**1**	**0**	**1**	**0**	**1**	**0**	**1**	**1**	**Right Inner Tank AFT Fuel Quantity**	**X**				
		1	0	1	0	1	0	1	1	VDR #3 - System Address Label				X	See Attachment 11
254	002	1	0	1	0	1	1	0	0	Cruise N1 Limit	X				
	012	1	0	1	0	1	1	0	0	ADF Ground Station Ident Word #1			X		
	01E	1	0	1	0	1	1	0	0	Cruise EPR Limit	X				
	04D	1	0	1	0	1	1	0	0	Actual Fuel Quantity (test)	X				
	055	1	0	1	0	1	1	0	0	GBAS ID			X		
	114	**1**	**0**	**1**	**0**	**1**	**1**	**0**	**0**	**Left Inner Tank Forward Fuel Quantity**	**X**				
	13A	1	0	1	0	1	1	0	0	N1 Cruise	X				
	140	1	0	1	0	1	1	0	0	Altitude Rate	X				
		1	0	1	0	1	1	0	0	Network Server System (NSS) - System Address Label				X	See Attachment 11
255	002	1	0	1	0	1	1	0	1	Climb N1 Limit	X				
	012	1	0	1	0	1	1	0	1	ADF Ground Station Ident Word #2			X		
	01E	1	0	1	0	1	1	0	1	Climb EPR Limit	X				
	02F	1	0	1	0	1	1	0	1	Max. Climb EPR Rating	X				
	03F	1	0	1	0	1	1	0	1	Max. Climb EPR Rating	X				
	04D	1	0	1	0	1	1	0	1	Fuel Quantity (gal)	X				
	055	1	0	1	0	1	1	0	1	GBAS ID/ Airport ID			X		
	08E	1	0	1	0	1	1	0	1	Spoiler Position	X				
	114	**1**	**0**	**1**	**0**	**1**	**1**	**0**	**1**	**Left Inner Tank AFT Fuel Quantity**	**X**				
	13A	1	0	1	0	1	1	0	1	N1 Climb	X				
	140	1	0	1	0	1	1	0	1	Impact Pressure	X				
		1	0	1	0	1	1	0	1	Electronic Flight Bag - Left - System Address Label				X	See Attachment 11
256	002	1	0	1	0	1	1	1	0	Time for Climb	X				
	00A	1	0	1	0	1	1	1	0	V Stick Shaker	X				
	027	1	0	1	0	1	1	1	0	MLS Ground Station Ident Word #1			X		
	02C	1	0	1	0	1	1	1	0	Fuel Quantity (Tanks) #1	X				
	04D	1	0	1	0	1	1	1	0	Fuel Discretes			X		
	055	1	0	1	0	1	1	1	0	MLS Station ID #1			X		
	056	1	0	1	0	1	1	1	0	Time for Climb	X				
	05A	1	0	1	0	1	1	1	0	Fuel Quantity - Left Outer Cell	X				
	060	1	0	1	0	1	1	1	0	Time for Climb	X				
	114	1	0	1	0	1	1	1	0	Left Outer Tank Fuel Quantity	X				
	140	1	0	1	0	1	1	1	0	Equivalent Airspeed	X				
		1	0	1	0	1	1	1	0	Electronic Flight Bag -Right - System Address Label					See Attachment 11
257	002	1	0	1	0	1	1	1	1	Time for Descent	X				
	027	1	0	1	0	1	1	1	1	MLS Ground Station Ident Word #2			X		
	02C	1	0	1	0	1	1	1	1	Fuel Quantity (Tanks) #2	X				
	055	1	0	1	0	1	1	1	1	MLS Station ID #2					
	056	1	0	1	0	1	1	1	1	Time for Descent	X				
	05A	1	0	1	0	1	1	1	1	Fuel Quantity Left W/T Tank	X				
	060	1	0	1	0	1	1	1	1	Time for Descent	X				
	114	1	0	1	0	1	1	1	1	Inner Tank 1 Fuel Quantity	X				
	140	1	0	1	0	1	1	1	1	Total Pressure (High Range)	X				

ATTACHMENT 1-1
LABEL CODES

Code No. (Octal)	Eqpt. ID (Hex)	Transmission Order Bit Position								Parameter	Data				Notes & Cross Ref. To Tables in Att. 6
		1	2	3	4	5	6	7	8		BNR	BCD	DISC	SAL	
260	002	1	0	1	1	0	0	0	0	Date/Flight Leg		X			6-8
	00B	1	0	1	1	0	0	0	0	Date		X			
	02C	1	0	1	1	0	0	0	0	Fuel Quantity (Tanks) #3	X				
	031	1	0	1	1	0	0	0	0	Date (No Flight Leg)		X			6-18
	033	1	0	1	1	0	0	0	0	T5	X				
	056	1	0	1	1	0	0	0	0	Date/Flight Leg		X			
	05A	1	0	1	1	0	0	0	0	Fuel Quantity Center Tank	X				
	060	1	0	1	1	0	0	0	0	Date/Flight Leg		X			6-8
	0A2	1	0	1	1	0	0	0	0	Date/Flight Leg		X			6-8
	10A	1	0	1	1	0	0	0	0	LP Turbine Discharge Temperature	X				
	10B	1	0	1	1	0	0	0	0	LP Turbine Discharge Temperature	X				
	114	1	0	1	1	0	0	0	0	Collector Cell 1 and 2 Fuel Quantity	X				
261	002	1	0	1	1	0	0	0	1	Flight Number		X			6-9
	02C	1	0	1	1	0	0	0	1	Fuel Quantity (Tanks) #4	X				
	033	1	0	1	1	0	0	0	1	P49	X				
	056	1	0	1	1	0	0	0	1	Flight Number (BCD)		X			
	05A	1	0	1	1	0	0	0	1	Fuel Quantity Right I/C or W/T Tank	X				
	060	1	0	1	1	0	0	0	1	Flight Number (BCD)		X			
	0A2	1	0	1	1	0	0	0	1	Flight Number		X			6-9
	10A	1	0	1	1	0	0	0	1	LP Turbine Inlet Pressure	X				
	10B	1	0	1	1	0	0	0	1	LP Turbine Inlet Pressure	X				
	114	1	0	1	1	0	0	0	1	Fuel On Board At Engine Start	X				
	144	1	0	1	1	0	0	0	1	Range Ring Radius	X				6-52
262	002	1	0	1	1	0	0	1	0	Documentary Data	X				6-14
	00A	1	0	1	1	0	0	1	0	Predictive Airspeed Variation	X				
	01C	1	0	1	1	0	0	1	0	LP Compressor Exist Pressure (PT3)	X				
	02C	1	0	1	1	0	0	1	0	Fuel Quantity (Tanks) #5	X				
	033	1	0	1	1	0	0	1	0	LP Compressor Exist Pressure	X				
	04D	1	0	1	1	0	0	1	0	T/U CAP-L Tank 1-4	X				
	056	1	0	1	1	0	0	1	0	Documentary Data	X				
	05A	1	0	1	1	0	0	1	0	Fuel Quantity - Right Outer Cell	X				
	060	1	0	1	1	0	0	1	0	Documentary Data	X				
	10A	1	0	1	1	0	0	1	0	HP Compressor Inlet Total Pressure	X				
	10B	1	0	1	1	0	0	1	0	HP Compressor Inlet Total Pressure	X				
	114	1	0	1	1	0	0	1	0	Center Tank Fuel Quantity	X				
	144	1	0	1	1	0	0	1	0	Display Range	X				6-51
263	002	1	0	1	1	0	0	1	1	Minimum Airspeed for Flap Retraction	X				
	00A	1	0	1	1	0	0	1	1	Minimum Airspeed for Flap Retraction	X				
	010	1	0	1	1	0	0	1	1	ILS Ground Station Ident Word #1			X		
	01C	1	0	1	1	0	0	1	1	LP Compressor Exit Temperature	X				
	02C	1	0	1	1	0	0	1	1	Fuel Quantity (Tanks) #6	X				
	033	1	0	1	1	0	0	1	1	LP Compressor Exit Temperature	X				
	04D	1	0	1	1	0	0	1	1	T/U CAP-L Tank 5-8	X				
	055	1	0	1	1	0	0	1	1	Ground Station/Approach			X		
	056	1	0	1	1	0	0	1	1	Minimum Airspeed For Flap Retraction	X				
	060	1	0	1	1	0	0	1	1	Minimum Airspeed For Flap Retraction	X				
	10A	1	0	1	1	0	0	1	1	Selected Compressor Inlet Temperature (Total)	X				
	10B	1	0	1	1	0	0	1	1	Selected Compressor Inlet Temperature (Total)	X				
	114	1	0	1	1	0	0	1	1	Collector Cell 3 and 4 Fuel Quantity	X				
264	002	1	0	1	1	0	1	0	0	Time to Touchdown	X				
	00A	1	0	1	1	0	1	0	0	Minimum Airspeed for Slats Retraction	X				
	010	1	0	1	1	0	1	0	0	ILS Ground Station Ident Word #2			X		
	01C	1	0	1	1	0	1	0	0	HP Compressor Exit Pressure	X				
	02C	1	0	1	1	0	1	0	0	Fuel Quantity (Tanks) #7	X				
	02F	1	0	1	1	0	1	0	0	Burner Pressure	X				
	033	1	0	1	1	0	1	0	0	HP Compressor Exit Pressure	X				
	03F	1	0	1	1	0	1	0	0	Burner Pressure	X				
	04D	1	0	1	1	0	1	0	0	T/U CAP-L Tank 9-12	X				
	055	1	0	1	1	0	1	0	0	Ground Station/Approach			X		
	056	1	0	1	1	0	1	0	0	Time to Touchdown	X				
	060	1	0	1	1	0	1	0	0	Time to Touchdown	X				
	10A	1	0	1	1	0	1	0	0	Selected Compressor Discharge Temperature	X				
	10B	1	0	1	1	0	1	0	0	Selected Compressor Discharge Temperature	X				
	114	1	0	1	1	0	1	0	0	Fuel Quantity (Tanks) #7	X				
	13A	1	0	1	1	0	1	0	0	Burner Pressure	X				
265	002	1	0	1	1	0	1	0	1	Minimum Buffet Airspeed	X				
	004	1	0	1	1	0	1	0	1	Integrated Vertical Acceleration	X				
	00A	1	0	1	1	0	1	0	1	Maneuvering Airspeed	X				
	01C	1	0	1	1	0	1	0	1	HP Compressor Exit Temperature (TT4.5)	X				
	02C	1	0	1	1	0	1	0	1	Fuel Quantity (Tanks) #8	X				

ATTACHMENT 1-1
LABEL CODES

Code No. (Octal)	Eqpt. ID (Hex)	Transmission Order Bit Position								Parameter	Data				Notes & Cross Ref. To Tables in Att. 6
		1	2	3	4	5	6	7	8		BNR	BCD	DISC	SAL	
	033	1	0	1	1	0	1	0	1	HP Compressor Exit Temperature	X				
	038	1	0	1	1	0	1	0	1	Integrated Vertical Acceleration	X				
	04D	1	0	1	1	0	1	0	1	T/U CAP-L Tank 13-14	X				
	056	1	0	1	1	0	1	0	1	Minimum Buffet Airspeed	X				
	060	1	0	1	1	0	1	0	1	Minimum Buffet Airspeed	X				
	10A	1	0	1	1	0	1	0	1	Selected Compressor Discharge Temperature	X				
	10B	1	0	1	1	0	1	0	1	Selected Compressor Discharge Temperature	X				
	114	1	0	1	1	0	1	0	1	Inner Tank 3 Fuel Quantity	X				
266	001	1	0	1	1	0	1	1	0	Test Word B			X		
	01D	1	0	1	1	0	1	1	0	Test Word B			X		
	04D	1	0	1	1	0	1	1	0	T/U CAP-C Tank 1-4	X				
	114	1	0	1	1	0	1	1	0	Inner Tank 2 Fuel Quantity	X				
		1	0	1	1	0	1	1	0	Cabin Video System - System Address Label				X	See Attachment 11
267	002	1	0	1	1	0	1	1	1	Maximum Maneuver Airspeed	X				
	00A	1	0	1	1	0	1	1	1	Predictive Maximum Maneuver Speed	X				
	02B	1	0	1	1	0	1	1	1	Throttle Position Command	X				
	033	1	0	1	1	0	1	1	1	Spare T/C	X				
	04D	1	0	1	1	0	1	1	1	T/U CAP-C Tank 5-8	X				
	056	1	0	1	1	0	1	1	1	Maximum Maneuver Airspeed	X				
	060	1	0	1	1	0	1	1	1	Maximum Maneuver Airspeed	X				
	10A	1	0	1	1	0	1	1	1	HP Compressor Inlet Temperature (Total)	X				
	10B	1	0	1	1	0	1	1	1	HP Compressor Inlet Temperature (Total)	X				
	114	1	0	1	1	0	1	1	1	Inner Tank 4 Fuel Quantity	X				
270	001	1	0	1	1	1	0	0	0	Discrete Data #1			X		
	002	1	0	1	1	1	0	0	0	Discrete Data #1			X		
	004	1	0	1	1	1	0	0	0	Discrete Data #1			X		
	005	1	0	1	1	1	0	0	0	Discrete Data #1			X		
	006	1	0	1	1	1	0	0	0	Discrete Data #1			X		
	00B	1	0	1	1	1	0	0	0	Discrete Data #1			X		
	01A	1	0	1	1	1	0	0	0	Discrete Data #1			X		
	01B	1	0	1	1	1	0	0	0	Discrete Data #1			X		
	01C	1	0	1	1	1	0	0	0	Discrete Data #1			X		
	01E	1	0	1	1	1	0	0	0	Discrete Data #1			X		
	023	1	0	1	1	1	0	0	0	GPWS Discrete			X		
	024	1	0	1	1	1	0	0	0	MU Output Data Word, Communication Link Status			X		
	025	1	0	1	1	1	0	0	0	Discrete Data #1			X		
	027	1	0	1	1	1	0	0	0	Discrete Data #1			X		
	029	1	0	1	1	1	0	0	0	Discrete Data #1			X		
	02F	1	0	1	1	1	0	0	0	Discrete Data #1			X		
	031	1	0	1	1	1	0	0	0	Discrete Data #1			X		
	033	1	0	1	1	1	0	0	0	Discrete Data #1			X		
	035	1	0	1	1	1	0	0	0	Discrete Data #1			X		
	037	1	0	1	1	1	0	0	0	Discrete Data #1			X		
	038	1	0	1	1	1	0	0	0	Discrete Data #1			X		
	039	1	0	1	1	1	0	0	0	MCDU Normal Discrete Word			X		
	03A	1	0	1	1	1	0	0	0	Discrete Data #1			X		
	03B	1	0	1	1	1	0	0	0	Discrete Data #1			X		
	03D	1	0	1	1	1	0	0	0	Discrete Data #1			X		
	03E	1	0	1	1	1	0	0	0	Discrete Data #1			X		
	03F	1	0	1	1	1	0	0	0	Discrete Data #1			X		
	041	1	0	1	1	1	0	0	0	SDU To ACARS MU/CMU Status Word			X		
	04A	1	0	1	1	1	0	0	0	Discrete Data #1			X		
	04D	1	0	1	1	1	0	0	0	T/U CAP-C Tank 9	X				
	050	1	0	1	1	1	0	0	0	VDR Status Word			X		
	053	1	0	1	1	1	0	0	0	HFDL Status Word			X		
	055	1	0	1	1	1	0	0	0	MLS Discrete			X		
	056	1	0	1	1	1	0	0	0	Status Discretes			X		
	05A	1	0	1	1	1	0	0	0	Discrete Data #1			X		
	060	1	0	1	1	1	0	0	0	Intent Status			X		
	060	1	0	1	1	1	0	0	0	Status Discretes			X		
	060	1	0	1	1	1	0	0	0	Discrete Data #1			X		
	0A2	1	0	1	1	1	0	0	0	Discrete Data #1			X		
	0A8	1	0	1	1	1	0	0	0	Discrete Data #1			X		
	0AD	1	0	1	1	1	0	0	0	Discrete Data #1			X		
	0C5	1	0	1	1	1	0	0	0	Discrete Data #1			X		
	10A	1	0	1	1	1	0	0	0	Discrete Data #1			X		
	10B	1	0	1	1	1	0	0	0	Discrete Data #1			X		
	114	1	0	1	1	1	0	0	0	Unusable, and Empty Warning			X		
	115	1	0	1	1	1	0	0	0	Stored TACAN Control Word			X		
	140	1	0	1	1	1	0	0	0	Discrete Data #1			X		
	142	1	0	1	1	1	0	0	0	Aircraft Category (Disc Data 1)			X		
	144	1	0	1	1	1	0	0	0	Display Mode			X		

ATTACHMENT 1-1
LABEL CODES

Code No. (Octal)	Eqpt. ID (Hex)	Transmission Order Bit Position								Parameter	Data				Notes & Cross Ref. To Tables in Att. 6
		1	2	3	4	5	6	7	8		BNR	BCD	DISC	SAL	
271	002	1	0	1	1	1	0	0	1	Discrete Data #2			X		
	005	1	0	1	1	1	0	0	1	AHRS Discrete			X		
	006	1	0	1	1	1	0	0	1	Discrete Data #2			X		
	018	1	0	1	1	1	0	0	1	Discrete Data #2			X		
	01A	1	0	1	1	1	0	0	1	Discrete Data #2			X		
	01C	1	0	1	1	1	0	0	1	Discrete Data #2			X		
	01E	1	0	1	1	1	0	0	1	Discrete Data #2			X		
	029	1	0	1	1	1	0	0	1	Discrete Data #2			X		
	02F	1	0	1	1	1	0	0	1	Discrete Data #2			X		
	031	1	0	1	1	1	0	0	1	Discrete Data #2			X		
	033	1	0	1	1	1	0	0	1	Discrete Data #2			X		
	035	1	0	1	1	1	0	0	1	Discrete Data #2			X		
	038	1	0	1	1	1	0	0	1	Discrete Data #2			X		
	03A	1	0	1	1	1	0	0	1	Discrete Data #2			X		
	03B	1	0	1	1	1	0	0	1	Discrete Data #2			X		
	03F	1	0	1	1	1	0	0	1	Discrete Data #2			X		
	041	1	0	1	1	1	0	0	1	SDU To ACARS MU/CMU Join/Leave Message	X				
	04D	1	0	1	1	1	0	0	1	T/U CAP-A Tank 1-4	X				
	055	1	0	1	1	1	0	0	1	MMR Discrete			X		
	056	1	0	1	1	1	0	0	1	Discrete Data #2			X		
	05A	1	0	1	1	1	0	0	1	Fuel Density			X		
	060	1	0	1	1	1	0	0	1	Discrete Data #2			X		
	0A2	1	0	1	1	1	0	0	1	Discrete Data #2			X		
	0A8	1	0	1	1	1	0	0	1	Discrete Data #2			X		
	0AD	1	0	1	1	1	0	0	1	Discrete Data #2			X		
	0C5	1	0	1	1	1	0	0	1	Discrete Data #2			X		
	10A	1	0	1	1	1	0	0	1	Discrete Data #2			X		
	10B	1	0	1	1	1	0	0	1	Discrete Data #2			X		
	114	1	0	1	1	1	0	0	1	Fuel Transfer Indication			X		
	140	1	0	1	1	1	0	0	1	Discrete Data #2			X		
	142	1	0	1	1	1	0	0	1	Altitude Filter Limits (Disc Data 2)			X		
	144	1	0	1	1	1	0	0	1	Altitude Filter Setting			X		
272	001	1	0	1	1	1	0	1	0	Discrete Data #3			X		
	002	1	0	1	1	1	0	1	0	Discrete Data #3			X		
	003	1	0	1	1	1	0	1	0	Discrete Data #3			X		
	005	1	0	1	1	1	0	1	0	Air Data AHARS					
	018	1	0	1	1	1	0	1	0	Discrete Data #3			X		
	01A	1	0	1	1	1	0	1	0	Discrete Data #3					
	01C	1	0	1	1	1	0	1	0	Discrete Data #3			X		
	025	1	0	1	1	1	0	1	0	Discrete Data #3			X		
	029	1	0	1	1	1	0	1	0	Discrete Data #3			X		
	02F	1	0	1	1	1	0	1	0	Discrete Data #3			X		
	035	1	0	1	1	1	0	1	0	Discrete Data #3			X		
	038	1	0	1	1	1	0	1	0	Discrete Data #3			X		
	03A	1	0	1	1	1	0	1	0	Discrete Data #3			X		
	03B	1	0	1	1	1	0	1	0	Discrete Data #3			X		
	03F	1	0	1	1	1	0	1	0	Discrete Data #3			X		
	04D	1	0	1	1	1	0	1	0	T/U CAP-A Tank 5-8	X				
	053	1	0	1	1	1	0	1	0	HFDL Slave (Disc Data 2)			X		
	056	1	0	1	1	1	0	1	0	Discrete Data #3			X		
	05A	1	0	1	1	1	0	1	0	Fuel Density		X			
	060	1	0	1	1	1	0	1	0	Discrete Data #3			X		
	0AD	1	0	1	1	1	0	1	0	Discrete Data #3			X		
	0C5	1	0	1	1	1	0	1	0	Discrete Data #3			X		
	10A	1	0	1	1	1	0	1	0	Discrete Data #3			X		
	10B	1	0	1	1	1	0	1	0	Discrete Data #3			X		
	114	1	0	1	1	1	0	1	0	Fuel Transfer Indication			X		
	140	1	0	1	1	1	0	1	0	Discrete Data #3			X		
	144	1	0	1	1	1	0	1	0	Target Selection Word			X		
273	001	1	0	1	1	1	0	1	1	Discrete Data #4			X		
	003	1	0	1	1	1	0	1	1	Discrete Data #4			X		
	00B	1	0	1	1	1	0	1	1	GNSS Sensor Status			X		
	018	1	0	1	1	1	0	1	1	Discrete Data #4			X		
	01C	1	0	1	1	1	0	1	1	Discrete Data #4			X		
	025	1	0	1	1	1	0	1	1	Discrete Data #4			X		
	029	1	0	1	1	1	0	1	1	Discrete Data #4			X		
	02F	1	0	1	1	1	0	1	1	Discrete Data #4			X		
	033	1	0	1	1	1	0	1	1	Discrete Data #4			X		
	035	1	0	1	1	1	0	1	1	Discrete Data #4			X		
	03B	1	0	1	1	1	0	1	1	Discrete Data #4			X		
	03F	1	0	1	1	1	0	1	1	Discrete Data #4			X		
	04D	1	0	1	1	1	0	1	1	T/U CAP-A Tank 9-11	X				
	055	1	0	1	1	1	0	1	1	GNSS Sensor Status			X		
	05A	1	0	1	1	1	0	1	1	Sensor Valves Left Wing Tank		X			

ATTACHMENT 1-1
LABEL CODES

Code No. (Octal)	Eqpt. ID (Hex)	Transmission Order Bit Position								Parameter	Data				Notes & Cross Ref. To Tables in Att. 6
		1	2	3	4	5	6	7	8		BNR	BCD	DISC	SAL	
	0C5	1	0	1	1	1	0	1	1	Discrete Data #4			X		
	10A	1	0	1	1	1	0	1	1	Discrete Data #4			X		
	10B	1	0	1	1	1	0	1	1	Discrete Data #4			X		
	114	1	0	1	1	1	0	1	1	Memos and Status			X		
274	001	1	0	1	1	1	1	0	0	Discrete Data #5			X		
	003	1	0	1	1	1	1	0	0	Discrete Data #5			X		
	00A	1	0	1	1	1	1	0	0	Discrete Data #5			X		
	018	1	0	1	1	1	1	0	0	Discrete Data #5			X		
	01C	1	0	1	1	1	1	0	0	Discrete Data #5			X		
	025	1	0	1	1	1	1	0	0	Discrete Data #5			X		
	029	1	0	1	1	1	1	0	0	Discrete Data #5			X		
	02F	1	0	1	1	1	1	0	0	Discrete Data #5			X		
	033	1	0	1	1	1	1	0	0	Discrete Data #5			X		
	035	1	0	1	1	1	1	0	0	Discrete Data #5			X		
	03B	1	0	1	1	1	1	0	0	Discrete Data #5			X		
	03F	1	0	1	1	1	1	0	0	Discrete Data #5			X		
	04D	1	0	1	1	1	1	0	0	T/U CAP-R Tank 1-4	X				
	055	**1**	**0**	**1**	**1**	**1**	**1**	**0**	**0**	**GLS Status**			**X**		
	05A	1	0	1	1	1	1	0	0	Sensor Valves Center Wing Tank		X			
	0C5	1	0	1	1	1	1	0	0	Discrete Data #5			X		
	10A	1	0	1	1	1	1	0	0	Discrete Data #5			X		
	10B	1	0	1	1	1	1	0	0	Discrete Data #5			X		
	114	1	0	1	1	1	1	0	0	Fuel Transfer Indications			X		
275	001	1	0	1	1	1	1	0	1	Discrete Data #6			X		
	002	1	0	1	1	1	1	0	1	Discrete Data #6			X		
	003	1	0	1	1	1	1	0	1	Discrete Data #6			X		
	018	1	0	1	1	1	1	0	1	Discrete Data #6			X		
	01C	1	0	1	1	1	1	0	1	Discrete Data #6			X		
	025	1	0	1	1	1	1	0	1	Discrete Data #6			X		
	029	1	0	1	1	1	1	0	1	Discrete Data #6			X		
	02B	1	0	1	1	1	1	0	1	Discrete Data #6			X		
	02F	1	0	1	1	1	1	0	1	Discrete Data #6			X		
	035	1	0	1	1	1	1	0	1	Discrete Data #6			X		
	038	1	0	1	1	1	1	0	1	IR Discrete Word #2			X		
	03B	1	0	1	1	1	1	0	1	Discrete Data #6			X		
	03F	1	0	1	1	1	1	0	1	Discrete Data #6			X		
	04A	1	0	1	1	1	1	0	1	T/U CAP-R Tank 5-8	X				
	04D	1	0	1	1	1	1	0	1	Discrete Data #6			X		
	055	**1**	**0**	**1**	**1**	**1**	**1**	**0**	**1**	**DGPS Status**			**X**		
	05A	1	0	1	1	1	1	0	1	Sensor Valves Right Wing Tank		X			
	056	1	0	1	1	1	1	0	1	Discrete Data #6			X		
	060	1	0	1	1	1	1	0	1	Discrete Data #6			X		
	10A	1	0	1	1	1	1	0	1	Discrete Data #6			X		
	10B	1	0	1	1	1	1	0	1	Discrete Data #6			X		
	114	1	0	1	1	1	1	0	1	Miscellaneous Warning			X		
276	002	1	0	1	1	1	1	1	0	Discrete Data #7			X		
	018	1	0	1	1	1	1	1	0	Discrete Data #7			X		
	01C	1	0	1	1	1	1	1	0	Discrete Data #7			X		
	025	1	0	1	1	1	1	1	0	Discrete Status 8 EFIS			X		
	029	1	0	1	1	1	1	1	0	Discrete Data #7			X		
	02F	1	0	1	1	1	1	1	0	Discrete Data #7			X		
	03F	1	0	1	1	1	1	1	0	Discrete Data #7			X		
	04D	1	0	1	1	1	1	1	0	T/U CAP-R Tank 9-12	X				
	050	1	0	1	1	1	1	1	0	VDR Mode			X		
	055	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**0**	**Selected/Achieved GBAS Approach Service Type**			**X**		
	056	1	0	1	1	1	1	1	0	Discrete Data #7			X		
	058	1	0	1	1	1	1	1	0	Output Status Word #2			X		
	05A	1	0	1	1	1	1	1	0	Discrete Data #7			X		
	060	1	0	1	1	1	1	1	0	Discrete Data #7			X		
	0BB	1	0	1	1	1	1	1	0	Discrete Data #7			X		
	114	1	0	1	1	1	1	1	0	Discrete Data #7			X		
	001	1	0	1	1	1	1	1	0	FCC to Simulator Control Word - Simulator Use Only	X				
	002	1	0	1	1	1	1	1	0	FMC to Simulator Control Word - Simulator Use Only	X				
	003	1	0	1	1	1	1	1	0	TCC to Simulator Control Word - Simulator Use Only	X				
277	XXX	1	0	1	1	1	1	1	1	General Test Word			X		Note 1
	004	1	0	1	1	1	1	1	1	IRS Maintenance Discrete			X		
	018	1	0	1	1	1	1	1	1	Discrete Data #8			X		
	038	1	0	1	1	1	1	1	1	IR Test			X		
	04D	1	0	1	1	1	1	1	1	T/U CAP-R Tank 13-14	X				

ATTACHMENT 1-1
LABEL CODES

Code No. (Octal)	Eqpt. ID (Hex)	Transmission Order Bit Position								Parameter	Data				Notes & Cross Ref. To Tables in Att. 6
		1	2	3	4	5	6	7	8		BNR	BCD	DISC	SAL	
	114	1	0	1	1	1	1	1	1	Fuel Transfer and CG Status			X		
300	001	1	1	0	0	0	0	0	0	Application Dependent			X		
	01A	1	1	0	0	0	0	0	0	Application Dependent			X		
	03D	1	1	0	0	0	0	0	0	Application Dependent			X		
	055	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**Data Load Address**			**X**		
	05A	1	1	0	0	0	0	0	0	Internal Parameter for SPATIAAL	X				
	10A	1	1	0	0	0	0	0	0	ECU Internal Temperature	X				
	10B	1	1	0	0	0	0	0	0	ECU Internal Temperature	X				
	TBD	1	1	0	0	0	0	0	0	Data Loader Address Label (Low Speed)			X		
		1	1	0	0	0	0	0	0	FMC 1 - System Address Label				X	See Attachment 11
301	001	1	1	0	0	0	0	0	1	Application Dependent			X		
	002	1	1	0	0	0	0	0	1	Application Dependent			X		
	01A	1	1	0	0	0	0	0	1	Application Dependent			X		
	056	1	1	0	0	0	0	0	1	Application Dependent			X		
	05A	1	1	0	0	0	0	0	1	Internal Parameter for SPATIAAL	X				
	060	1	1	0	0	0	0	0	1	Application Dependent			X		
	10A	1	1	0	0	0	0	0	1	Demanded Fuel Metering Valve Position	X				
	10B	1	1	0	0	0	0	0	1	Demanded Fuel Metering Valve Position	X				
		1	1	0	0	0	0	0	1	FMC 2 - System Address Label				X	See Attachment 11
302	001	1	1	0	0	0	0	1	0	Application Dependent			X		
	002	1	1	0	0	0	0	1	0	Application Dependent			X		
	01A	1	1	0	0	0	0	1	0	Application Dependent			X		
	056	1	1	0	0	0	0	1	0	Application Dependent			X		
	05A	1	1	0	0	0	0	1	0	Internal Parameter for SPATIAAL	X				
	060	1	1	0	0	0	0	1	0	Application Dependent			X		
	10A	1	1	0	0	0	0	1	0	Demanded Variable Stator Vane Position	X				
	10B	1	1	0	0	0	0	1	0	Demanded Variable Stator Vane Position	X				
		1	1	0	0	0	0	1	0	AIDS (DFDAU) - System Address Label				X	See Attachment 11
303	001	1	1	0	0	0	0	1	1	Application Dependent			X		
	002	1	1	0	0	0	0	1	1	Application Dependent			X		
	01A	1	1	0	0	0	0	1	1	Application Dependent			X		
	056	1	1	0	0	0	0	1	1	Application Dependent			X		
	05A	1	1	0	0	0	0	1	1	Internal Parameter for SPATIAAL	X				
	060	1	1	0	0	0	0	1	1	Application Dependent			X		
	10A	1	1	0	0	0	0	1	1	Demanded Variable Bleed Valve Position	X				
	10B	1	1	0	0	0	0	1	1	Demanded Variable Bleed Valve Position	X				
		1	1	0	0	0	0	1	1	CFDIU - System Address Label				X	See attachment 11
304	001	1	1	0	0	0	1	0	0	Application Dependent			X		
	01A	1	1	0	0	0	1	0	0	Application Dependent			X		
	05A	1	1	0	0	0	1	0	0	Internal Parameter for SPATIAAL	X				
	10A	1	1	0	0	0	1	0	0	Demanded HPT Clearance Valve Position	X				
	10B	1	1	0	0	0	1	0	0	Demanded HPT Clearance Valve Position	X				
		1	1	0	0	0	1	0	0	ACARS - System Address Label				X	See Attachment 11
305	001	1	1	0	0	0	1	0	1	Application Dependent			X		
	01A	1	1	0	0	0	1	0	1	Application Dependent			X		
	05A	1	1	0	0	0	1	0	1	Internal Parameter for SPATIAAL	X				
	10A	1	1	0	0	0	1	0	1	Demanded LPT Clearance Valve Position	X				
	10B	1	1	0	0	0	1	0	1	Demanded LPT Clearance Valve Position	X				
		1	1	0	0	0	1	0	1	Weight/Balance System - System Address Label				X	See Attachment 11
306	001	1	1	0	0	0	1	1	0	Application Dependent			X		
	01A	1	1	0	0	0	1	1	0	Application Dependent			X		
	05A	1	1	0	0	0	1	1	0	Internal Parameter for SPATIAAL	X				
		1	1	0	0	0	1	1	0	TCAS - System Address Label				X	See Attachment 11
307	001	1	1	0	0	0	1	1	1	Application Dependent			X		
	01A	1	1	0	0	0	1	1	1	Application Dependent			X		
	05A	1	1	0	0	0	1	1	1	Internal Parameter for SPATIAAL	X				
		1	1	0	0	0	1	1	1	Satellite Data Unit (SDU) - System Address Label				X	See Attachment 11
310	002	1	1	0	0	1	0	0	0	Present Position - Latitude	X				6-27
	004	1	1	0	0	1	0	0	0	Present Position - Latitude	X				
	029	1	1	0	0	1	0	0	0	Aileron Position	X				
	038	1	1	0	0	1	0	0	0	Present Position - Latitude	X				
	04D	1	1	0	0	1	0	0	0	COMP CAP - TANK	X				
	056	1	1	0	0	1	0	0	0	Present Position Latitude	X				
	05A	1	1	0	0	1	0	0	0	Internal Parameter for SPATIAAL	X				
	060	1	1	0	0	1	0	0	0	Present Position Latitude	X				
	114	1	1	0	0	1	0	0	0	Right Outer Tank Fuel Quantity	X				

ATTACHMENT 1-1
LABEL CODES

Code No. (Octal)	Eqpt. ID (Hex)	Transmission Order Bit Position								Parameter	Data				Notes & Cross Ref. To Tables in Att. 6
		1	2	3	4	5	6	7	8		BNR	BCD	DISC	SAL	
		1	1	0	0	1	0	0	0	GPWS - System Address Label				X	See Attachment 11
311	002	1	1	0	0	1	0	0	1	Present Position - Longitude	X				6-27
	004	1	1	0	0	1	0	0	1	Present Position - Longitude	X				
	029	1	1	0	0	1	0	0	1	Aileron Trim	X				
	038	1	1	0	0	1	0	0	1	Present Position - Longitude	X				
	03B	1	1	0	0	1	0	0	1	Control Wheel Roll Force	X				
	056	1	1	0	0	1	0	0	1	Present Position Longitude	X				
	05A	1	1	0	0	1	0	0	1	Internal Parameter for SPATIAAL	X				
	060	1	1	0	0	1	0	0	1	Present Position Longitude	X				
	114	1	1	0	0	1	0	0	1	Right Outer Tank Fuel Quantity	X				
		1	1	0	0	1	0	0	1	GNLU 1 - System Address Label				X	See Attachment 11
312	002	1	1	0	0	1	0	1	0	Ground Speed	X				6-27
	004	1	1	0	0	1	0	1	0	Ground Speed	X				
	005	1	1	0	0	1	0	1	0	Ground Speed	X				
	029	1	1	0	0	1	0	1	0	Rudder Position	X				
	038	1	1	0	0	1	0	1	0	Ground Speed	X				
	056	1	1	0	0	1	0	1	0	Ground Speed	X				
	05A	1	1	0	0	1	0	1	0	Fuel Quantity ACT 1	X				
	060	1	1	0	0	1	0	1	0	Ground Speed	X				
	114	1	1	0	0	1	0	1	0	Additional Center Tank (Act 1) Fuel Quantity	X				
		1	1	0	0	1	0	1	0	GNLU 2 - System Address Label				X	See Attachment 11
313	002	1	1	0	0	1	0	1	1	Track Angle - True	X				
	004	1	1	0	0	1	0	1	1	Track Angle - True	X				
	025	1	1	0	0	1	0	1	1	Track Angle - True	X				
	029	1	1	0	0	1	0	1	1	Rudder Trim	X				
	038	1	1	0	0	1	0	1	1	Track Angle - True	X				
	056	1	1	0	0	1	0	1	1	Track Angle - True	X				
	05A	1	1	0	0	1	0	1	1	Fuel Quantity ACT 2	X				
	060	1	1	0	0	1	0	1	1	Track Angle - True	X				
	114	1	1	0	0	1	0	1	1	Additional Center Tank (Act 2) Fuel Quantity	X				
		1	1	0	0	1	0	1	1	GNLU 3 - System Address Label				X	See Attachment 11
314	002	1	1	0	0	1	1	0	0	Stabilizer Position Indication (B747-400)	X				
	004	1	1	0	0	1	1	0	0	True Heading	X				
	025	1	1	0	0	1	1	0	0	True Heading	X				
	029	1	1	0	0	1	1	0	0	Elevator Position	X				
	038	1	1	0	0	1	1	0	0	True Heading	X				
	03B	1	1	0	0	1	1	0	0	Control Wheel Pitch Force	X				
	05A	1	1	0	0	1	1	0	0	Internal Parameter for SPATIAAL	X				
	114	1	1	0	0	1	1	0	0	Rear Center Tank (RCT) Fuel Quantity	X				
		1	1	0	0	1	1	0	0	GNU 1 - System Address Label				X	See Attachment 11
315	001	1	1	0	0	1	1	0	1	Stabilizer Position	X				
	002	1	1	0	0	1	1	0	1	Wind Speed	X				
	004	1	1	0	0	1	1	0	1	Wind Speed	X				
	005	1	1	0	0	1	1	0	1	Wind Speed	X				
	029	1	1	0	0	1	1	0	1	Stabilizer Position	X				
	038	1	1	0	0	1	1	0	1	Wind Speed	X				
	056	1	1	0	0	1	1	0	1	Wind Speed	X				
	05A	1	1	0	0	1	1	0	1	Internal Parameter for SPATIAAL	X				
	060	1	1	0	0	1	1	0	1	Wind Speed	X				
	0A1	1	1	0	0	1	1	0	1	Stabilizer Position	X				
		1	1	0	0	1	1	0	1	GNU 2 - System Address Label				X	See Attachment 11
316	002	1	1	0	0	1	1	1	0	Wind Direction (True)	X				
	004	1	1	0	0	1	1	1	0	Wind Angle	X				
	029	1	1	0	0	1	1	1	0	Oil Temperature (Engine)	X				
	038	1	1	0	0	1	1	1	0	Wind Angle	X				
	056	1	1	0	0	1	1	1	0	Wind Direction (True)	X				
	05A	1	1	0	0	1	1	1	0	Internal Parameter for SPATIAAL	X				
	060	1	1	0	0	1	1	1	0	Wind Direction (True)	X				
	0D0	1	1	0	0	1	1	1	0	Engine Oil Temperature	X				
	10A	1	1	0	0	1	1	1	0	Engine Oil Temperature	X				
	10B	1	1	0	0	1	1	1	0	Engine Oil Temperature	X				
		1	1	0	0	1	1	1	0	GNU 3 - System Address Label				X	See Attachment 11
317	002	1	1	0	0	1	1	1	1	Track Angle - Magnetic	X				
	004	1	1	0	0	1	1	1	1	Track Angle - Magnetic	X				
	005	1	1	0	0	1	1	1	1	Track Angle - Magnetic	X				
	025	1	1	0	0	1	1	1	1	Track Angle - Magnetic	X				
	029	1	1	0	0	1	1	1	1	Oil Pressure (Engine)	X				
	038	1	1	0	0	1	1	1	1	Track Angle - Magnetic	X				
	056	1	1	0	0	1	1	1	1	Track Angle - Magnetic	X				
	05A	1	1	0	0	1	1	1	1	Internal Parameter for SPATIAAL	X				

ATTACHMENT 1-1
LABEL CODES

Code No. (Octal)	Eqpt. ID (Hex)	Transmission Order Bit Position 1	2	3	4	5	6	7	8	Parameter	Data BNR	BCD	DISC	SAL	Notes & Cross Ref. To Tables in Att. 6
	060	1	1	0	0	1	1	1	1	Track Angle - Magnetic	X				
	0D0	1	1	0	0	1	1	1	1	Oil Pressure (Engine)	X				
		1	**1**	**0**	**0**	**1**	**1**	**1**	**1**	**AFIRS (Automated Flight Info. Reporting System)**				**X**	
320	004	1	1	0	1	0	0	0	0	Magnetic Heading	X				
	005	1	1	0	1	0	0	0	0	Magnetic Heading	X				
	025	1	1	0	1	0	0	0	0	Magnetic Heading	X				
	029	1	1	0	1	0	0	0	0	Engine Fuel Pressure	X				
	035	1	1	0	1	0	0	0	0	Own Aircraft Magnetic Heading	X				
	038	1	1	0	1	0	0	0	0	Magnetic Heading	X				
	04D	1	1	0	1	0	0	0	0	Density - Tank	X				
	055	**1**	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**Aircraft Altitude**	**X**				
	056	1	1	0	1	0	0	0	0	Magnetic Heading	X				
	060	1	1	0	1	0	0	0	0	Magnetic Heading	X				
321	002	1	1	0	1	0	0	0	1	Drift Angle	X				
	004	1	1	0	1	0	0	0	1	Drift Angle	X				
	005	1	1	0	1	0	0	0	1	Drift Angle	X				
	029	1	1	0	1	0	0	0	1	Engine Fuel Temperature	X				
	038	1	1	0	1	0	0	0	1	Drift Angle	X				
	056	1	1	0	1	0	0	0	1	Drift Angle	X				
	060	1	1	0	1	0	0	0	1	Drift Angle	X				
	10A	1	1	0	1	0	0	0	1	Exhaust gas Temperature (Total)	X				
	10B	1	1	0	1	0	0	0	1	Exhaust gas Temperature (Total)	X				
		1	1	0	1	0	0	0	1	Autothrottle Computer - System Address Label				X	See Attachment 11
322	002	1	1	0	1	0	0	1	0	Flight Path Angle	X				
	004	1	1	0	1	0	0	1	0	Flight Path Angle	X				
	005	1	1	0	1	0	0	1	0	Flight Path Angle	X				
	029	1	1	0	1	0	0	1	0	Engine Nacelle Temperature	X				
	038	1	1	0	1	0	0	1	0	Flight Path Angle	X				
	056	1	1	0	1	0	0	1	0	Flight Path Angle	X				
	060	1	1	0	1	0	0	1	0	Flight Path Angle	X				
	10A	1	1	0	1	0	0	1	0	Total Compressor Discharge Temperature	X				
	10B	1	1	0	1	0	0	1	0	Total Compressor Discharge Temperature	X				
		1	1	0	1	0	0	1	0	FCC 1 - System Address Label				X	See Attachment 11
323	002	1	1	0	1	0	0	1	1	Geometric Altitude	X				
	004	1	1	0	1	0	0	1	1	Flight Path Acceleration	X				6-27
	005	1	1	0	1	0	0	1	1	Flight Path Acceleration	X				
	038	1	1	0	1	0	0	1	1	Flight Path Acceleration	X				
	056	1	1	0	1	0	0	1	1	Geometric Altitude	X				
	060	1	1	0	1	0	0	1	1	Geometric Altitude	X				
	10A	1	1	0	1	0	0	1	1	Variable Stator Vane Position	X				
	10B	1	1	0	1	0	0	1	1	Variable Stator Vane Position	X				
		1	1	0	1	0	0	1	1	FCC 2 - System Address Label				X	See Attachment 11
324	004	1	1	0	1	0	1	0	0	Pitch Angle	X				
	005	1	1	0	1	0	1	0	0	Pitch Angle	X				
	025	1	1	0	1	0	1	0	0	Pitch Angle	X				
	038	1	1	0	1	0	1	0	0	Pitch Angle	X				
	04D	1	1	0	1	0	1	0	0	Tank VSO Quantity	X				
	05A	1	1	0	1	0	1	0	0	Effective Pitch Angle	X				
	10A	1	1	0	1	0	1	0	0	Selected Fuel Metering Valve Position	X				
	10B	1	1	0	1	0	1	0	0	Selected Fuel Metering Valve Position	X				
	114	1	1	0	1	0	1	0	0	Effective Pitch Angle	X				
		1	1	0	1	0	1	0	0	FCC 3 - System Address Label				X	See Attachment 11
325	004	1	1	0	1	0	1	0	1	Roll Angle	X				
	005	1	1	0	1	0	1	0	1	Roll Angle	X				
	01A	1	1	0	1	0	1	0	1	Engine Control Trim Feedback	X				
	025	1	1	0	1	0	1	0	1	Roll Angle	X				
	02F	1	1	0	1	0	1	0	1	Stator Vane Feedback	X				
	038	1	1	0	1	0	1	0	1	Roll Angle	X				
	03F	1	1	0	1	0	1	0	1	Stator Vane Feedback	X				
	055	**1**	**1**	**0**	**1**	**0**	**1**	**0**	**1**	**Anchor Point Latitude**	**X**				
	05A	1	1	0	1	0	1	0	1	Effective Roll Angle	X				
	10A	1	1	0	1	0	1	0	1	Selected Fuel Metering Vane Position	X				
	10B	1	1	0	1	0	1	0	1	Selected Fuel Metering Vane Position	X				
	114	1	1	0	1	0	1	0	1	Effective Roll Angle	X				
		1	1	0	1	0	1	0	1	APU - System Address Label				X	See Attachment 11

ATTACHMENT 1-1
LABEL CODES

Code No. (Octal)	Eqpt. ID (Hex)	Transmission Order Bit Position								Parameter	Data				Notes & Cross Ref. To Tables in Att. 6
		1	2	3	4	5	6	7	8		BNR	BCD	DISC	SAL	
326	004	1	1	0	1	0	1	1	0	Body Pitch Rate	X				
	005	1	1	0	1	0	1	1	0	Body Pitch Rate	X				
	038	1	1	0	1	0	1	1	0	Body Pitch Rate	X				
	04D	1	1	0	1	0	1	1	0	Uplift Quantity	X				
	055	**1**	**1**	**0**	**1**	**0**	**1**	**1**	**0**	**Anchor Point Longitude**	**X**				
	05A	1	1	0	1	0	1	1	0	Maintenance Word	X				
	10A	1	1	0	1	0	1	1	0	Compressor Discharge Static Pressure	X				
	10B	1	1	0	1	0	1	1	0	Compressor Discharge Static Pressure	X				
		1	1	0	1	0	1	1	0	APU Controller - System Address Label				X	See Attachment 11
327	004	1	1	0	1	0	1	1	1	Body Roll Rate	X				
	005	1	1	0	1	0	1	1	1	Body Roll Rate	X				
	038	1	1	0	1	0	1	1	1	Body Roll Rate	X				
	04D	1	1	0	1	0	1	1	1	Uplift Density	X				
	055	**1**	**1**	**0**	**1**	**0**	**1**	**1**	**1**	**Anchor Point Altitude**	**X**				
	10A	1	1	0	1	0	1	1	1	Fuel Metering Valve Position	X				
	10B	1	1	0	1	0	1	1	1	Fuel Metering Valve Position	X				
		1	1	0	1	0	1	1	1	Mode Control Panel (MCP) - System Address Label				X	See Attachment 11
330	004	1	1	0	1	1	0	0	0	Body Yaw Rate	X				
	005	1	1	0	1	1	0	0	0	Body Yaw Rate	X				
	02F	1	1	0	1	1	0	0	0	HC/TC Cooling Valve Position Feedback	X				
	038	1	1	0	1	1	0	0	0	Body Yaw Rate	X				
	03F	1	1	0	1	1	0	0	0	HC/TC Cooling Valve Position Feedback	X				
	055	**1**	**1**	**0**	**1**	**1**	**0**	**0**	**0**	**FLS Beam Slope**	**X**				
	10A	1	1	0	1	1	0	0	0	Selected HPT Clearance Valve Position	X				
	10B	1	1	0	1	1	0	0	0	Selected HPT Clearance Valve Position	X				
		1	1	0	1	1	0	0	0	FMC 3 – System Address Label	X				
331	004	1	1	0	1	1	0	0	1	Body Longitudinal Acceleration	X				
	005	1	1	0	1	1	0	0	1	Body Longitudinal Acceleration	X				
	02F	1	1	0	1	1	0	0	1	LTC Cooling Valve Position Feedback	X				
	038	1	1	0	1	1	0	0	1	Body Longitudinal Acceleration	X				
	03F	1	1	0	1	1	0	0	1	LTC Cooling Valve Position Feedback	X				
	055	**1**	**1**	**0**	**1**	**1**	**0**	**0**	**1**	**Local Magnetic Deviation**	**X**				
	10A	1	1	0	1	1	0	0	1	Selected LPT Clearance Valve Position	X				
	10B	1	1	0	1	1	0	0	1	Selected LPT Clearance Valve Position	X				
		1	1	0	1	1	0	0	1	ATC Transponder - System Address Label				X	See Attachment 11
332	004	1	1	0	1	1	0	1	0	Body Lateral Acceleration	X				
	005	1	1	0	1	1	0	1	0	Body Lateral Acceleration	X				
	02F	1	1	0	1	1	0	1	0	A/O Heat Exchanger Valve Position Feedback	X				
	038	1	1	0	1	1	0	1	0	Body Lateral Acceleration	X				
	03F	1	1	0	1	1	0	1	0	A/O Heat Exchanger Valve Postion Feedback	X				
		1	1	0	1	1	0	1	0	DADC - System Address Label				X	See Attachment 11
333	004	1	1	0	1	1	0	1	1	Body Normal Acceleration	X				
	005	1	1	0	1	1	0	1	1	Body Normal Acceleration	X				
	02F	1	1	0	1	1	0	1	1	Acceleration Fuel Flow Limit	X				
	038	1	1	0	1	1	0	1	1	Body Normal Acceleration	X				
	03F	1	1	0	1	1	0	1	1	Acceleration Fuel Flow Limit	X				
	055	**1**	**1**	**0**	**1**	**1**	**0**	**1**	**1**	**Runway Threshold Latutude**	**X**				
334	004	1	1	0	1	1	1	0	0	Platform Heading	X				
	005	1	1	0	1	1	1	0	0	Platform Heading	X				
	02F	1	1	0	1	1	1	0	0	Fuel Flow Command	X				
	038	1	1	0	1	1	1	0	0	Platform Heading	X				
	03F	1	1	0	1	1	1	0	0	Fuel Flow Command	X				
	055	**1**	**1**	**0**	**1**	**1**	**1**	**0**	**0**	**Runway Threshold Longitude**	**X**				
		1	1	0	1	1	1	0	0	CTU - System Address Label				X	See Attachment 11
335	002	1	1	0	1	1	1	0	1	Track Angle Rate	X				
	004	1	1	0	1	1	1	0	1	Track Angle Rate	X				
	005	1	1	0	1	1	1	0	1	Track Angle Rate	X				
	02F	1	1	0	1	1	1	0	1	2.5 Bld Actuator Postion	X				
	038	1	1	0	1	1	1	0	1	Track Angle Rate	X				
	03F	1	1	0	1	1	1	0	1	2.5 Bld Actuator Postion	X				
	055	**1**	**1**	**0**	**1**	**1**	**1**	**0**	**1**	**Aircraft latitude Fine**	**X**				
	056	1	1	0	1	1	1	0	1	Track Angle Rate	X				
	060	1	1	0	1	1	1	0	1	Track Angle Rate	X				
	10A	1	1	0	1	1	1	0	1	Selected Variable Bleed Valve Position	X				
	10B	1	1	0	1	1	1	0	1	Selected Variable Bleed Valve Position	X				
		1	**1**	**0**	**1**	**1**	**1**	**0**	**1**	**Cursor Control Device - Left (1)**				**X**	

ATTACHMENT 1-1
LABEL CODES

Code No. (Octal)	Eqpt. ID (Hex)	Transmission Order Bit Position								Parameter	Data				Notes & Cross Ref. To Tables in Att. 6
		1	2	3	4	5	6	7	8		BNR	BCD	DISC	SAL	
336	002	1	1	0	1	1	1	1	0	Maximum Climb Angle	X				
	004	1	1	0	1	1	1	1	0	Inertial Pitch Rate	X				
	005	1	1	0	1	1	1	1	0	Inertial Pitch Rate	X				
	01A	1	1	0	1	1	1	1	0	Engine Torque	X				
	02F	1	1	0	1	1	1	1	0	N2 Corrected to Sta. 2.5	X				
	038	1	1	0	1	1	1	1	0	Inertial Pitch Rate	X				
	03F	1	1	0	1	1	1	1	0	N2 Corrected to Sta. 2.5	X				
	055	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**0**	**Aircraft Longitude Fine**	**X**				
	10A	1	1	0	1	1	1	1	0	Variable Bleed Value Position	X				
	10B	1	1	0	1	1	1	1	0	Variable Bleed Value Position	X				
		1	**1**	**0**	**1**	**1**	**1**	**1**	**0**	**Cursor Control Device - Right (2)**				**X**	
337	002	1	1	0	1	1	1	1	1	EPR - Required for Level Flight	X				
	002	1	1	0	1	1	1	1	1	N1 - Required for Level Flight	X				
	004	1	1	0	1	1	1	1	1	Inertial Roll Rate	X				
	005	1	1	0	1	1	1	1	1	Inertial Roll Rate	X				
	01A	1	1	0	1	1	1	1	1	Engine Rating	X				
	038	1	1	0	1	1	1	1	1	Inertial Roll Rate	X				
	10A	1	1	0	1	1	1	1	1	HPT Clearance Valve Position	X				
	10B	1	1	0	1	1	1	1	1	HPT Clearance Valve Position	X				
		1	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**Smoke Detection System (B-767)**				**X**	
340	003	1	1	1	0	0	0	0	0	EPR Actual	X				
	004	1	1	1	0	0	0	0	0	Inertial Yaw Rate	X				
	004	1	1	1	0	0	0	0	0	Track Angle Rate	X				
	005	1	1	1	0	0	0	0	0	Inertial Yaw Rate	X				
	01A	1	1	1	0	0	0	0	0	EPR Actual	X				
	029	1	1	1	0	0	0	0	0	EPR Actual (Engine Direct)	X				
	02D	1	1	1	0	0	0	0	0	EPR Actual	X				
	02F	1	1	1	0	0	0	0	0	EPR Actual	X				
	033	1	1	1	0	0	0	0	0	EPR Actual	X				
	03F	1	1	1	0	0	0	0	0	EPR Actual	X				
	13A	1	1	1	0	0	0	0	0	N1 Take Off	X				
	140	1	1	1	0	0	0	0	0	Pressure Ratio (Pt/Ps)	X				
		1	1	1	0	0	0	0	0	HF DATA Radio/Data #1 - System Address Label				X	See Attachment 11
341	002	1	1	1	0	0	0	0	1	Target N1	X				
	003	1	1	1	0	0	0	0	1	N1 Command	X				
	003	1	1	1	0	0	0	0	1	EPR Command	X				
	004	1	1	1	0	0	0	0	1	Grid Heading	X				
	01A	1	1	1	0	0	0	0	1	N1 Command	X				
	01A	1	1	1	0	0	0	0	1	EPR Command	X				
	029	1	1	1	0	0	0	0	1	N1 Command (Engine)	X				
	029	1	1	1	0	0	0	0	1	EPR Command (Engine)	X				
	02F	1	1	1	0	0	0	0	1	N1 Command	X				
	02F	1	1	1	0	0	0	0	1	EPR Command	X				
	038	1	1	1	0	0	0	0	1	Grid Heading	X				
	03F	1	1	1	0	0	0	0	1	EPR Command	X				
	04D	1	1	1	0	0	0	0	1	I/O S/W REV 1&2	X				
	10A	1	1	1	0	0	0	0	1	Command Fan Speed	X				
	10B	1	1	1	0	0	0	0	1	Command Fan Speed	X				
	13A	1	1	1	0	0	0	0	1	N1 Reference	X				
	140	1	1	1	0	0	0	0	1	Pressure Ratio (Ps/Pso)	X				
342	002	1	1	1	0	0	0	1	0	N1 Bug Drive	X				
	003	1	1	1	0	0	0	1	0	N1 Limit	X				
	003	1	1	1	0	0	0	1	0	EPR Limit	X				
	01A	1	1	1	0	0	0	1	0	N1 Maximum	X				
	01A	1	1	1	0	0	0	1	0	EPR Maximum	X				
	029	1	1	1	0	0	0	1	0	N1 Limit (TCC)	X				
	029	1	1	1	0	0	0	1	0	EPR Limit (TOC)	X				
	02F	1	1	1	0	0	0	1	0	Maximum Available EPR	X				
	03B	1	1	1	0	0	0	1	0	N1 Limit	X				
	03B	1	1	1	0	0	0	1	0	EPR Limit	X				
	03F	1	1	1	0	0	0	1	0	Maximum Available EPR	X				
	04D	1	1	1	0	0	0	1	0	S/W Rev-Tank	X				
	10A	1	1	1	0	0	0	1	0	Maximum Allowed Fan Speed	X				
	10B	1	1	1	0	0	0	1	0	Maximum Allowed Fan Speed	X				
	140	1	1	1	0	0	0	1	0	Air Density Ratio	X				
343	003	1	1	1	0	0	0	1	1	N1 Derate	X				
	003	1	1	1	0	0	0	1	1	EPR Rate	X				
	01A	1	1	1	0	0	0	1	1	N1 Demand	X				
	10A	1	1	1	0	0	0	1	1	N1 Command vs. TLA	X				
	10B	1	1	1	0	0	0	1	1	N1 Command vs. TLA	X				

ATTACHMENT 1-1
LABEL CODES

Code No. (Octal)	Eqpt. ID (Hex)	Transmission Order Bit Position								Parameter	Data				Notes & Cross Ref. To Tables in Att. 6
		1	2	3	4	5	6	7	8		BNR	BCD	DISC	SAL	
344	01A	1	1	1	0	0	1	0	0	N2	X				
	01C	1	1	1	0	0	1	0	0	N2	X				
	029	1	1	1	0	0	1	0	0	N2	X				
	02F	1	1	1	0	0	1	0	0	N2	X				
	033	1	1	1	0	0	1	0	0	N2	X				
	03F	1	1	1	0	0	1	0	0	N2	X				
	04D	1	1	1	0	0	1	0	0	Fuel Discretes			X		
	0D0	1	1	1	0	0	1	0	0	N2	X				
	10A	1	1	1	0	0	1	0	0	Selected Actual Core Speed	X				
	10B	1	1	1	0	0	1	0	0	Selected Actual Core Speed	X				
	13A	1	1	1	0	0	1	0	0	N2 Speed	X				
		1	1	1	0	0	1	0	0	HF DATA Radio/Data #2 - System Address Label				X	See Attachment 11
345	002	1	1	1	0	0	1	0	1	NDB Effectivity		X			
	01A	1	1	1	0	0	1	0	1	Exhaust Gas Temperature	X				
	01C	1	1	1	0	0	1	0	1	Exhaust Gas Temperature	X				
	029	1	1	1	0	0	1	0	1	Exhaust Gas Temperature	X				
	02F	1	1	1	0	0	1	0	1	Exhaust Gas Temperature	X				
	033	1	1	1	0	0	1	0	1	Exhaust Gas Temperature	X				
	03F	1	1	1	0	0	1	0	1	Exhaust Gas Temperature	X				
	04D	1	1	1	0	0	1	0	1	Discretes Status 1&3			X		
	0D0	1	1	1	0	0	1	0	1	EGT	X				
	10A	1	1	1	0	0	1	0	1	Selected Exhaust Gas Temperature (Total)	X				
	10B	1	1	1	0	0	1	0	1	Selected Exhaust Gas Temperature (Total)	X				
	13A	1	1	1	0	0	1	0	1	EGT Trimmed	X				
		1	1	1	0	0	1	0	1	Remote Data Concentrator - System Address Label				X	See Attachment 11
346	003	1	1	1	0	0	1	1	0	N1 Actual	X				
	01A	1	1	1	0	0	1	1	0	N1 Actual	X				
	02F	1	1	1	0	0	1	1	0	N1 Actual	X				
	033	1	1	1	0	0	1	1	0	N1 Actual	X				
	03F	1	1	1	0	0	1	1	0	N1 Actual	X				
	04D	1	1	1	0	0	1	1	0	Cable Cap-Hi-Z	X				
	0D0	1	1	1	0	0	1	1	0	N1	X				
	10A	1	1	1	0	0	1	1	0	Selected Actual Fan Speed	X				
	10B	1	1	1	0	0	1	1	0	Selected Actual Fan Speed	X				
	13A	1	1	1	0	0	1	1	0	N1 Speed Actual	X				
		1	**1**	**1**	**0**	**0**	**1**	**1**	**0**	**Integrated Air System Controller**				**X**	**See Attachment 11**
347	018	1	1	1	0	0	1	1	1	Antenna Control	X				
	029	1	1	1	0	0	1	1	1	Fuel Flow (Engine)	X				
	030	1	1	1	0	0	1	1	1	Sector Control	X				
	035	1	1	1	0	0	1	1	1	Antenna Control	X				
	0D0	1	1	1	0	0	1	1	1	Fuel Flow	X				
	10A	1	1	1	0	0	1	1	1	LPT Clearance Valve Position	X				
	10B	1	1	1	0	0	1	1	1	LPT Clearance Valve Position	X				
	13A	1	1	1	0	0	1	1	1	Fuel Flow	X				
		1	**1**	**1**	**0**	**0**	**1**	**1**	**1**	**Landing Gear Control & Interface Unit (LGCIU) (Airbus)**				**X**	**See Attachment 11**
350	003	1	1	1	0	1	0	0	0	Maintenance Data #1			X		
	004	1	1	1	0	1	0	0	0	IRS Maintenance Discrete			X		
	006	1	1	1	0	1	0	0	0	Maintenance Data #1			X		
	00B	1	1	1	0	1	0	0	0	GPS Test Word (manufacturer specific)			X		
	018	1	1	1	0	1	0	0	0	Maintenance Data #1			X		
	019	1	1	1	0	1	0	0	0	CFDS Bite Fault Summary Word for HFDR			X		
	01A	1	1	1	0	1	0	0	0	Maintenance Data #1			X		
	01C	1	1	1	0	1	0	0	0	Maintenance Data #1			X		
	023	1	1	1	0	1	0	0	0	Maintenance Data #1			X		
	024	1	1	1	0	1	0	0	0	MU Output Data Word Failure Status			X		
	025	1	1	1	0	1	0	0	0	Maintenance Data #1			X		
	027	1	1	1	0	1	0	0	0	Maintenance Data #1			X		
	029	1	1	1	0	1	0	0	0	Maintenance Data #1			X		
	02F	1	1	1	0	1	0	0	0	Maintenance Data #1			X		
	032	1	1	1	0	1	0	0	0	Maintenance Data #1			X		
	035	1	1	1	0	1	0	0	0	Maintenance Data #1			X		
	038	1	1	1	0	1	0	0	0	IRS Maintenance Word #1			X		
	03D	1	1	1	0	1	0	0	0	Maintenance Data #1			X		
	03E	1	1	1	0	1	0	0	0	Maintenance Data #1			X		
	03F	1	1	1	0	1	0	0	0	Maintenance Data #1			X		
	040	1	1	1	0	1	0	0	0	Maintenance Data #1			X		
	04D	1	1	1	0	1	0	0	0	Maintenance Data FQIS 1-3			X		
	050	1	1	1	0	1	0	0	0	VDR Fault Summary Word			X		
	053	1	1	1	0	1	0	0	0	CFDS Bite Fault Summary Word for HFDR			X		
	055	1	1	1	0	1	0	0	0	ILS Maintenance Word			X		

ATTACHMENT 1-1
LABEL CODES

Code No. (Octal)	Eqpt. ID (Hex)	Transmission Order Bit Position								Parameter	Data				Notes & Cross Ref. To Tables in Att. 6
		1	2	3	4	5	6	7	8		BNR	BCD	DISC	SAL	
	057	1	1	1	0	1	0	0	0	CVR Status			X		
	10A	1	1	1	0	1	0	0	0	Maintenance Data #1			X		
	10B	1	1	1	0	1	0	0	0	Maintenance Data #1			X		
	114	1	1	1	0	1	0	0	0	Fuel Density		X			
	115	1	1	1	0	1	0	0	0	Maintenance Data #1			X		
	140	1	1	1	0	1	0	0	0	Maintenance Data #1			X		
	144	1	1	1	0	1	0	0	0	CDTI Fault Summary Word			X		
	181	**1**	**1**	**1**	**0**	**1**	**0**	**0**	**0**	**Satellite Antenna Maintenance Word**			**X**		
	241	1	1	1	0	1	0	0	0	Maintenance Data #1			X		
	341	1	1	1	0	1	0	0	0	Maintenance Data #1			X		
351	006	1	1	1	0	1	0	0	1	Maintenance Data #2			X		
	00B	1	1	1	0	1	0	0	1	SRU Test Word (manufacturer specific)			X		
	01A	1	1	1	0	1	0	0	1	Maintenance Data #2			X		
	01C	1	1	1	0	1	0	0	1	Maintenance Data #2			X		
	024	1	1	1	0	1	0	0	1	MU Output Data Word Failure Status			X		
	025	1	1	1	0	1	0	0	1	Maintenance Data #2			X		
	029	1	1	1	0	1	0	0	1	Maintenance Data #2			X		
	02E	1	1	1	0	1	0	0	1	Maintenance Data #2			X		
	02F	1	1	1	0	1	0	0	1	Maintenance Data #2			X		
	031	1	1	1	0	1	0	0	1	Maintenance Data #2			X		
	038	1	1	1	0	1	0	0	1	IRS Maintenance Word #2			X		
	03F	1	1	1	0	1	0	0	1	Maintenance Data #2			X		
	04D	1	1	1	0	1	0	0	1	Maintenance Data FQIS 1&3			X		
	055	1	1	1	0	1	0	0	1	MMR Maintenance Word			X		
	10A	1	1	1	0	1	0	0	1	Maintenance Data #2			X		
	10B	1	1	1	0	1	0	0	1	Maintenance Data #2			X		
	114	1	1	1	0	1	0	0	1	Inner Tank 1 Probe Capacitance		X			
	140	1	1	1	0	1	0	0	1	Maintenance Data #2			X		
352	01A	1	1	1	0	1	0	1	0	Maintenance Data #3			X		
	01C	1	1	1	0	1	0	1	0	Maintenance Data #2			X		
	024	1	1	1	0	1	0	1	0	Maintenance Word			X		
	025	1	1	1	0	1	0	1	0	Maintenance Data #2			X		
	02E	1	1	1	0	1	0	1	0	Maintenance Data #2			X		
	02F	1	1	1	0	1	0	1	0	Maintenance Data #2			X		
	03F	1	1	1	0	1	0	1	0	Maintenance Data #2			X		
	04D	1	1	1	0	1	0	1	0	Maintenance Data FQIS 1-4			X		
	055	1	1	1	0	1	0	1	0	MLS Bite Status			X		
	10A	1	1	1	0	1	0	1	0	Maintenance Data #2			X		
	10B	1	1	1	0	1	0	1	0	Maintenance Data #2			X		
	114	1	1	1	0	1	0	1	0	Center, ACT & RCT Probe Capacitance		X			
	140	1	1	1	0	1	0	1	0	Maintenance Data #3 Flight Count	X				
353	01A	1	1	1	0	1	0	1	1	Maintenance Data #4			X		
	01C	1	1	1	0	1	0	1	1	Maintenance Data #4			X		
	025	1	1	1	0	1	0	1	1	Maintenance Data #4			X		
	02F	1	1	1	0	1	0	1	1	Maintenance Data #4			X		
	038	1	1	1	0	1	0	1	1	IRS Maintenance Word #3			X		
	03D	1	1	1	0	1	0	1	1	Maintenance Data #4			X		
	03F	1	1	1	0	1	0	1	1	Maintenance Data #4			X		
	04D	1	1	1	0	1	0	1	1	Maintenance Data FQIS 1-4			X		
	055	**1**	**1**	**1**	**0**	**1**	**0**	**1**	**1**	**GLS Maintenance Word**			**X**		
	0D0	1	1	1	0	1	0	1	1	Vibration	X				
	10A	1	1	1	0	1	0	1	1	Maintenance Data #4			X		
	10B	1	1	1	0	1	0	1	1	Maintenance Data #4			X		
	114	1	1	1	0	1	0	1	1	Inner Tank 1 Probe Capacitance		X			
354	002	1	1	1	0	1	1	0	0	Maintenance Data #5			X		
	01A	1	1	1	0	1	1	0	0	Maintenance Data #5			X		
	01C	1	1	1	0	1	1	0	0	Maintenance Data #5			X		
	02F	1	1	1	0	1	1	0	0	Maintenance Data #5			X		
	035	**1**	**1**	**1**	**0**	**1**	**1**	**0**	**0**	**Program Pin Status**			**X**		
	03D	1	1	1	0	1	1	0	0	N1 Vibration	X				
	03F	1	1	1	0	1	1	0	0	Maintenance Data #5			X		
	04D	1	1	1	0	1	1	0	0	FQIS Tank ID			X		
	055	**1**	**1**	**1**	**0**	**1**	**1**	**0**	**0**	**MMR Identification**					**Block - DISC**
	056	1	1	1	0	1	1	0	0	Maintenance Data #5					
	060	1	1	1	0	1	1	0	0	Maintenance Data #5					
	0BB	1	1	1	0	1	1	0	0	Maintenance Data #5			X		
	10A	1	1	1	0	1	1	0	0	Maintenance Data #5			X		
	10B	1	1	1	0	1	1	0	0	Maintenance Data #5			X		

ATTACHMENT 1-1
LABEL CODES

Code No. (Octal)	Eqpt. ID (Hex)	Transmission Order Bit Position								Parameter	Data				Notes & Cross Ref. To Tables in Att. 6
		1	2	3	4	5	6	7	8		BNR	BCD	DISC	SAL	
355	00B	1	1	1	0	1	1	0	1	GNSS Fault Summary			X		
	027	1	1	1	0	1	1	0	1	MLS Maintenance Data			X		
	038	1	1	1	0	1	1	0	1	IRS Maintenance Word #4			X		
	03D	1	1	1	0	1	1	0	1	N2 Vibration	X				
	055	**1**	**1**	**1**	**0**	**1**	**1**	**0**	**1**	**GNSS Fault Summary**			**X**		
	04D	1	1	1	0	1	1	0	1	Maintenance Data FQIS 2-4			X		
	XXX	1	1	1	0	1	1	0	1	Acknowledgement			X		6-5/Note 1
356	03D	1	1	1	0	1	1	1	0	N3 Vibration	X				
	055	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**0**	**MMR Fault Message**					**Block - DISC**
	XXX	1	1	1	0	1	1	1	0	Maintenance ISO #5 Message			X		6-3/Note 1
	YYY	1	1	1	0	1	1	1	0	BITE Status Word	X				Note 1
357	002	1	1	1	0	1	1	1	1	ISO Alphabet #5 Message			X		6-3
	017	1	1	1	0	1	1	1	1	ISO Alphabet #5 Message			X		
	024	1	1	1	0	1	1	1	1	ISO Alphabet #5 Message			X		
	035	1	1	1	0	1	1	1	1	TCAS Intruder Data File			X		
	037	1	1	1	0	1	1	1	1	ISO Alphabet #5 Message			X		
	03D	1	1	1	0	1	1	1	1	BB Vibration	X				
	04D	1	1	1	0	1	1	1	1	Maintenance Data FQIS 2-3			X		
	056	1	1	1	0	1	1	1	1	ISO Alphabet #5 Message					
	05A	1	1	1	0	1	1	1	1	Part Number (Manufacturer - Specific)			X		
	060	1	1	1	0	1	1	1	1	ISO Alphabet #5 Message					
360	002	1	1	1	1	0	0	0	0	Flight Information	X				6-33
	004	1	1	1	1	0	0	0	0	Potential Vertical Speed	X				
	005	1	1	1	1	0	0	0	0	Potential Vertical Speed	X				
	038	1	1	1	1	0	0	0	0	Potential Vertical Speed	X				
	03D	1	1	1	1	0	0	0	0	N1 Rotor Imbalance Angle	X				
	056	1	1	1	1	0	0	0	0	Flight Information	X				
	060	1	1	1	1	0	0	0	0	Flight Information	X				
	10A	1	1	1	1	0	0	0	0	Throttle Rate of Change	X				
	10B	1	1	1	1	0	0	0	0	Throttle Rate of Change	X				
	142	1	1	1	1	0	0	0	0	RAIM Status Word	X				
		1	1	1	1	0	0	0	0	ACESS - System Address Label				X	See Attachment 11
361	004	1	1	1	1	0	0	0	1	Altitude (Inertial)	X				
	005	1	1	1	1	0	0	0	1	Altitude (Inertial)	X				
	038	1	1	1	1	0	0	0	1	Altitude (Inertial)	X				
	03D	1	1	1	1	0	0	0	1	LPT Rotor Imbalance Angle (737 only)	X				
	10A	1	1	1	1	0	0	0	1	Derivative of Thrust vs. N1	X				
	10B	1	1	1	1	0	0	0	1	Derivative of Thrust vs. N1	X				
		1	1	1	1	0	0	0	1	EFIS - System Address Label				X	See Attachment 11
362	004	1	1	1	1	0	0	1	0	Along Track Horizontal Acceleration	X				
	038	1	1	1	1	0	0	1	0	Along Track Horizontal Acceleration	X				
	10A	1	1	1	1	0	0	1	0	Derivative of Thrust vs. TLA	X				
	10B	1	1	1	1	0	0	1	0	Derivative of Thrust vs. TLA	X				
	115	1	1	1	1	0	0	1	0	Range Rate	X				
		1	1	1	1	0	0	1	0	PSS - System Address Label				X	See Attachment 11
363	004	1	1	1	1	0	0	1	1	Cross Track Acceleration	X				
	038	1	1	1	1	0	0	1	1	Cross Track Acceleration	X				
	10A	1	1	1	1	0	0	1	1	Corrected Thrust	X				
	10B	1	1	1	1	0	0	1	1	Corrected Thrust	X				
		1	1	1	1	0	0	1	1	System Address Label for CSS				X	See Attachment 11
364	004	1	1	1	1	0	1	0	0	Vertical Acceleration	X				
	005	1	1	1	1	0	1	0	0	Vertical Acceleration	X				
	038	1	1	1	1	0	1	0	0	Vertical Acceleration	X				
	13A	1	1	1	1	0	1	0	0	N1 APR Rating	X				
		1	1	1	1	0	1	0	0	AES - System Address Label				X	See Attachment 11
365	004	1	1	1	1	0	1	0	1	Inertial Vertical Velocity (EFI)	X				
	005	1	1	1	1	0	1	0	1	Inertial Vertical Velocity (EFI)	X				
	038	1	1	1	1	0	1	0	1	Inertial Vertical Velocity (EFI)	X				
	13A	1	1	1	1	0	1	0	1	N1 Max Reverse	X				
		1	1	1	1	0	1	0	1	Engine Indication Unit - System Address Label				X	See Attachment 11
366	004	1	1	1	1	0	1	1	0	North-South Velocity	X				6-2-1
	035	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**0**	**Display Traffic Information File (DTIF)**					**DISC - BNR**
	038	1	1	1	1	0	1	1	0	North-South Velocity	X				
	13A	1	1	1	1	0	1	1	0	IGV Position	X				
		1	1	1	1	0	1	1	0	Multicast - System Address Label				X	See Attachment 11

ATTACHMENT 1-1
LABEL CODES

Code No. (Octal)	Eqpt. ID (Hex)	Transmission Order Bit Position								Parameter	Data				Notes & Cross Ref. To Tables in Att. 6
		1	2	3	4	5	6	7	8		BNR	BCD	DISC	SAL	
367	004	1	1	1	1	0	1	1	1	East-West Velocity	X				
	038	1	1	1	1	0	1	1	1	East-West Velocity	X				
	13A	1	1	1	1	0	1	1	1	EGV Request	X				
		1	1	1	1	0	1	1	1	Bridge - System Address Label				X	See Attachment 11
370	004	1	1	1	1	1	0	0	0	g	X				
	005	1	1	1	1	1	0	0	0	g	X				
	00B	1	1	1	1	1	0	0	0	GNSS Height WGS-84 (HAE)	X				
	025	1	1	1	1	1	0	0	0	Decision Height Selected (EFI)	X				
	055	**1**	**1**	**1**	**1**	**1**	**0**	**0**	**0**	**GNSS Height**	**X**				
	0C5	1	1	1	1	1	0	0	0	Decision Height Selected (EFI)	X				
371	000	1	1	1	1	1	0	0	1	General Aviation Equipment Identifier	X				See Attachment 9B
372	005	1	1	1	1	1	0	1	0	Wind Direction - Magnetic	X				
	10A	1	1	1	1	1	0	1	0	Actual Fan Speed	X				
	10B	1	1	1	1	1	0	1	0	Actual Fan Speed	X				
		1	1	1	1	1	0	1	0	Cabin Terminal #3 - System Address Label				X	See Attachment 11
373	005	1	1	1	1	1	1	0	0	North-South Velocity - Magnetic	X				
	10A	1	1	1	1	1	1	0	0	Actual Core Speed	X				
	10B	1	1	1	1	1	1	0	0	Actual Core Speed	X				
		1	1	1	1	1	1	0	0	Cabin Terminal #4 - System Address Label				X	See Attachment 11
374	005	1	1	1	1	1	1	0	0	East-West Velocity - Magnetic	X				
	10A	1	1	1	1	1	1	0	0	Left Thrust Reverser Position	X				
	10B	1	1	1	1	1	1	0	0	Left Thrust Reverser Position	X				
		1	1	1	1	1	1	0	0	Cabin Terminal #1 - System Address Label				X	See Attachment 11
375	004	1	1	1	1	1	1	0	1	Along Heading Acceleration	X				
	005	1	1	1	1	1	1	0	1	Along Heading Acceleration	X				
	033	1	1	1	1	1	1	0	1	Spare DC1	X				
	038	1	1	1	1	1	1	0	1	Along Heading Acceleration	X				
	10A	1	1	1	1	1	1	0	1	Right Thrust Reverser Position	X				
	10B	1	1	1	1	1	1	0	1	Right Thrust Reverser Position	X				
	XXX	1	1	1	1	1	1	0	1	GPS Differential Correction Word A	X				
		1	1	1	1	1	1	0	1	Cabin Terminal #2 - System Address Label				X	See Attachment 11
376	038	1	1	1	1	1	1	1	0	Cross Heading Acceleration	X				
	XXX	1	1	1	1	1	1	1	0	GPS Differential Correction Word B	X				
		1	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**OMEGA Nav. Systems**				**X**	**See Attachment 11**
377	030	1	1	1	1	1	1	1	1	Equipment Identification			X		
	XXX	1	1	1	1	1	1	1	1	Equipment Identification			X		6-17/Note 2

Notes:

1. XXX or YYY is applicable to all Equipment IDs.
2. The preferred SSM encoding method for the Equipment Identification Word is according to the Discrete word guidelines. When this label was originally assigned, it was recognized as a non-BNR word. The SSM encoding was according to the BCD and DISC guidelines that were identical at that time. During development of Supplement 4, the SSM for DISC was revised to its current form to provide enhanced failure warning. When the SSM encoding was changed, some systems retained the BCD encoding for the Equipment Identification word and others changed to DISC encoding. There are ARINC standards that are still active that have the SSM for Equipment Identification designated as BCD. You will need to check with the equipment manufacturer to determine the SSM format.
3. The Label does not adhere to ARINC 429 Standard Signal Format and contains both BCD and BNR bit encoding depending on the selected mode.

ATTACHMENT 1-2
EQUIPMENT CODES

Equip ID (Hex)	Equipment Type
000	(Not Used)
001	Flight Control Computer (701)
002	Flight Management Computer (702)
003	Thrust Control Computer (703)
004	Inertial Reference System (704)
005	Attitude and Heading Reference System (705)
006	Air Data System (706)
007	Radio Altimeter (707)
008	Airborne Weather Radar (708)
009	Airborne DME (709)
00A	FAC (A310)
00B	Global Positioning System (743)
00C	
00D	AIDS Data Management Unit
00E	
00F	
010	Airborne ILS Receiver (710)
011	Airborne VOR Receiver (711)
012	Airborne ADF System (712)
013	(Not Used)
014	(Not Used)
015	(Not Used)
016	Airborne VHF COM (716)
017	DEFDARS-AIDS (717)
018	ATC Transponder (718A)
019	Airborne HF/SSB System (719)
01A	Electronic Engine Control / Electronic Supervisory Control / Power Management Control
01B	Digital Slat/Flap Computer (A310)
01C	Engine Parameter Digitizer
01D	A/P and F/D Mode Control Panel (B757/767)
01E	Performance Data Computer (B737)
01F	Fuel Quantity Totalizer
020	DFS System (720)
021	(Not Used)
022	(Not Used)
023	Ground Proximity Warning System (723)
024	ACARS (724) / CMU Mark 2 (758)
025	Electronic Flight Instruments (725)
026	Flight Warning Computer (726)
027	Microwave Landing System (727)
028	(Not Used)
029	Analog and Discrete Converter (729) and EICAS
02A	Thrust Management Computer
02B	Performance Navigation Computer System (B737)
02C	Digital Fuel Gauging System (A310)
02D	Engine Pressure Ratio (EPR) Indicator (B757)
02E	Land Rollout CU/Landing C&LU
02F	Full Authority Digital Engine Control (FADEC) - A
030	Airborne Separation Assurance System (730)
031	Electronic Chronometer (731)
032	Passenger Entertainment Tape Reproducer (732)
033	Propulsion Multiplexer (733)
034	Fault Isolation and Detection System (734)
035	TCAS (735**/735A**) **Traffic Computer (735B)**
036	Radio Management System (736)
037	Weight and Balance System (737)
038	Air Data and Inertial Reference System (ADIRS) (738)
039	Multi-Purpose Control and Display Unit (MCDU) (739)
03A	Propulsion Discrete Interface Unit
03B	Autopilot Buffer Unit
03C	Tire Pressure Monitoring System
03D	Airborne Vibration Monitor (B735/757/767)
03E	Center of Gravity Control Computer
03F	Full Authority EEC-B
040	Cockpit Printer (740)
041	Satellite Data Unit (741)
042	(Not Used)
043	(Not Used)
044	(Not Used)
045	(Not Used)
046	Cabin Telecommunications Unit (CTU) (746)
047	Digital Flight Data Recorder
048	(Not Used)
049	(Not Used)
04A	Landing Gear Position Interface Unit
04B	Main Electrical System Controller
04C	Emergency Electrical System Controller
04D	Fuel Quantity Indicating System (B757/767)
04E	Fuel Quantity Indicating System (B747)
04F	
050	VHF Digital Radio (VDR) (750)
051	(Not Used)
052	(Not Used)
053	HF Data Unit (753)
054	(Not Used)
055	Multi-Mode Receiver (MMR) (755)
056	GNSS Navigation and Landing Unit (GNLU) (756)
057	Cockpit Voice Recorder (CVR) (757)
058	(Not Used)
059	
05A	Fuel Quantity Indicating System (A320/A321)
05B	Cargo Smoke Detection Unit (A320)
05C	Cabin Pressure Unit (A320)
05D	Zone Controller (A320)
05E	Cargo Heat (A320)
05F	CIDS (A320)
060	GNSS Navigation Unit (GNU) (760)
061	Satellite High-Speed Data Unit (HSDU) (761)
062	(Not Used)
063	(Not Used)
064	(Not Used)
065	(Not Used)
066	
067	(Not Used)
068	**Integrated Surveillance System (768)**
069	
06A	Audio Management Unit (AMU) (A320)
06B	Battery Charge Limiter (A320)
06C	Flight Control Data Concentrator (A320)
06D	Landing Gear Proximity Control (A320)
06E	Brake Steering Unit (A320)
06F	Bleed Air (A320)
070	
071	
072	
073	

ATTACHMENT 1-2
EQUIPMENT CODES

Equip ID (Hex)	Equipment Type
074	
075	
076	
077	(Not Used)
078	
079	
07A	APU Engine Control Unit (A320)
07B	Engine Interface Unit (A320)
07C	FADEC Channel A (A320)
07D	FADEC Channel B (A320)
07E	Centralized Fault Data Interface Unit
07F	Fire Detection Unit (A320)
080	
081	
082	
083	
084	
085	
086	
087	
088	
089	
08A	Window Heat Computer (A320)
08B	Probes Heat Computer (A320)
08C	Avionics Cooling Computer (A320)
08D	Fuel Flow Indicator (B747)
08E	Surface Position Digitizer (B747-400)
08F	Vacuum System Controller
090	
091	
093	
094	
095	
096	
097	
098	
099	
09A	**On-Board Airport Navigation System (Airbus)**
09B	
09C	
09D	
09E	
09F	
0A0	
0A1	FCC Controller (701)
0A2	FMC Controller (702)
0A3	Thrust Rating Controller (703)
0A4	IRS Controller (704)
0A5	**AHRS Controller (705)**
0A6	
0A7	
0A8	Airborne WXR Controller (708)
0A9	Airborne DME Controller (709)
0AA	Generator Control Unit (A320)
0AB	Air Supply Control and Test Unit (B747-400)
0AC	Bus Control Unit (B747-400)
0AD	ADIRS Air Data Module
0AE	Yaw Damper Module (B747-400)
0AF	Stabilizer Trim Module (B747-400)

Equip ID (Hex)	Equipment Type
0B0	Airborne ILS Controller (710)
0B1	Airborne VOR Controller (711)
0B2	Airborne ADF Controller (712)
0B3	
0B4	
0B5	
0B6	VHF COM Controller (716)
0B7	
0B8	ATC Transponder Controller (718A)
0B9	HF/SSB System Controller (719)
0BA	Power Supply Module (B747-400)
0BB	Flap Control Unit (B747)/ Flap Slat Electronics Unit (B767)
0BC	Fuel System Interface Card (B747-400)
0BD	Hydraulic Quantity Monitor Unit (B747-400)
0BE	Hydraulic Interface Module (B747-400)
0BF	Window Heat Control Unit (B747-400)
0C0	
0C1	
0C2	PVS Control Unit
0C3	GPWS Controller (723)
0C4	A429W SDU Controller
0C5	EFI Controller (725)
0C6	
0C7	MLS Controller (727)
0C8	
0C9	
0CA	Brake Temperature Monitor Unit (B747-400)
0CB	Autostart (B747-400)
0CC	Brake System Control Unit (B747-400)
0CD	Pack Temperature Controller (B747-400)
0CE	EICAS/EFIC Interface Unit (B747-400)
0CF	Para Visual Display Computer (B747-400)
0D0	Engine Instrument System (B737)
0D1	
0D2	
0D3	Thermal Monitoring Unit (General)
0D4	
0D5	TCAS Control Panel
0D6	
0D7	
0D8	
0D9	
0DA	Proximity Switch Electronics Unit (B747-400)
0DB	APU Controller (B747-400)
0DC	Zone Temperature Controller (B747-400)
0DD	Cabin Pressure Controller (B747-400)
0DE	Windshear Computer (Honeywell/Sperry)
0DF	Equipment Cooling Card (B747-400)
0E0	Crew Rest Temperature Controller (B747-400)
0E1	**Cargo Door Control (B777)**
0E2	**Enhanced Vision System**
0E3	**AN/APN-232 Radar Altimeter (C-135)**
0E4	
0E5	
0E6	
0E7	
0E8	
0E9	

ATTACHMENT 1-2
EQUIPMENT CODES

Equip ID (Hex)	Equipment Type
0EA	Miscellaneous Environment Control (B747)
0EB	Fuel Jettison Control Card (B747)
0EC	Cabin Entertainment Service System
0ED	Fuel System Controller (MD-11)
0EE	Hydraulic System Controller (MD-11)
0EF	Environmental System Controller (MD-11)
0F0	
0F1	**Fire Detection and Suppression System**
0F2	
0F3	
0F4	
0F5	
0F6	
0F7	
0F8	
0F9	
0FA	Miscellaneous System controller (MD-11)
0FB	Anti-Skid System (MD-11)
0FC	Cabin Pressure Control System (MD-11)
0FD	Air Condition Control System (MD-11)
0FE	Pneumatic Control System (MD-11)
0FF	Manifold Failure Detection System (MD-11)
100	
101	
102	
103	
104	
105	
106	
107	
108	Electronic Engine Control (EEC) Channel A (B737-700)
109	Elect Engine Control (EEC) Channel B (B737-700)
10A	Full Authority Engine Control A (GE)
10B	Full Authority Engine Control B (GE)
10C	APU Controller
10D	Data Loader
10E	Fire Detection Unit (MD-11)
10F	Auto Brake Unit (MD-11)
110	Multiplexer PES (A-320)
111	
112	TACAN Adapter Unit
113	Stall Warning Card (B747-400)
114	Fuel Unit Management System (A330/A340)
115	TACAN
116	Engine Interface Vibration Monitoring Unit (A330/340)
117	Engine Control Unit Channel A (A330/A340)
118	Engine Control Unit Channel B (A330/A340)
119	Centralized Maintenance Computer (A330/A340)
11A	Multi-Disk Drive Unit (A330/A340)
11B	
11C	
11D	
11E	Integrated Static Probe
11F	
120	Multifunction Air Data Probe
121	
122	Ground Auxiliary Power Unit (A320/319/321)
123	Ground Power Control Unit (A330/A340)
124	Fuel Management Computer (A330/A340)
125	Center of Gravity Fuel Control Computer (A330/A340)

Equip ID (Hex)	Equipment Type
126	Circuit breakers Monitoring Unit (A330/A340)
127	Electrical Contractor Management Unit (A330/A340)
128	Hydraulic Electrical Generator Control Unit (A330/A340)
129	Hydraulic System Monitoring Unit (A330/A340)
12A	Cargo Bay Conditioning Card (B747)
12B	Predictive Windshear System Sensor
12C	Angle of Attack Sensor
12D	Logic Drive Control Computer (B747/B767)
12E	Cargo Control Logic Unit (B767)
12F	Cargo Electronics Interface Unit (B767)
130	Load Management Unit (LMU) (Airbus)
131	**Primary Flight Display**
132	
133	
134	
135	
136	Audio Management System
137	
138	
139	**Cockpit Door Surveillance System**
13A	Full Authority Engine Control (P&W)
13B	Audio Entertainment System (AES) Controller (Boeing)
13C	Boarding Music Machine (B777)
13D	Passenger In Flight Info Unit (Airshow)
13E	Video Interface Unit (B777)
13F	Camera Interface Unit (A340/B777)
140	Supersonic Air Data Computer
141	Satellite RF Unit
142	ADS-B Link Display Processor Unit (LPDU)
143	Vertical/Horizontal Gyro
144	CDTI Display Unit
145	
146	
147	
148	**Airline Network Infrastructure (Airbus)**
149	
14A	Slide Slip Angle (SSA)
14B	
14C	
14D	**Integrated Air System Controller (B747-8)**
14E	
14F	
150	AIMS General Purpose Bus #1 (B777)
151	AIMS General Purpose Bus #2 (B777)
152	AIMS Digital Communications Mgmt. (B777)
153	AIMS General Purpose Bus #3 (B777)
154	Central Maintenance Computer (B-777)
155	AIMS EFIS Control Panel (B777)
156	AIMS Display Unit (B777)
157	AIMS Cursor Control Device (B777)
158	AIMS General Purpose Bus #4
159	
15A	Flight Data Interface Unit (A330/A340)
15B	Flight Control Unit (A330/A340)
15C	Flight Control Primary Computer (A330/A340)
15D	Flight Control Secondary Computer (A330/A340)
15E	Flight Management Guidance Computer (A330/A340)
15F	**Cooled Service Air System (CSAS)**

ATTACHMENT 1-2
EQUIPMENT CODES

Equip ID (Hex)	Equipment Type
160	Special Fuel Quantity (Boeing)
161	
162	
163	
164	
165	
166	
167	Air Traffic Service Unit (ATSU)
168	Integrated Standby Instrument System (Airbus)
169	Data Link Control and Display Unit (A340/330)
16A	Display Unit (A330/A340)
16B	Display Management Computer (A330/A340)
16C	Head-Up Display Computer (A330/A340)
16D	ECAM Control Panel (A330/A340)
16E	Clock (A330/A340)
16F	Cabin Interphone System (B777)
170	Radio Tuning Panel (B777)
171	Electronic Flight Bag (EFB)
172	**Lateral Control Electronics Unit (B747-8)**
173	
174	
175	
176	
177	
178	
179	
17A	Cabin Ventilation Controller (A330/A340)
17B	Smoke Detection Control Unit (A330/A340)
17C	Proximity Sensor Control Unit (A330/A340)
17D	**Master Galley Control (A330, A340, A380)**
17E	**On-board Oxygen Generation System (OBOGS) (A330, A340, A380)**
17F	**Nitrogen Generation System Control**
180	
181	**Satellite Communications Antenna (781)**
182	
183	
184	
185	
186	
187	
188	
189	
18A	Audio Control Panel (A330/A340)
18B	Cockpit Voice Recorder (A330/A340)
18C	Passenger Entertainment Sys Main MUX (A330/A340)
18D	Passenger Entertainment Sys Audio Repro.(A330/A340)
18E	Pre-recorded Announcement Music Repro (A330/A340)
18F	Video Control Unit (A330/A340)
190	
191	
192	
193	
194	
195	
196	
197	
198	
199	

Equip ID (Hex)	Equipment Type
19A	
19B	
19C	
19D	
19E	
19F	Cade Environment System
1A0	
1A1	
1A2	
1A3	
1A4	
1A5	
1A6	
1A7	
1A8	
1A9	
1AA	
1AB	
1AC	
1AD	
1AE	**Yaw Damper Stabilizer Trim Module (B747-8)**
1AF	
1E2	ADS-B LDPU Controller
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)
241	High Power Amplifier
2BA	**GENx-2B Electronic Engine Control (EEC) Channel A**
2BB	**GENx-2B Electronic Engine Control (EEC) Channel B**
341	Satellite Antenna Control Unit (ACU)

ATTACHMENT 2A
DATA STANDARDS - BCD DATA

Label	Eqpt ID (Hex)	Parameter Name	Units	Range (Scale)	Sig Bits	Pos Sense	Resolution	Min Transit Interval (msec) 2	Max Transit Interval (msec) 2	Max Trans-port Delay (msec) 3	Notes & Cross Ref. to Tables and Attachments
0 0 1	0 0 2	Distance to Go	NM	±3999.9	5		0.1	100	200		6-25
	0 5 6	Distance to Go	NM	±3999.9	5		0.1	100	200		
	0 6 0	Distance to Go	NM	±3999.9	5		0.1	100	200		
0 0 2	0 0 2	Time to Go	Min	0-399.9	4		0.1	100	200		6-25
	0 5 6	Time to Go	Min	0-399.9	4		0.1	100	200		
	0 6 0	Time to Go	Min	0-399.9	4		0.1	100	200		
	1 1 5	Time to Station	Min	0-399.9	4		0.1	50	50		
0 0 3	0 0 2	Cross Track Distance	NM	0-399.9	4		0.1	100	200		6-25
0 0 4	0 0 1	Runway Distance to Go	Feet	0-79900	3		100.0	100	200		
0 1 0	0 0 2	Present Position - Latitude	Deg:Min	180N-180S	6	N	0.1	250	500		Section 2.1.2
	0 0 4	Present Position - Latitude	Deg:Min	180N-180S	6	N	0.1	250	500		Section 2.1.2
	0 3 8	Present Position - Latitude	Deg:Min	180N-180S	6	N	0.1	250	500		
0 1 1	0 0 2	Present Position - Longitude	Deg:Min	180E-180W	6	E	0.1	250	500		
	0 0 4	Present Position - Longitude	Deg:Min	180E-180W	6	E	0.1	250	500		
	0 3 8	Present Position - Longitude	Deg:Min	180E-180W	6	E	0.1	250	500		
0 1 2	0 0 2	Ground Speed	Knots	0-7000	4		1.0	250	500		6-25
	0 0 4	Ground Speed	Knots	0-7000	4		1.0	250	500		
	0 4 D	Qty-LD SEL (LB)	Lbs	0-79999	5		1.0				
	0 0 5	Ground Speed	Knots	0-7000	4		1.0	250	500		
	0 2 5	Ground Speed	Knots	0-7000	4		1.0	125	250		
	0 3 8	Ground Speed	Knots	0-7000	4		1.0	250	500		
	0 5 6	Ground Speed	Knots	0-7000	4		1.0	250	500		
	0 6 0	Ground Speed	Knots	0-7000	4		1.0	250	500		
0 1 3	0 0 2	Track Angle - True	Deg	0-359.9	4		0.1	250	500		6-25
	0 0 4	Track Angle - True	Deg	0-359.9	4		0.1	250	500		
	0 4 D	Qty-Flt. Deck (LB)	Lbs	0-79999	5		1.0				
	0 3 8	Track Angle - True	Deg	0-359.9	4		0.1	250	500		
0 1 4	0 0 4	Magnetic Heading	Deg	0-359.9	4		0.1	250	500		
	0 0 5	Magnetic Heading	Deg	0-359.9	4		0.1	250	500		
	0 3 8	Magnetic Heading	Deg	0-359.9	4		0.1	250	500		
0 1 5	0 0 2	Wind Speed	Knots	0-799	3		1.0	250	500		
	0 0 4	Wind Speed	Knots	0-799	3		1.0	250	500		
	0 0 5	Wind Speed	Knots	0-799	3		1.0	250	500		
	0 3 8	Wind Speed	Knots	0-799	3		1.0	250	500		
0 1 6	0 0 4	Wind Direction - True	Deg	0-359	3		1.0	250	500		
	0 3 8	Wind Direction - True	Deg	0-359	3		1.0	250	500		
0 1 7	0 1 0	Selected Runway Heading	Deg	0-359.9	4	**Always Positive**	0.1	167	333		
	0 4 D	Total-Flt. Deck (LB)	Lbs	0-79999	5		1.0				
	0 5 5	Selected Runway Heading	Deg	0-359.9	4		0.1	**167**	**333**		
	0 A 0	Selected Runway Heading	Deg	0-359.9	4		0.1	167	333		
	0 B 0	Selected Runway Heading	Deg	0-359.9	4		0.1	167	333		
0 2 0	0 2 0	Selected Vertical Speed	Ft/Min	±6000	4		1.0	100	200		6-25
	0 4 D	Tnk-LD SEL (LB)	Lbs	0-79999	5		1.0				
	0 A 1	Selected Vertical Speed	Ft/Min	±6000	4	Up	1.0	100	200		

ATTACHMENT 2A
DATA STANDARDS - BCD DATA

Label	Eqpt ID (Hex)	Parameter Name	Units	Range (Scale)	Sig Bits	Pos Sense	Resolution	Min Transit Interval (msec) 2	Max Transit Interval (msec) 2	Max Trans-port Delay (msec) 3	Notes & Cross Ref. to Tables and Attachments
0 2 1	0 0 2	Selected EPR	EPR	0-3	4		0.001	100	200		
	0 0 2	Selected N1	RPM	0-3000	4		1	100	200		
	0 2 0	Selected EPR	EPR	0-3	4		0.001	100	200		
	0 2 0	Selected N1	RPM	0-3000	4		1	100	200		
	0 A 1	Selected EPR	EPR	0-3	3		0.001	100	200		
	0 A 1	Selected N1	RPM	0-3000	4		1	100	200		
0 2 2	0 2 0	Selected Mach	Mach	0-4	4		0.001	100	200		
	0 4 D	Qty-LD SEL (KG)	Kg	0-79999	5		1.0				
	0 A 1	Selected Mach	Mach	0-4	4		0.001	100	200		
0 2 3	0 2 0	Selected Heading	Deg	0-359	3		1.0	100	200		6-25
	0 4 D	Qty-Flt Deck (KG)	Kg	0-79999	5		1.0				
	0 A 1	Selected Heading	Deg	0-359	3		1.0	100	200		
0 2 4	0 1 1	Selected Course #1	Deg	0-359	3		1.0	167	333		6-25
	0 2 0	Selected Course #1	Deg	0-359	3		1.0	167	333		
	0 A 1	Selected Course #1	Deg	0-359	3		1.0	167	333		
	0 B 1	Selected Course #1	Deg	0-359	3		1.0	167	333		
0 2 5	0 2 0	Selected Altitude	Feet	0-50000	5		1.0	100	200		6-25
	0 A 1	Selected Altitude	Feet	0-50000	5		1.0	100	200		
0 2 6	0 0 3	Selected Airspeed	Knots	30-450	3		1.0	100	200		6-25
	0 2 0	Selected Airspeed	Knots	30-450	3		1.0	100	200		
	0 A 1	Selected Airspeed	Knots	30-450	3		1.0	100	200		
0 2 7	0 0 2	TACAN Selected Course	Deg	0-359	3		1.0	167	333		
	0 1 1	Selected Course #2	Deg	0-359	3		1.0	167	333		
	0 2 0	Selected Course #2	Deg	0-359	3		1.0	167	333		
	0 4 D	Total-Flt Deck (KG)	Kg	0-79999	5		1.0				
	0 5 6	TACAN Selected Course	Deg	0-359	3		1.0	167	333		
	0 6 0	TACAN Selected Course (BCD)	Deg	0-359	3		1.0	167	333		
	0 A 1	Selected Course #2	Deg	0-359	3		1.0	167	333		
	0 B 1	Selected Course #2	Deg	0-359	3		1.0	167	333		
0 3 0	0 2 0	VHF COM Frequency		See Sect. 3				100	200		6-45
	0 2 4	VHF COM Frequency		See Sect. 3				100	200		
	0 4 D	TNK-LD SEL (KG)	Kg	0-79999	5		1.0				
	0 B 6	VHF COM Frequency		See Sect. 3				100	200		
0 3 1	0 2 0	Beacon Transponder Code		See Sect. 3				100	200		6-46
	0 B 8	Beacon Transponder Code		See Sect. 3				100	200		
				See Sect. 3							
0 3 2	0 1 2	ADF Frequency		See Sect. 3				100	200		6-40
	0 2 0	ADF Frequency		See Sect. 3				100	200		
	0 B 2	ADF Frequency		See Sect. 3				100	200		
				See Sect. 3							
0 3 3	0 0 2	ILS Frequency		See Sect. 3				167	333		6-44
	0 1 0	ILS Frequency		See Sect. 3				167	333		
	0 2 0	ILS Frequency		See Sect. 3				167	333		
	0 5 6	ILS Frequency		See Sect. 3				167	333		
	0 6 0	ILS Frequency		See Sect. 3				167	333		
	0 B 0	ILS Frequency		See Sect. 3				167	333		
0 3 4	0 0 2	VOR/ILS Frequency		See Sect. 3				167	333		6-44-1
	0 0 6	Baro Correction (mb) #3	mb	745-1050	5		0.1	62.5	125		
	0 1 1	VOR/ILS Frequency		See Sect. 3				167	333		
	0 2 0	VOR/ILS Frequency		See Sect. 3				167	333		
	0 5 6	VOR/ILS Frequency		See Sect. 3				167	333		
	0 6 0	VOR/ILS Frequency #1		See Sect. 3				167	333		
	0 B 0	VOR/ILS Frequency		See Sect. 3				167	333		

ATTACHMENT 2A
DATA STANDARDS - BCD DATA

Label	Eqpt ID (Hex)	Parameter Name	Units	Range (Scale)	Sig Bits	Pos Sense	Resolution	Min Transit Interval (msec) 2	Max Transit Interval (msec) 2	Max Trans-port Delay (msec) 3	Notes & Cross Ref. to Tables and Attachments
0 3 5	0 0 2	DME Frequency		See Sect. 3				100	200		6-41
	0 0 6	Baro Correction (ins of Hg) #3	ins Hg	22-31	5		0.001	62.5	125		
	0 0 9	DME Frequency		See Sect. 3				100	200		
	0 2 0	DME Frequency		See Sect. 3				100	200		
	0 5 5	Paired DME Frequency	MHz	108-135.9	4	**Always Positive**	0.05	**100**	**200**		
	0 5 6	DME Frequency		See Sect. 3				100	200		
	0 6 0	DME Frequency		See Sect. 3				100	200		
	0 A 9	DME Frequency		See Sect. 3				100	200		
				See Sect. 3							
0 3 6	0 0 2	MLS Frequency		See Sect. 3				100	200		
	0 2 0	MLS Frequency		See Sect. 3				100	200		
	0 5 5	MLS Channel Selection		500-6**99**	3	**Always Positive**	1	**100**	**200**		
	0 5 6	MLS Frequency Channel		See Sect. 3				100	200		
	0 6 0	MLS Frequency Channel		See Sect. 3				100	200		
	0 C 7	MLS Frequency		See Sect. 3				100	200		
0 3 7	0 2 0	HF COM Frequency		See Sect. 3				100	200		6-42
	0 B 9	HF COM Frequency		See Sect. 3				100	200		
0 4 1	0 0 2	Set Latitude	Deg/Min	180N/180S	6	N	0.1	250	500		
	0 0 4	Set Latitude	Deg/Min	180N/180S	6	N	0.1	250	500		
	0 2 0	Set Latitude	Deg/Min	180N/180S	6	N	0.1	250	500		
	0 5 6	Set Latitude	Deg/Min	180N/180S	6	N	0.1	250	500		
	0 6 0	Set Latitude	Deg/Min	180N/180S	6	N	0.1	250	500		
	0 A 4	Set Latitude	Deg/Min	180N/180S	6	N	0.1	250	500		
0 4 2	0 0 2	Set Longitude	Deg/Min	180E/180W	6	E	0.1	250	500		
	0 0 4	Set Longitude	Deg/Min	180E/180W	6	E	0.1	250	500		
	0 2 0	Set Longitude	Deg/Min	180E/180W	6	E	0.1	250	500		
	0 5 6	Set Longitude	Deg/Min	180E/180W	6	E	0.1	250	500		
	0 6 0	Set Longitude	Deg/Min	180E/180W	6	E	0.1	250	500		
	0 A 4	Set Longitude	Deg/Min	180E/180W	6	E	0.1	250	500		
0 4 3	0 0 2	Set Magnetic Heading	Deg	0-359	3		1.0	250	500		
	0 0 4	Set Magnetic Heading	Deg	0-359	3		1.0	250	500		
	0 2 0	Set Magnetic Heading	Deg	0-359	3		1.0	250	500		
	0 5 6	Set Magnetic Heading	Deg	0-359	3		1.0	250	500		
	0 6 0	Set Magnetic Heading	Deg	0-359	3		1.0	250	500		
	0 A 4	Set Magnetic Heading	Deg	0-359	3		1.0	250	500		
0 4 4	0 0 4	True Heading	Deg	0-359.9	4		0.1	250	500		
	0 3 8	True Heading	Deg	0-359.9	4		0.1	250	500		
0 4 5	0 0 3	Minimum Airspeed	Knots	0-259.9	4		0.1	62.5	125		
0 4 6	0 3 3	Engine Serial No. (LSDs)						500	1000		6-15
	1 0 A	Engine Serial No. (LSDs)						500	1000		6-15
	1 0 B	Engine Serial No. (LSDs)						500	1000		6-15
0 4 7	0 2 0	VHF Com Frequency	See Sect. 3					100	200		
	0 2 4	VHF Com Frequency	See Sect. 3					100	200		
	0 3 3	Engine Serial No. (MSDs)						500	1000		6-16
	1 0 A	Engine Serial No. (MSDs)						500	1000		6-16
	1 0 B	Engine Serial No. (MSDs)						500	1000		6-17
	0 B 6	VHF Com Frequency	See Sect. 3					100	200		
0 5 2	0 3 7	Long. Zero Fuel CG	% MAC	0-100.00	5		0.01	100	200		
0 5 3	0 0 5	Track Angle-Magnetic	Deg	0-359	3		1.0	250	500		

ATTACHMENT 2A
DATA STANDARDS - BCD DATA

Label	Eqpt ID (Hex)	Parameter Name	Units	Range (Scale)	Sig Bits	Pos Sense	Resolution	Min Transit Interval (msec) 2	Max Transit Interval (msec) 2	Max Trans-port Delay (msec) 3	Notes & Cross Ref. to Tables and Attachments
0 5 6	0 0 2	Estimated Time of Arrival	Hr:Min	0-23.59.9	5		0.1	250	500		
	0 0 5	Wind Direction - Magnetic	Deg	0-359	3		1.0	250	500		
	0 3 7	Gross Weight (Kilograms)	100 kg	0-19999	5		1.0	100	200		
	0 5 6	ETA (Active Waypoint)	Hr:Min	0-23.59.9	5		0.1	250	500		
	0 6 0	ETA (Active Waypoint)	Hr:Min	0-23.59.9	5		0.1	250	500		
0 6 0	0 2 5	S/G Hardware Part Number			4						6-36
	0 3 7	Tire Loading (Left Body Main)	%	0-299.9	4		0.1	100	200		
0 6 1	0 2 5	S/G Software Config. Part No.			4						6-37
	0 3 7	Tire Loading (Right Body Main)	%	0-299.9	4		0.1	100	200		
0 6 2	0 3 7	Tire Loading (Left Wing Main)	%	0-299.9	4		0.1	100	200		
0 6 3	0 3 7	Tire Loading (Right Wing Main)	%	0-299.9	4		0.1	100	200		
0 6 4	0 3 7	Tire Loading (Nose)	%	0-299.9	4		0.1	100	200		
0 6 5	0 0 3	Gross Weight	100 lb.	0-12000	5		1.0	100	200		
	0 3 7	Gross Weight	100 lb.	0-19999	5		1.0	100	200		
0 6 6	0 0 2	Longitudinal Center of Gravity	% MAC	0-100.00	5		0.01	500	1000		
	0 3 7	Longitudinal Center of Gravity	% MAC	0-100.00	5		0.01	100	200		
0 6 7	0 3 7	Lateral Center of Gravity	% MAC	0-100.00	5		0.01	100	200		
1 2 5	0 0 2	Universal Time Coordinate	Hr-Min	0-23.59.9	4		0.1	100	200		6-25
	0 0 B	UTC	Hr:Min	0-23:59.9	5		0.1	200	1200		
	0 3 1	Universal Time Coordinate	Hr: Min	0-23.59.9	5		0.1	100	200		
	0 5 6	Universal Time Coordinate	Hr-Min	0-23.59.9	4		0.1	100	200		
	0 6 0	Universal Time Coordinate (UTC)	Hr-Min	0-23.59.9	4		0.1	100	200		
1 3 5	0 5 A	ACT 1 Fuel Quan. Display	Kg/Lb	0-9999	4		100	100	200		
1 3 6	0 5 A	ACT 2 Fuel Quan. Display	Kg/Lb	0-9999	4		100	100	200		
1 3 7	0 5 A	Center+Act1+Act2 FQ Display	Kg/Lb	0-9999	4		100	100	200		
1 4 0	0 5 A	Actual Fuel Quan. Display	Kg/Lb	0-9999	4		100	100	200		
1 4 1	0 5 A	Preselect Fuel Quan. Display	Kg/Lb	0-9999	4		100	100	200		
1 4 2	0 5 A	Left Wing Fuel Quan. Display	Kg/Lb	0-9999	4		100	100	200		
1 4 3	0 5 A	Center Wing Fuel Quan. Display	Kg/Lb	0-9999	4		100	100	200		
1 4 4	0 5 A	Right Wing Fuel Quan. Display	Kg/Lb	0-9999	4		100	100	200		
1 5 5	0 2 7	MLS Selected GP Angle	Deg	0-359.9	4		0.1	100	200		
1 5 7	1 1 4	Trim Tank Probe Capacitance	pf	0-400	4		1.0				
1 6 3	0 3 7	Zero Fuel Weight (lb)	Lbs	0-19999	5		1.0	100	200		
1 6 5	0 0 7	Radio Height	Feet	±7999.9	5		0.1	25	200		6-25
1 7 0	0 2 5	Decision Height Selected (EFI)	Feet	±7000	4		1.0	100	200		6-25
	0 C 5	Decision Height Selected (EFI)	Feet	±7000	4		1.0	100	200		6-25
2 0 0	0 0 2	Drift Angle	Deg	±180	4		0.1	100	200		
	0 0 4	Drift Angle	Deg	±180	4		0.1	100	200		
	0 5 6	Drift Angle	Deg	±180	4		0.1	100	200		
	0 6 0	Drift Angle	Deg	±180	4		0.1	100	200		
2 0 1	0 0 9	DME Distance	NM	-1-399.99	5		0.01	83.3	167		6-1-1

ATTACHMENT 2A
DATA STANDARDS - BCD DATA

Label	Eqpt ID (Hex)	Parameter Name	Units	Range (Scale)	Sig Bits	Pos Sense	Resolution	Min Transit Interval (msec) 2	Max Transit Interval (msec) 2	Max Trans-port Delay (msec) 3	Notes & Cross Ref. to Tables and Attachments
	1 1 2	TACAN Distance	NM	0-399.99	5		0.01	190	210		
	1 1 5	DME Distance	NM	0-399.99	5		0.01	50	50		
2 0 5	0 0 2	HF COM Freq (New Format)									
	0 B 9	HF COM Freq (New Format)									
2 0 7	0 2 5	Operational Software Parts			4						6-37
2 3 0	0 0 6	True Airspeed	Knots	100-599	3		1.0	250	500		6-25
	0 3 8	True Airspeed	Knots	100-599	3		1.0	250	500		
2 3 1	0 0 6	Total Air Temperature	Deg C	-060+099	3		1.0	250	500		
	0 3 8	Total Air Temperature	Deg C	-060+099	3		1.0	250	500		
	1 1 4	Inner 2 Tank Probe Capacitance	pf	0-400	4		1.0				
2 3 2	0 0 4	Altitude Rate	Ft/Min	±20000	4	Up	10.0	31.3	62.5		6-25
	0 0 5	Altitude Rate	Ft/Min	±20000	4	Up	10.0	31.3	62.5		
	0 0 6	Altitude Rate	Ft/Min	±20000	4	Up	10.0	31.3	62.5		
	1 1 4	Inner 4 Tank Probe Capacitance	pf	0-400	4		1.0				
2 3 3	0 0 6	Static Air Temperature	Deg C	-099 to +060	3		1.0	250	500		6-25
	0 3 8	Static Air Temperature	Deg C	-099 to +060	3		1.0	250	500		
	1 1 4	Right Outer Probe Capacitance	pf	0-400	4		1.0				
2 3 4	0 0 6	Baro Correction (mb) #1	mb	745-1050	5		0.1	62.5	125		
	0 3 8	Baro Correction (mb) #1	mb	745-1050	5		0.1	62.5	125		
2 3 5	0 0 6	Baro Correction (ins of Hg) #1	ins Hg	22-31	5		0.001	62.5	125		6-25
	0 3 8	Baro Correction (ins of Hg) #1	ins Hg	22-31	5		0.001	62.5	125		6-25
2 3 6	0 0 6	Baro Correction (mb) #2	mb	745-1050	5		0.1	62.5	125		
	0 3 8	Baro Correction (mb) #2	mb	745-1050	5		0.1	62.5	125		
2 3 7	0 0 6	Baro Correction (ins of Hg) #2	ins Hg	22-31	5		0.001	62.5	125		
	0 3 8	Baro Correction (ins of Hg) #2	ins Hg	22-31	5		0.001	62.5	125		
2 4 3	0 3 7	Zero Fuel Weight (kg)	Kg	0-19999	5		1.0	100	200		
2 6 0	0 0 2	Date/Flight Leg	N/A					500	1000		
	0 0 B	Date	dd:mo:yr	dd:mm:yr	6		4				
	0 3 1	Date	N/A					100	200		6-18
	0 5 6	Date/Flight Leg	N/A					500	1000		
	0 6 0	Date/Flight Leg	N/A					500	1000		
	0 A 2	Date/Flight Leg	N/A					500	1000		
2 6 1	0 0 2	Flight Number	N/A	0-9999	4		1.0	500	1000		6-9
	0 A 2	Flight Number	N/A	0-9999	4		1.0	500	1000		
	0 5 6	Flight Number	N/A	0-9999	4		1.0	500	1000		
	0 6 0	Flight Number	N/A	0-9999	4		1.0	500	1000		
2 7 2	0 5 A	Fuel Density	Kg/cu.m.	0-9999	4		0.0001	100	200		ARINC 429 P2
2 7 3	0 5 A	Sensor Values Left Wing Tank	pF	0-100	3		100	200			
2 7 4	0 5 A	Sensor Values Center Wing Tank	pF	0-100	3		0.1	100	200		
2 7 5	0 5 A	Sensor Values Right Wing Tank	pF	0-100	3		0.1	100	200		
3 4 5	0 0 2	NDB Effectivity							1000		
3 5 0	1 1 4	Fuel Density	kg/l	0-.999	4		0.01				ARINC 429 P2
3 5 1	1 1 4	Inner Tank 1 Probe Capacitance	pf	0-400	3		0.1				ARINC 429 P2

ATTACHMENT 2A
DATA STANDARDS - BCD DATA

Label	Eqpt ID (Hex)	Parameter Name	Units	Range (Scale)	Sig Bits	Pos Sense	Resolution	Min Transit Interval (msec) 2	Max Transit Interval (msec) 2	Max Trans-port Delay (msec) 3	Notes & Cross Ref. to Tables and Attachments
3 5 2	1 1 4	Center, ACT &RCT Probe Capac.	pf	0-400	3		0.1				ARINC 429 P2
3 5 3	1 1 4	Inner Tank 3 Probe Capacitance	pf	0-400	3		0.1				ARINC 429 P2

ATTACHMENT 2B
DATA STANDARDS - BNR DATA

Label	Eqpt ID (Hex)	Parameter Name	Units	Range (Scale)	Sig Bits	Pos Sense	Resolution	Min Transit Interval (msec) 2	Max Transit Interval (msec) 2	Max Trans-port Delay (msec) 3	Notes & Cross Ref. to Tables and Attachments
0 0 5	0 D 0	Engine Discrete									Bit 11-Chan. A/ Bit 12-Chan. B
0 2 5	0 4 D	Load SEL Control	NA	204700	11		100				
0 3 4	0 2 5	VOR/ILS Frequency						125	250		
0 3 5	0 2 5	DME Frequency						125	250		
0 5 2	0 0 4	Body Pitch Acceleration	Deg/Sec^2	± 64	15		0.002	50 Hz	117 Hz		
	0 3 8	Body Pitch Acceleration	Deg/Sec^2	± 64	15		0.002	50 Hz	117 Hz		
0 5 3	0 0 4	Body Roll Acceleration	Deg/Sec^2	± 64	15		0.002	50 Hz	117 Hz		
	0 3 8	Body Roll Acceleration	Deg/Sec^2	± 64	15		0.002	50 Hz	117 Hz		
0 5 4	0 0 4	Body Yaw Acceleration	Deg/Sec^2	± 64	15		0.002	50 Hz	117 Hz		
	0 3 7	Zero Fuel Weight (Kg)	Kg	655360	15		20	100	200		
	0 3 8	Body Yaw Acceleration	Deg/Sec^2	± 64	15		0.002	50 Hz	117 Hz		
0 6 0	0 3 C	Tire Pressure (Left Outer)	PSIA	1024	10		1.0	50	250		
0 6 1	0 0 2	ACMS Information									6-29
	0 0 B	Pseudo Range	Meters	± 268435456	20		256	200	1200		
	0 3 C	Tire Pressure (Left Inner)	PSIA	1024	10		1.0	50	250		
	0 5 6	ACMS Information									
	0 6 0	ACMS Information									
0 6 2	0 0 2	ACMS Information									6-29
	0 0 B	Pseudo Rang Fine	Meters	256	11		0.125	200	1200		
	0 3 C	Tire Pressure (Right Inner)	PSIA	1024	10		1.0	50	250		
	0 5 6	ACMS Information									
	0 6 0	ACMS Information									
0 6 3	0 0 2	ACMS Information									6-29
	0 0 B	Range Rate	M/S	± 4096	20		0.0039	200	1200		
	0 3 C	Tire Pressure (Right Outer)	PSIA	1024	10		1.0	50	250		
	0 5 6	ACMS Information									
	0 6 0	ACMS Information									
0 6 4	0 0 B	Delta Range	Meters	± 4096	20		0.0039	200	1200		
	0 3 C	Tire Pressure (Nose)	PSIA	1024	10		1.0	50	250		
0 6 5	0 0 B	SV Position X	Meters	±67108864	20		64	200	1200		
0 6 6	0 0 B	SV Position X Fine	Meters	64	14		0.0039	200	1200		
0 7 0	0 0 2	Reference Airspeed (Vref)	Knots	512	11		0.25	500	1000	1000	
	0 0 B	SV Position X	Meters	±67108864	20		64	200	1200		
	0 2 9	AC Frequency (Engine)	Hz	512	11		0.25	100	200		
	0 3 7	Hard Landing Magnitude #1	Lbs		12		-	100	200		
	0 5 6	Reference Airspeed (Vref)	Knots	512	11		0.25	500	1000	1000	
	0 6 0	Reference Airspeed (Vref)	Knots	512	11		0.25	500	1000	1000	
	0 C C	Brakes - Metered Hyd. Pres. L (Normal)	PSIG	4096	12		1	50	100		#1 & 2 coded in SDI
0 7 1	0 0 2	Take-Off Climb Airspeed (V2)	Knots	512	11		0.25	500	1000	50	
	0 0 B	SV Position Y Fine	Meters	64	14		0.0039	200	1200		
	0 2 9	AC Frequency (Engine)	Hz	512	11		0.25	100	200		
	0 3 3	VBV	Deg	64	12		0.016	150	250		
	0 3 7	Hard Landing Magnitude #2	Lbs		12		-	100	200		
	0 C C	Brakes-Metered Hyd.Pres.L (alt.)	PSIG	4096	12		1	50	100		#1 & 2 coded in SDI
0 7 2	0 0 2	Rotation Speed (VR)	Knots	512	11		0.25	500	1000	1000	Revised by Supp 11
	0 0 B	SV Position Z	Meters	±67108864	20		64	200	1200		
	0 1 C	Stator Vane Angle	Deg/180	±180	11		0.1	100	200		

ATTACHMENT 2B
DATA STANDARDS - BNR DATA

Label	Eqpt ID (Hex)	Parameter Name	Units	Range (Scale)	Sig Bits	Pos Sense	Resolution	Min Transit Interval (msec) 2	Max Transit Interval (msec) 2	Max Trans-port Delay (msec) 3	Notes & Cross Ref. to Tables and Attachments
	0 2 9	AC Voltage (Engine)	Volts	256	10		0.25	100	200		
	0 2 F	Stator Vane Angle	Deg/180	±180	11		0.1	100	200		
	0 3 3	Stator Vane Angle	Deg	64	12		0.016	150	250		See Note [4]
	0 C C	Brakes-Metered Hyd.Pres.R (normal)	PSIG	4096	12		1	50	100		#1 &2 coded in SDI
0 7 3	0 0 2	V1 (critical engine failure speed)	Knots	512	11		0.25	100	200		
	0 0 B	SV Position Z Fine	Meters	64	14		0.0039	200	1200		
	0 1 C	Oil Quantity	cc	32768	8		128	100	200		
	0 2 9	Oil Quantity	US Pint	128	9		0.25	100	200		
	0 A 2	V2 (critical engine failure speed)	Knots	512	11		0.25	100	200		
	0 C C	Brakes-Metered Hyd.Pres.R (alt.)	PSIG	4096	12		1	50	100		#1 & 2 coded in SDI
	0 D 0	Engine Oil Quantity	US Pint	128	9		0.25				SDI 1=L/SDI 2=R
0 7 4	0 0 2	Zero Fuel Weight	Lbs	1310720	15		40	500	1000	1000	
	0 0 B	UTC Measure Time	Seconds	10.0	20		9.536743µs	200	1200		
	0 2 C	Zero Fuel Weight	Lbs	1310720	15		40	100	400		
	0 3 3	LP Compressor Bleed Pos. (3.0)	Inches	4	10		0.004	100	200		See Note [5]
	0 3 7	Zero Fuel Weight (lb)	Lbs	1310720	15		40	100	200		
	0 5 6	Zero Fuel Weight	Lbs	1310720	15		40	500	1000	1000	
	0 6 0	Zero Fuel Weight	Lbs	1310720	15		40	500	1000	1000	
	1 1 4	Zero Fuel Weight	Lbs	1310720	15		40	100	400		
0 7 5	0 0 2	Gross Weight	Lbs	1310720	15		40	100	200		
	0 0 3	Gross Weight	Lbs	1310720	15		40	100	200		
	0 0 B	Geodetic Altitude	Feet	131072	17		1.0	500	1000		
	0 2 9	AC Voltage (Alt. Sources)	Volts	256	10		0.25	100	200		
	0 2 C	Gross Weight	Lbs	1310720	15		40	100	200		
	0 3 7	Gross Weight	Lbs	1310720	15		40	100	200		
	0 3 E	Gross Weight	Lbs	1310720	15		40	100	200		
	1 1 4	Aircraft Gross Weight	Lbs	1310720	15		40	100	400		
0 7 6	0 0 B	GPS Height Above Ref.Ellipsoid	Feet	131072	17		1.0	25	50		
	0 0 B	GNSS Altitude (Msl)	Feet	±131072	20		0.125	200	1200		
	0 2 9	AC Voltage (Bus Bar)	Volts	256	10		0.25	100	200		
	0 3 7	Longitudinal Center of Gravity	% MAC	163.84	14		0.01	100	200		
	0 3 E	Longitudinal Center of Gravity	%	164	14		0.01	100	200		
	1 1 4	Aircraft Longitudinal Center of Gravity	Percent	163.84	14		0.01	100	200		
0 7 7	0 - -	Lateral Center of Gravity	MLb-in	128	17		0.001	100	200		
	0 0 2	Target Airspeed	Knots	512	11		0.25	100	200		
	0 0 B	GPS Hor/Vert Deviation	% F.S.	128	8		0.8	25	50		Revised by Supp 11
	0 2 9	AC Load (Engine)	%	256	8		1.0	100	200		
	0 3 7	Lateral Center of Gravity	% MAC	131.072	17		0.01	100	200		
	0 5 6	Target Airspeed	Knots	512	11		0.25	100	200		
	0 6 0	Target Airspeed	Knots	512	11		0.25	100	200		
	1 1 4	Zero Fuel Center of Gravity	Percent	163.84	14		0.01	100	200		
1 0 0	0 0 1	Selected Course #1	Deg/180	±180	12		0.05	167	333		6-27
	0 0 2	Selected Course #1	Deg/180	±180	12		0.05	167	333		
	0 1 1	Selected Course #1	Deg/180	±180	12		0.05	167	333		
	0 2 0	Sleected Course #1	Deg/180	±180	12		0.05	167	333		
	0 2 9	AC Load (Alt. Source)	%	128	8		1.0	100	200		
	0 5 6	Selected Course #1	Deg/180	±180	12		0.05	167	333		
	0 6 0	Selected Course #1	Deg/180	±180	12		0.05	167	333		
	0 3 7	Gross Weight (Kilogram)	Kilograms	655360	15		20	100	200		
	0 A 1	Selected Course #1	Deg/180	±180	12		0.05	167	333		
	0 B 1	Selected Course #1	Deg/180	±180	12		0.05	167	333		
	0 B B	Outboard Flaps - PDU	Deg/180	±180	12		0.05	20	100		
1 0 1	0 0 2	Selected Heading	Deg/180	±180	12		0.05	31.3	62.5		
	0 0 B	HDOP	N/A	1024	15		0.031	200	1200		
	0 2 0	Selected Heading	Deg/180	±180	12		0.05	31.3	62.5		
	0 2 5	Selected Heading	Deg/180	±180	12		0.05	125	250		
	0 2 9	DC Current (TRU)	Amperes	256	8		1.0	100	200		

ATTACHMENT 2B
DATA STANDARDS - BNR DATA

Label	Eqpt ID (Hex)	Parameter Name	Units	Range (Scale)	Sig Bits	Pos Sense	Resolution	Min Transit Interval (msec) 2	Max Transit Interval (msec) 2	Max Trans-port Delay (msec) 3	Notes & Cross Ref. to Tables and Attachments
	0 5 A	FQIC	Lbs	4-65532	14		4	900	1100		
	0 A 1	Selected Heading	Deg/180	±180	12		0.05	31.3	62.5		
	0 B B	Inboard Flaps - PDU	Deg/180	±180	12		0.05	20	100		
	1 1 4	C/G Target	%	164	8		0.01	100	200		
1 0 2	0 0 2	Selected Altitude	Feet	65536	16		1.0	100	200		6-27
	0 0 B	VDOP	N/A	1024	15		0.031	200	1200		
	0 2 0	Selected Altitude	Feet	65536	16		1.0	100	200		
	0 2 9	DC Current (Battery)	Amperes	256	8		1.0	100	200		
	0 5 6	Selected Altitude	Feet	65536	16		1.0	100	200		
	0 6 0	Selected Altitude	Feet	65536	16		1.0	100	200		
	0 A 1	Selected Altitude	Feet	65536	16		1.0	100	200		
1 0 3	0 0 1	Selected Airspeed	Knots	512	11		0.25	100	200		6-27
	0 0 2	Selected Airspeed	Knots	512	11		0.25	100	200		
	0 0 3	Selected Airspeed	Knots	512	11		0.25	100	200		
	0 0 B	GNSS Track Angle	Deg	±108	15		0.0055	200	1200		
	0 1 B	Left/PDU Flap	Deg/180	±180	18		0.000687	100	200		
	0 2 0	Selected Airspeed	Knots	512	11		0.25	100	200		
	0 2 9	DC Voltage (TRU)	Volts	128	9		0.25	100	200		
	0 5 6	Selected Airspeed	Knots	512	11		0.25	100	200		
	0 6 0	Selected Airspeed	Knots	512	11		0.25	100	200		
	0 A 1	Selected Airspeed	Knots	512	11		0.25	100	200		
	0 B B	Left Outboard Flap Position	Deg/180	±180	12		0.05	20	100		
1 0 4	0 0 1	Selected Vertical Speed	Ft/Min	16384	10	UP	16	100	200		6-27
	0 0 2	Selected Vertical Speed	Ft/Min	16384	10	UP	16	100	200		
	0 1 B	Right/PDU Flap	Deg/180	±180	18		0.000687	100	200		
	0 2 0	Selected Vertical Speed	Ft/Min	16384	10	UP	16	100	200		
	0 2 9	DC Voltage (Battery)	Volts	128	9		0.25	100	200		
	0 2 B	Selected Vertical Speed	Ft/Min	16384	14	UP	1	100	200		
	0 5 6	Selected Vertical Speed	Ft/Min	16384	10	UP	16	100	200		
	0 6 0	Selected Vertical Speed	Ft/Min	16384	10	UP	16	100	200		
	0 A 1	Selected Vertical Speed	Ft/Min	16384	10	UP	16	100	200		
	0 B B	Right Outboard Flap Position	Deg/180	±180	12		0.05	20	100		
1 0 5	0 0 2	Selected Runway Heading	Deg/180	±180	11		0.1	167	333		
	0 1 0	Selected Runway Heading	Deg/180	±180	11		0.1	167	333		
	0 1 B	Left/PDU Slat	Deg/180	±180	18		0.000687	100	200		
	0 2 0	Selected Runway Heading	Deg/180	±180	11		0.1	167	333		
	0 2 9	Oil Temp. Input (IDG/CSD)	Deg C	2048	12		0.5	100	200		
	0 5 5	Selected Runway Heading	Deg	±180	11	**CW-N**	0.1	**167**	**333**		
	0 5 6	Selected Runway Heading	Deg/180	±180	11		0.1	167	333		
	0 6 0	Selected Runway Heading	Deg/180	±180	11		0.1	167	333		
	0 A 1	Selected Runway Heading	Deg/180	±180	11		0.1	167	333		
	0 B 0	Selected Runway Heading	Deg/180	±180	11		0.1	167	333		
	0 B B	Left Inboard Flap Position	Deg/180	±180	12		0.05	20	100		
1 0 6	0 0 2	Selected Mach	Mach	4096	12		1	31.3	200		6-27
	0 1 B	Right/PDU Slat	Deg/180	±180	18		0.000687	100	200		
	0 2 0	Selected Mach	Mach	4096	12		0.5	100	200		
	0 2 9	Oil Temp. Input (IDG/CSD)	Deg C	2048	12		0.5	100	200		
	0 5 6	Selected Mach	Mach	4096	12		1	31.3	200		
	0 6 0	Selected Mach	Mach	4096	12		1	31.3	200		
	0 A 1	Selected Mach	Mach	4096	12		1	31.3	62.5		
	0 B B	Right Inboard Flap Position	Deg/180	±180	12		0.05	20	100		
1 0 7	0 0 2	Selected Cruise Altitude	Feet	65536	16	UP	1	100	200		
	0 1 B	Flap/Slat Lever	Deg/180	±180	18		0.000687	100	200		
	0 B B	Flap Lever Position-median value	Deg/180	±180	18		0.000687	100	200		
	0 3 7	Long. Zero Fuel Ctr of Gravity	% MAC	163.84	14		0.01	100	200		
	0 5 6	Selected Cruise Altitude	Feet	65536	16	UP	1	100	200		
	0 6 0	Selected Cruise Altitude	Feet	65536	16	UP	1	100	200		
1 1 0	0 0 1	Selected Course #2	Deg/180	±180	12		0.05	167	333		

ATTACHMENT 2B
DATA STANDARDS - BNR DATA

Label	Eqpt ID (Hex)	Parameter Name	Units	Range (Scale)	Sig Bits	Pos Sense	Resolution	Min Transit Interval (msec) 2	Max Transit Interval (msec) 2	Max Trans-port Delay (msec) 3	Notes & Cross Ref. to Tables and Attachments
	0 0 2	Selected Course #2	Deg/180	±180	12		0.05	167	333		
	0 0 B	GNSS Latitude	Deg	±180	20		0.000172	200	1200		
	0 1 0	Selected Course #2	Deg/180	±180	12		0.05	167	333		
	0 1 1	Selected Course #2	Deg/180	±180	12		0.05	167	333		
	0 2 0	Selected Course #2	Deg/180	±180	12		0.05	167	333		
	0 A 1	Selected Course #2	Deg/180	±180	12		0.05	167	333		
	0 B 1	Selected Course #2	Deg/180	±180	12		0.05	167	333		
	0 B B	Flap Lever Position - Center	Deg/180	180	18		0.000687	80	160		
1 1 1	0 0 B	GNSS Longitude	Deg	±180	20		0.000172	200	1200		
1 1 2	0 0 2	Runway Length	Feet	20480	11		10	250	500		
	0 0 B	GNSS Ground Speed	Knots	4096	15		0.125	200	1200		
	0 A 1	Selected EPR		4	12		0.001	100	200		
	0 A 1	Selected N1	RPM	4096	12		1	100	200		
	0 B B	Flap Lever Position - Left	Deg/180	±180	18		0.000687	80	160		
1 1 4	0 0 2	Desired Track	Deg/180	±180	12		0.05	100	200		6-27
	0 2 9	Brake Temp. (Left Inner L/G)	Deg C	2048	11		1	100	200		
	0 2 F	Ambient Pressure	PSIA	32	14		0.002	100	200		
	0 3 F	Pamb Sensor	PSIA	32	14		0.002	100	200		
	0 5 5	**Lateral Protection Level**	**Meters**	**0 – 163.83**	**14**	**Always Positive**	**0.01**	**66.6**	**240**		
	0 5 6	Desired Track	Deg/180	±180	12		0.05	100	200		
	0 6 0	Desired Track	Deg/180	±180	12		0.05	100	200		
	0 B B	Flap Lever Position - Right	Deg/180	±180	18		0.000687	80	160		
	0 C C	Wheel Torque Output	Lb./Ft.	16384	12		4	50	100		No. 5 to 8 in SDI
	1 0 A	Selected Ambient Static Pressure	PSIA	1.5-20.0	11		0.016	100	500		
	1 0 B	Selected Ambient Static Pressure	PSIA	1.5-20.0	11		0.016	100	500		
	1 3 A	Ambient Pressure	PSIA	32	14		0.002	100	200		
1 1 5	0 0 2	Waypoint Bearing	Deg/180	±180	12		0.05	31.3	62.5		
	0 2 9	Brake Temp. (Left Outer L/G)	Deg C	2048	11		1	100	200		
	0 2 F	Fuel Temperature	Deg C	512	11		0.25	100	200		
	0 3 F	Fuel Temperature	Deg C	512	11		0.25	100	200		
	0 5 5	**Vertical Protection Level**	**Meters**	**0 – 163.83**	**14**	**Always Positive**	**0.01**	**66.6**	**240**		
	0 5 6	Waypoint Bearing	Deg/180	±180	12		0.05	31.3	62.5		
	0 6 0	Waypoint Bearing	Deg/180	±180	12		0.05	31.3	62.5		
	0 B C	Fuel Temperature	Deg C	256	8		1	500	1000		
	0 C C	Wheel Torque Output	Lb./Ft.	16384	12		4	50	100		No. 1 to 4 in SDI – 6-26
1 1 6	0 0 2	Cross Track Distance	NM	128	15		0.004	31.3	62.5		6-27
	0 0 B	Horizontal GLS Deviation Rectilinear	Feet	24000	18		0.00915		100		
	0 2 9	Brake Temp. (Right Inner L/G)	Deg C	2048	11		1	100	200		
	0 5 5	Horizontal GLS Deviation Rectilinear	Feet	±24000	18	**Fly Right**	0.00915	**33.3**	**66.6**		
	0 5 6	Cross Track Deviation	NM	128	15		0.004	31.3	62.5		
	0 6 0	Cross Track Deviation	NM	128	15		0.004	31.3	62.5		
	0 C C	Wheel Torque Output	Lb./Ft.	16384	12		4	50	100		No. 9 to 12 in SDI – 6-26
1 1 7	0 0 2	Vertical Deviation	Feet	2048	11		1.0	31.3	62.5		6-27
	0 0 B	Vertical GLS Deviation Rectilinear	Feet	1024	14		0.0625		100		
	0 2 9	Brake Temp. (Right Outer L/G)	Deg C	2048	11		1	100	200		
	0 5 5	Vertical GLS Deviation Rectilinear	Feet	±1024	14	**Fly Down**	0.0625	**33.3**	**66.6**		
	0 5 6	Vertical Deviation	Feet	2048	11		1.0	31.3	62.5		
	0 6 0	Vertical Deviation	Feet	2048	11		1.0	31.3	62.5		
	0 C C	Wheel Torque Output	Lb./Ft.	16384	12		4	50	100		No. 13 to 16 in SDI – 6-26
1 2 0	0 0 2	Range to Altitude	NM	512	15		0.016	25	50		
	0 0 B	GNSS Latitude Fine	Deg	0.000172	11		8.38-E-8	200	1200		
	0 5 6	Range to Altitude	NM	512	15		0.016	25	50		
	0 6 0	Range to Altitude	NM	512	15		0.016	25	50		

ATTACHMENT 2B
DATA STANDARDS - BNR DATA

Label	Eqpt ID (Hex)	Parameter Name	Units	Range (Scale)	Sig Bits	Pos Sense	Resolution	Min Transit Interval (msec) 2	Max Transit Interval (msec) 2	Max Trans-port Delay (msec) 3	Notes & Cross Ref. to Tables and Attachments
1 2 1	0 0 2	Horizontal Command Signal	Deg/180	±180	14		0.01	50	100		
	0 0 B	GNSS Longitude Fine	Degrees	0.000172	11		8.38-E-8 °	200	1200		
	0 2 5	Pitch Limit	Deg/180	±180	14		0.01	125	250		
	0 5 6	Horizontal Command Signal	Deg/180	±180	14		0.01	50	100		
	0 6 0	Horizontal Command Signal	Deg/180	±180	14		0.01	50	100		
1 2 2	0 0 2	Vertical Command Signal	Deg/180	±180	12		0.05	500	100		
	0 5 6	Vertical Command Signal	Deg/180	±180	12		0.05	500	100		
	0 6 0	Vertical Command Signal	Deg/180	±180	12		0.05	500	100		
1 2 3	0 0 2	Throttle Command	Deg/Sec	256	18		0.001	50	100		
1 2 4	0 A 5	Client Device for GNSS Receiver	Meters	8192	13		1		200		6-49
	1 E 2	Horizontal Alarm Limit	Meters	0-8190	13		1	800	1200		
1 2 6	0 0 2	Vertical Deviation (wide)	Feet	32768	15	above sel alt	1.0	31.3	62.5		
	0 5 6	Vertical Deviation	Feet	32768	15	above sel alt	1.0	31.3	62.5		
	0 6 0	Vertical Deviation	Feet	32768	15	above sel alt	1.0	31.3	62.5		
1 2 7	0 0 2	Selected Landing Altitude	Feet	65536	16	UP	1	100	200		
	0 1 B	Slat Angle	Deg/180	±180	12		0.05	100	200		6-11
	0 3 3	P14	PSIA	32	14		0.002	100	200		
	0 5 5	**FAS Vertical Alarm Limit**	**Meters**	**0 – 102.3**	**10**	**Always Positive**	**0.1**	**66.6**	**240**		
	1 0 A	Fan Discharge Static Pressure	PSIA	1.5 - 30.0	11		0.016	100	500		
	1 0 B	Fan Discharge Static Pressure	PSIA	1.5 - 30.0	11		0.016	100	500		
	1 E 2	Vertical Alarm Limit	Meters	0-255	8		1	800	1200		6-50
1 3 0	0 0 B	Aut Horiz Integ Limit	NM	16	17		1.2E-4	200	1200		
	0 1 A	Fan Inlet Total Temperature	Deg C	128	11		0.06	100	200		
	0 1 C	Fan Inlet Total Temperature	Deg C	128	11		0.06	100	200		
	0 2 F	Fan Inlet Total Temperature	Deg C	128	11		0.06	100	200		
	0 3 5	Intruder Range							500		6-21 and ARINC 735
	0 3 F	Fan Inlet Total Temperature	Deg C	128	11		0.06	100	200		
	0 5 5	**MLS Aux Data Part 1 Group A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**125**	**250**		
	1 0 A	Selected Total Air Temperature	Deg C	-80 to 90	10		0.125	100	500		
	1 0 B	Selected Total Air Temperature	Deg C	-80 to 90	10		0.125	100	500		
	1 3 A	Inlet Temperature	Deg C	128	11		0.0625	100	200		
1 3 1	0 1 A	Fan Inlet Total Pressure	PSIA	32	13		0.004	100	200		
	0 1 C	Fan Inlet Total Pressure	PSIA	32	13		0.004	100	200		
	0 2 D	Fan Inlet Total Pressure	PSIA	32	13		0.004	100	200		
	0 2 F	Fan Inlet Total Pressure	PSIA	32	13		0.004	100	200		
	0 3 3	Fan Inlet Total Pressure	PSIA	32	13		0.004	100	200		
	0 3 5	Intruder Altitude							500		6-22 and ARINC 735
	0 5 5	**MLS Aux Part 2 Group A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**125**	**250**		
	1 3 A	Inlet Pressure	PSIA	32	13		0.004	100	200		
1 3 2	0 1 A	Exhaust Gas Total Pressure	PSIA	32	13		0.004	100	200		
	0 1 C	Exhaust Gas Total Pressure	PSIA	32	13		0.004	100	200		
	0 3 3	Exhaust Gas Total Pressure	PSIA	32	14		0.002	100	250		
	0 3 5	Intruder Bearing							500		6-23 and ARINC 735
	0 5 5	**MLS Aux Part 3 Group A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**125**	**250**		
1 3 3	0 0 B	Aut Vert Integ Limit	Feet	32,768	18		0.125	200	1200		
	0 1 A	Thrust Lever Angle	Deg/180	±180	12		0.05	100	250		
	0 2 F	Thrust Lever Angle	Deg/180	±180	12		0.05	25	50		
	0 3 F	Thrust Lever Angle	Deg/180	±180	12		0.05	25	50		
	0 5 5	**MLS Aux Part 4 Group A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**125**	**250**		
	1 0 A	Selected Throttle Lever Angle	Deg	90	11		0.088	31.3	100		

ATTACHMENT 2B
DATA STANDARDS - BNR DATA

Label	Eqpt ID (Hex)	Parameter Name	Units	Range (Scale)	Sig Bits	Pos Sense	Resolution	Min Transit Interval (msec) 2	Max Transit Interval (msec) 2	Max Trans-port Delay (msec) 3	Notes & Cross Ref. to Tables and Attachments
	1 0 B	Selected Throttle Lever Angle	Deg	90	11		0.088	31.3	100		
1 3 4	0 1 C	Power Lever Angle	Deg/180	±180	12		0.05	100	200		
	0 5 5	**MLS Aux Part 1 Group B**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**125**	**250**		
	1 0 A	Throttle Lever Angle	Deg	±128	11		0.088	500	1000		
	1 0 B	Throttle Lever Angle	Deg	±128	11		0.088	500	1000		
	1 3 A	Throttle Lever Angle	Deg/180	±180	12		0.05	25	50		
1 3 5	0 1 C	Engine Vibration #1	in/sec	8	12		0.002	100	200		
	0 2 9	Engine Fan Vibration	% FS	128	7		1	100	200		
	0 5 5	**MLS Aux Part 2 Group B**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**125**	**250**		
1 3 6	0 0 B	Vertical Figure of Merit	Feet	32,768	18		0.125	200	1200		
	0 1 C	Engine Vibration #2	in/sec	8	12		0.002	100	200		
	0 5 5	**MLS Aux Part 3 Group B**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**125**	**250**		
1 3 7	0 1 B	Flap Angle	Deg/180	±180	12		0.05	100	200		6-11
	0 2 A	Flap Angle	Deg/180	±180	12		0.05	100	200		6-11
	0 2 F	Thrust Reverser Position Feedback	%	128	12		0.03	100	200		
	0 3 F	Thrust Reverser Position Feedback	%	128	12		0.03	100	200		
	0 5 5	**MLS Aux Part 4 Group B**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**125**	**250**		
	1 0 A	Selected Thrust Reverser Position	%	-5 to 105	11		0.063	62.5	250		
	1 0 B	Selected Thrust Reverser Position	%	-5 to 105	11		0.063	62.5	250		
	1 4 0	Flap Angle	Deg	180	12		0.05	62.5	200		6-11
1 4 0	0 0 1	Flight Director - Roll	Deg/180	±180	12		0.05	50	100		6-27
	0 0 B	UTC Fine	Seconds	1	20		0.953674µs	200	1200		
	0 2 5	Flight Director - Roll	Deg/180	±180	10		0.02	125	250		
	0 5 5	**MLS Aux Part 1 Group C**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**125**	**250**		
1 4 1	0 0 1	Flight Director - Pitch	Deg/180	±180	12		0.05	50	100		
	0 0 B	UTC Fine Fractions	Seconds	0.9536743µs	10		0.931225ns	200	1200		
	0 2 5	Flight Director - Pitch	Deg/180	±180	10		0.02	125	250		
	0 5 5	**MLS Aux Part 2 Group C**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**125**	**250**		
1 4 2	0 0 2	Flight Director - Fast/Slow	Knots	32	12		0.008	31.3	62.5		6-27
	0 0 3	Flight Director - Fast/Slow	Knots	32	12		0.008	31.3	62.5		
	0 2 5	Flight Director - Fast/Slow	Knots	32	8		0.125	125	250		
1 4 3	0 0 1	Flight Director - Yaw	Deg/180	±180	12		0.05	50	100		
	0 4 1	HPA Command Word									See ARINC 741
	2 4 1	HPA Response Word									See ARINC 741
1 4 4	0 2 B	Altitude Error	Feet	8192	14	Above Cmd Alt	1.0	25	50		
	0 4 1	ACU/BSU Control Word									See ARINC 741
	3 4 1	ACU/BSU Response Word									See ARINC 741
1 4 5	0 0 2	TACAN Control	See Sec. 3.1.4					180	220		6-30
1 4 6	1 1 2	TACAN Control	See Sec. 3.1.4					180	220		
1 4 7	X X X	TACAN Control Word						100	200		
1 5 0	0 0 2	Universal Time Coordinate									6-12
	0 0 B	UTC	Hr:Min:S	±23:59:59	17		1.0sec	200	1200		
	0 3 1	Universal Time Coordinate						100	200		6-12
	0 5 6	Universal Time Coordinate									6-12
	0 6 0	Universal Time Coordinate									6-12
1 5 1	0 0 2	Localizer Bearing (True)	Deg/180	±180	11		0.1	167	333		
	0 2 7	MLS Azimuth Deviation									
	0 5 5	MLS AZ Deviation	mV	± 2400	15	**Fly**	0.0732				

ATTACHMENT 2B
DATA STANDARDS - BNR DATA

Label	Eqpt ID (Hex)	Parameter Name	Units	Range (Scale)	Sig Bits	Pos Sense	Resolution	Min Transit Interval (msec) 2	Max Transit Interval (msec) 2	Max Trans-port Delay (msec) 3	Notes & Cross Ref. to Tables and Attachments
						Right					
	0 5 6	Localizer Bearing (True)	Deg/180	±180	11		0.1	167	333		
	0 6 0	Localizer Bearing (True)	Deg/180	±180	11		0.1	167	333		
1 5 2	0 2 7	MLS Elevation Deviation									
	0 3 8	Cabin Pressure	mB	2048	16		0.03125	62.5	125		
	0 4 1	Open Loop Steering									See ARINC 741
	0 5 5	MLS GP Deviation	mV	± 2400	15	**Fly Down**	0.0732				
	0 A D	Cabin Pressure	mB	2048	18		0.008	20	200		
1 5 3	0 0 2	Maximum Altitude	Feet	65536	16	Above S.L.	1	500	1000	100	
	0 4 1	Closed Loop Steering									See ARINC 741
	0 5 5	MLS Selected Azimuth	Deg	0-359	9		1				
1 5 4	0 0 2	Runway Heading (True)	NM	512	16		0.008	83.3	167		
	0 2 7	MLS Auxiliary Data									
	0 5 5	MLS Max Selectable GP	Deg	± 51.1	9		1				
	0 5 6	Runway Heading (True)	NM	512	16		0.008	83.3	167		
	0 6 0	Runway Heading (True)	NM	512	16		0.008	83.3	167		
1 5 5	0 5 5	MLS Selected Glide Path	Deg	± 51.1	9		0.01				
1 6 2	0 1 2	ADF Bearing	Deg/180	±180	12		0.05	31.3	62.5		
	0 2 5	ADF brg left/right	Deg/180	±180	12		0.05	125	250		SDI-01=left/SDI-10=right
	0 2 9	Crew Oxygen Pressure	PSI	4096	12		1	100	200		
	0 5 5	MLS Basic Data Word 5	N/A	N/A	N/A		N/A				
	1 4 0	Density Altitude	Feet	1131072	16		2	250	500		
1 6 4	0 0 2	Minimum Descent Altitude (MDA)	Feet	8192	16		0.125	500	1000		
	0 0 3	Target Height	Feet	8192	16		0.125	500	1000		
	0 0 7	Radio Height	Feet	8192	16		0.125	25	50		6-13/6-27
	0 2 5	Radio Height	Feet	8192	12		2.0	125	250		
	0 3 B	Radio Height	VDC	32	11		0.015	150	250		Per ARINC 522A
	0 5 5	MLS Absolute Glide Path Angle	Deg	± 41	15		0.00125	**25**	**66.6**		
1 6 5	0 0 B	Vertical Velocity	Feet/Min	± 32768	15		1.0	200	1200		
	0 5 5	MLS Absolute Azimuth Angle	Deg	± 82	16		0.00125	**25**	**100**		
1 6 6	0 0 7	RALT Check Point Dev	Feet	512	10		0.5	*	*		
	0 0 B	North/South Velocity	Knots	± 4096	15		0.125	200			
1 6 7	0 0 2	EPU Estimate Position Uncertainty (ANP) Actual Navigation Perf.	NM	0-128	16		0.00195				
	0 5 5	**FAS Vertical Alarm Limit**	**Meters**	**0 – 102.3**	**10**	**Always Positive**	**0.1**	**66.6**	**240**		
1 7 1	0 0 2	Required Navigation Performance (RNP)	NM	0-128	16		0.001953				
	0 A 5	Vertical Alarm Limit (VAL) and SBAS System Identifier	Meters	256	8		1		200		
	X X X	Manu. Specific Status Word									See Attachment 10
1 7 3	0 1 0	Localizer Deviation	DDM	0.4	12		0.0001	33.3	66.6		6-6/6-27
	0 2 5	Localizer Deviation	DDM	0.4	10		0.0004	125	250		
	0 2 9	Hydraulic Quantity	%	128	7		1	100	200		
	0 3 B	Localizer Deviation	Dots	4	11		0.002	150	250		
	0 5 5	Localizer Deviation	DDM	± 0.4	12	**Fly Right**	0.0001	**33.3**	**66.6**		
	0 B D	Hydraulic Quantity	%	128	7		1	500	1000		
	0 D 0	Hydraulic Oil Quantity	US Pint	128	9		0.25				SDI 1= A/SDI 2= B

ATTACHMENT 2B
DATA STANDARDS - BNR DATA

Label	Eqpt ID (Hex)	Parameter Name	Units	Range (Scale)	Sig Bits	Pos Sense	Resolution	Min Transit Interval (msec) 2	Max Transit Interval (msec) 2	Max Trans-port Delay (msec) 3	Notes & Cross Ref. to Tables and Attachments
1 7 4	0 0 3	Delayed Flap Approach Speed (DFA)	Knots	512	11		0.25	100	200		
	0 0 B	East/West Velocity	Knots	± 4096	15		0.125	200	1200		
	0 1 0	Glideslope Deviation	DDM	0.8	12		0.0002	33.3	66.6		6-6/6-27
	0 2 9	Hydraulic Pressure	PSI	4096	12		1	100	200		
	0 3 B	Glideslope Deviation	Dots	4	11		0.0002	150	250		6-6/6-27
	0 5 5	Glide Slope Deviation	DDM	± 0.8	12	**Fly Down**	0.0002	**33.3**	**66.6**		
	0 D 0	Hydraulic Oil Pressure	PSI	4096	12		1.0				SDI 1= A/SDI 2= B
1 7 5	0 0 3	Economical Speed	Knots	1024	14		0.06	62.5	125		
	0 2 9	EGT (APU)	Deg C	2048	11		1	100	200		
	0 3 3	Hydraulic Pump Case Drain Temp	Deg C	256	12		0.06	100	200		
1 7 6	0 0 3	Economical Mach	Mach	4096	13		0.5	62.5	125		
	0 2 9	RPM (APU)	% RPM	256	9		0.5	100	200		
	0 3 8	Left Static Pressure Uncorrected, mb	mb	2048	18		0.008	20	200		
	0 5 A	Fuel Temperature - Set to Zero	Deg. C	512	11		0.25	100	200		
	0 A D	Static Pressure Left, Uncorrected, mb	mb	2048	18		0.008	20	200		
	1 1 4	Left Outer Tank Fuel Temp & Advisory Warning	Deg	± 512	11		0.25				
1 7 7	0 0 3	Economical Flight Level	Feet	131072	17		1.0	31.3	62.5		
	0 2 9	Oil Quantity (APU)	US Pint	128	9		0.25	100	200		
	0 3 8	Right Static Pressure, Uncorrected, mb	mb	2048	18		0.008	20	200		
	0 5 5	Distance to LTP/FTP	Nmiles	± 512	16	**Positive**	0.007812	**83.3**	**167**		
	0 5 A	Fuel Temp. Left Wing Tank	Deg C	512	11		0.25	100	200		
	0 A D	Static Pressure Right, Uncorrected, mb	mb	2048	18		0.008	20	200		
	1 1 4	Inner Tank 1 Fuel Temp & Advisory Warning	Deg C	± 512	11		0.25				
2 0 0	1 1 4	Inner Tank 2 Fuel Temp & Advisory Warning	Deg C	± 512	11		0.25				
2 0 1	0 5 A	Fuel Temp. Right Wing Tank	Deg C	512	11		0.25	100	200		
	1 1 4	Inner Tank 3 Fuel Temp & Advisory Warning	Deg C	± 512	11		0.25				
	1 4 0	Mach Maximum Operation (Mmo)	Mach	4.096	12		0.001	62.5	125		
	1 4 2	Projected Future Latitude	Deg	± 180	20		0.000172	150	400		
2 0 2	0 0 2	Energy Management (clean)	NM	512	15		0.016	100	200		
	0 0 9	DME Distance	NM	512	16		0.008	83.3	167		6-7/6-27
	0 5 A	Fuel Temperature - Set to Zero	Deg C	512	11		0.25	100	200		
	1 1 4	Inner Tank 4 Fuel Temp & Advisory Warning	Deg C	± 512	11		0.025				
	1 4 0	Mach Rate	M/minute	4.096	12		0.001	62.5	125		
	1 4 2	Projected Future Latitude Fine	Deg	0.000172	11		2·E-32	150	400		
2 0 3	0 0 2	Energy Management Speed Brakes	NM	512	15		0.016	100	200		
	0 0 6	Altitude (1013.25 mb)	Feet	131072	17		1.0	31.3	62.5		6-24/6-27
	0 1 8	Altitude	Feet	131072	17		1.0	20	40		
	0 3 5	Own A/C Altitude	Feet	131072	17		1.0	20	500		
	0 3 8	Altitude (1013.25 mb)	Feet	131072	17		1.0	31.3	62.5		
	0 5 A	Fuel Tank #6 Temperature	Deg C	512	11		0.25	100	200		
	1 0 A	Ambient Static Pressure	PSIA	1.5 to 20.0	11		0.016	500	1000		
	1 0 B	Ambient Static Pressure	PSIA	1.5 to 20.0	11		0.016	500	1000		
	1 1 4	Trim Tank Fuel Temp & Advisory Warning	Deg C	± 512	11		0.25				
	1 4 0	Altitude	Feet	131072	17		1	31.25	62.5		
2 0 4	0 0 2	Utility Airspeed	Knots	512	11		0.25	500	1000	50	
	0 0 6	Baro Corrected Altitude #1	Feet	131072	17		1.0	31.3	62.5		
	0 3 8	Baro Corrected Altitude #1	Feet	131072	17		1.0	31.3	62.5		
	0 5 6	Baro Altitude	Knots	512	11		0.25	500	1000	50	

ATTACHMENT 2B
DATA STANDARDS - BNR DATA

Label	Eqpt ID (Hex)	Parameter Name	Units	Range (Scale)	Sig Bits	Pos Sense	Resolution	Min Transit Interval (msec) 2	Max Transit Interval (msec) 2	Max Trans-port Delay (msec) 3	Notes & Cross Ref. to Tables and Attachments
	0 5 A	Fuel Tank #7 Temperature	Deg C	512	11		0.25	100	200		
	0 6 0	Baro Altitude	Knots	512	11		0.25	500	1000	50	
	1 1 4	Right Outer Tank Fuel Temp & Advisory Warning	Deg C	± 512	11		0.25				
	1 4 0	Baro Corrected Altitude	Feet	131072	17		1	31.25	62.5		
2 0 5	0 0 6	Mach	Mach	4.096	16		0.0000625	62.5	125		6-27
	0 1 A	Mach	Mach	4.096	16		0.0000625	62.5	125		6-27
	0 3 8	Mach	Mach	4.096	16		0.0000625	62.5	125		6-27
	0 5 A	Fuel Tank #8 Temperature	Deg C	512	11		0.25	100	200		
	1 0 A	Mach Number	Mach	1	11		0.002	100	500		
	1 0 B	Mach Number	Mach	1	11		0.002	100	500		
	1 4 0	Mach	Mach	4.096	16		0.00000625	62.5	125		
2 0 6	0 0 6	Computed Airspeed	Knots	1024	14		0.0625	62.5	125		6-27
	0 1 8	Altitude (Variable Resolution)	Feet	Variable	15		Variable	31.3	62.5		6-20
	0 3 8	Computed Airspeed	Knots	1024	14		0.0625	62.5	125		
	0 C C	Taxi Speed	Knots	512	11		0.25	50	100		
	1 4 0	Computed Airspeed (CAS)	Knots	1024	14		0.0625	62.5	125		
2 0 7	0 0 6	Maximum Allowable Airspeed	Knots	1024	12		0.25	62.5	125		
	0 0 A	Maximum Allowable Airspeed	Knots	512	11		0.25	100	200		
	0 3 8	Maximum Allowable Airspeed	Knots	1024	12		0.25	62.5	125		
	1 4 0	Airspeed Maximum Operating (VMO)	Knots	1024	12		0.25	62.56	125		
2 1 0	0 0 6	True Airspeed	Knots	2048	15		0.0625	62.5	125		6-27
	0 3 8	True Airspeed	Knots	2048	15		0.0625	62.5	125		
	1 4 0	True Airspeed	Knots	2048	15		0.0625	62.5	125		
2 1 1	0 0 2	Total Air Temperature	Deg C	512	11		0.25	250	500		6-27
	0 0 3	Total Air Temperature	Deg C	512	11		0.25	250	500		
	0 0 6	Total Air Temperature	Deg C	512	11		0.25	250	500		
	0 1 A	Total Air Temperature	Deg C	512	11		0.25	250	500		
	0 3 8	Total Air Temperature	Deg C	512	11		0.25	250	500		
	0 A D	Total Air Temperature Indicated	Deg C	512	12		0.125	250	500		
	1 0 A	Total Fan Inlet Temperature	Deg C	-80 to 90	10		0.125	500	1000		
	1 0 B	Total Fan Inlet Temperature	Deg C	-80 to 90	10		0.125	500	1000		
	1 4 0	Total Air Temperature (TAT)	Deg C	512	12		0.125	250	500		
	1 4 2	Projected Future Longitude	Deg	± 180	20		0.000172	250	500		
2 1 2	0 0 4	Altitude Rate	Ft/Min	32768	11		16	31.3	62.5		6-27
	0 0 5	Altitude Rate	Ft/Min	32768	11		16	31.3	62.5		
	0 0 6	Altitude Rate	Ft/Min	32768	11		16	31.3	62.5		
	0 3 8	Altitude Rate	Ft/Min	32768	11		16	31.3	62.5		
	0 3 B	Altitude Rate	Ft/Min	32768	11		16	150	250		
	1 4 0	Altitude Rate	Ft/Min	32768	11		16	31.25	62.5		
	1 4 2	Projected Future Longitude Fine	Deg	0.000172	11		2E-32 Cir	150	400		
2 1 3	0 0 2	Static Air Temperature	Deg C	512	11		0.25	250	500		6-27
	0 0 6	Static Air Temperature	Deg C	512	11		0.25	250	500		
	0 3 8	Static Air Temperature	Deg C	512	11		0.25	250	500		
	0 8 D	Fuel Used	Lbs	262144	18		1	75	125		
	1 4 0	Static Air Temperature (SAT)	Deg C	512	11		0.25	250	500		
	1 4 2	Vertical Time Interval	Minute	265 min	10		0.25 min	500	2000		
2 1 5	0 0 6	Impacted Pressure	mb	512	14		0.03125	62.5	125		
	0 1 A	Impact Pressure	mb	512	14		0.03125	62.5	125		
	0 2 9	N1 Actual (EEC)	% RPM	256	14		0.015	50	100		
	0 2 9	EPR Actual (EEC)		4	12		0.001	50	100		
	0 3 8	Impacted Pressure, Uncorrected, mb	mb	512	14		0.03125	62.5	125		
	0 A D	Impacted Pressure, Uncorrected, mb	mb	512	16		0.008	20	40		
	1 4 0	Impact Pressure Subsonic	mb	512	14		0.03125	62.5	125		
2 1 7	0 0 2	Geometric Vertical Rate	Ft/Min	20000	11		16				

ATTACHMENT 2B
DATA STANDARDS - BNR DATA

Label	Eqpt ID (Hex)	Parameter Name	Units	Range (Scale)	Sig Bits	Pos Sense	Resolution	Min Transit Interval (msec) 2	Max Transit Interval (msec) 2	Max Trans-port Delay (msec) 3	Notes & Cross Ref. to Tables and Attachments
	0 0 6	Static Pressure, Corrected (In.Hg.)	in. Hg	64	16		0.001	62.5	125		
	0 2 9	N1 Limit (EEC)	% RPM	256	14		0.015	100	200		
	0 2 9	EPR Limit (EEC)		4	12		0.001	100	200		
	0 3 8	Static Pressure, Average, Corrected (In. Hg.)	in. Hg	64	16		0.001	62.5	125		
	1 4 0	Static Pressure Corrected (In. Hg.)	in. Hg	64	16		0.001	62.5	125		
2 2 0	0 0 6	Baro Corrected Altitude #2	Feet	131072	17		1.0	31.3	62.5		
	0 3 8	Baro Corrected Altitude #2	Feet	131072	17		1.0	31.3	62.5		
	1 4 0	Baro Corrected Altitude #2	Feet	131072	17		1	31.25	62.5		
2 2 1	0 0 6	Indicated Angle of Attack (Avg)	Deg/180	±180	12		0.05	31.3	62.5		
	0 3 8	Indicated Angle of Attack (Average)	Deg/180	±180	12		0.05	31.3	62.5		
	0 A D	Indicated Angle of Attack	Deg/180	±180	14		0.01	31.3	200		
	1 2 C	Indicated Angle of Attack (Avg.)	Deg/180	±180	12		0.05	31.3	62.5		
	1 4 0	Angle of Attack Indicated Average	Deg	±180	12		0.05	31.25	62.5		
2 2 2	0 0 6	Indicated Angle of Attack (#1 Left)	Deg/180	±180	12		0.05	31.3	62.5		
	0 1 1	VOR Omnibearing	Deg/180	±180	12		0.05	50	100		
	1 1 2	TACAN Bearing	Deg/180	±180	12		0.05	180	220		
	1 1 5	Bearing	Deg/180	±180	11		0.1	50	50		
	1 2 C	Indicated Angle of Attack (#1 Left)	Deg/180	±180	12		0.05	31.3	62.5		
	1 4 0	Angle of Attack, Indicated #1 Left	Deg	±180	12		0.05	31.5	62.5		
2 2 3	0 0 6	Indicated Angle of Attack (#1 Right)	Deg/180	±180	12		0.05	31.3	62.5		
	1 2 C	Indicated Angle of Attack (#1 Right)	Deg/180	±180	12		0.05	31.3	62.5		
	1 4 0	Angle of Attack, Indicated #1 Right	Deg	±180	12		0.05	31.5	62.5		
2 2 4	0 0 6	Indicated Angle of Attack (#2 Left)	Deg/180	±180	12		0.05	31.3	62.5		
	1 2 C	Indicated Angle of Attack (#2 Left)	Deg/180	±180	12		0.05	31.3	62.5		
	1 4 0	Angle of Attack, Indicated #2 Left	Deg	±180	12		0.05	31.5	62.5		
2 2 5	0 0 2	Minimum Maneuvering Airspeed	Knots	512	11		0.25	500	1000	50	
	0 0 6	Indicated Angle of Attack (#2 Right)	Deg/180	±180	12		0.05	31.3	62.5		
	0 2 B	Compensated Altitude Rate	Ft/Min	32768	11	Increas-ing alt	16.0	31.3	62.5		
	0 5 6	Minimum Maneuvering Air Speed	Knots	512	11		0.25	500	1000		
	0 6 0	Minimum Maneuvering Air Speed	Knots	512	11		0.25	500	1000		
	1 2 C	Indicated Angle of Attack (#2 Right)	Deg/180	±180	12		0.05	31.3	62.5		
	1 4 0	Angle of Attack, Indicated #2 Right	Deg	±180	12		0.05	31.5	62.5		
2 2 7	0 3 D	AVM Command									6-28
	0 7 E	BITE Command Word									See ARINC 604
2 3 1	0 A D	Total Air Temperature	Deg C	512	12		0.125	20	200		
2 3 3	0 0 2	ACMS Information									6-31
	0 5 6	ACMS Information									
	0 6 0	ACMS Information									
2 3 4	0 0 2	ACMS Information									6-31
	0 5 6	ACMS Information									
	0 6 0	ACMS Information									
2 3 5	0 0 2	ACMS Information									6-31
	0 5 6	ACMS Information									
	0 6 0	ACMS Information									
2 3 6	0 0 2	ACMS Information									6-31
	0 5 6	ACMS Information									
	0 6 0	ACMS Information									
2 3 7	0 0 2	ACMS Information									
	0 0 B	Horizontal Uncertainty Level	NM	16	17		0.000122		1200		See ARINC 743A
	0 5 6	ACMS Information									
	0 6 0	ACMS Information									

ATTACHMENT 2B
DATA STANDARDS - BNR DATA

Label	Eqpt ID (Hex)	Parameter Name	Units	Range (Scale)	Sig Bits	Pos Sense	Resolution	Min Transit Interval (msec) 2	Max Transit Interval (msec) 2	Max Trans-port Delay (msec) 3	Notes & Cross Ref. to Tables and Attachments
2 4 0	**0 5 5**	**Selected Glide Path Angle**	**Degrees**	**0 - 180**	**15**	**Always Positive**	**0.0055**	**800**	**1600**		
2 4 1	0 0 2	Min. Airspeed for Flap Extension	Knots	512	11		0.25	500	1000	50	
	0 0 6	Corrected Angle of Attack	Deg/180	±180	12		0.05	31.3	62.5		
	0 3 8	Corrected Angle of Attack	Deg/180	±180	12		0.05	31.3	62.5		
	0 4 D	FQIS System Data						500	1024		6-35
	0 5 5	**Threshold crossing Height**	**Meters**	**0 – 1638.35**	**20**	**Always Positive**	**0.00156**	**800**	**1600**		
	0 5 6	Min. Airspeed for Flap Extension	Knots	512	11		0.25	500	1000		
	0 6 0	Min. Airspeed for Flap Extension	Knots	512	11		0.25	500	1000		
	1 4 0	Angle of Attack, Corrected	Deg	±180	12		0.05	31.5	62.5		
2 4 2	0 0 6	Total Pressure	mb	2048	16		0.03125	62.5	125		
	0 1 A	Total Pressure	mb	2048	16		0.03125	62.5	125		
	0 3 8	Total Pressure	mb	2048	16		0.03125	62.5	125		
	0 3 B	Speed Deviation	Dots	4	11		0.002	150	250		
	0 A D	Total Pressure, Uncorrected, mb	mb	2048	18		0.008	20	200		
	1 4 0	Total Pressure	mb	2048	16		0.03125	62.5	125		
2 4 3	X X X	Simulator to Avcs Control Word						33	100		See ARINC Rpt 610
2 4 4	0 1 C	Fuel Flow (Engine Direct)	Lbs/hr	32768	8		128.0	100	200		
	0 3 3	Fuel Flow (Wf)	pph	32768	16		0.5	150	250		
	0 3 B	Mach Error	Mach	0.064	11		0.00003	150	250		
	0 8 D	Fuel Flow Rate	PPH	32768	16		0.5	75	125		
	1 0 A	Fuel Mass Flow	MSEC	256	15		0.008	31.3	100		
	1 0 B	Fuel Mass Flow	MSEC	256	15		0.008	31.3	100		
	1 4 0	Angle of Attack, Normalized	Ratio	2	11		0.001	62.5	125		
2 4 5	0 0 2	Minimum Airspeed	Knots	256	12		0.0625	62.5	125		
	0 0 3	Minimum Airspeed	Knots	256	12		0.0625	62.5	125		
	0 0 A	Minimum Airspeed	Knots	512	13		0.0625	62.5	125		
	0 2 9	N3 (Engine)	% RPM	256	14		0.015	50	100		
	0 3 8	Avg. Static Pres. mb uncorrected	mb	2048	16		0.03125	62.5	125		
	0 3 B	EPR Error		4	12		0.001	150	250		
	0 5 5	**FTP to GARP Distance**	**Meters**	**0 – 104857.5**	**20**	**Always Positive**	**0.1**	**800**	**1600**		
	0 A D	Average Static Pressure mb Uncorrected	mb	2048	16		0.03125	62.5	125		
	0 5 6	Minimum Airspeed	Knots	256	12		0.0625	62.5	125		
	0 6 0	Minimum Airspeed	Knots	256	12		0.0625	62.5	125		
	1 4 0	Static Pressure, Uncorrected	mb	2048	16		0.03125	62.5	125		
2 4 6	0 0 2	Control Maximum Speed (VCMAX)	Knots	512	11		0.25	50	100	50	
	0 0 6	Average Static Pressure	mb	2048	16		0.03	62.5	125		
	0 1 C	N1 (Engine Direct)	RPM	4096	12		1.0	100	200		
	0 2 9	N1 (Engine Direct)	% RPM	256	14		0.015	50	100		
	0 3 8	Avg Static Pres mb Corrected	mb	2048	16		0.03125	62.5	125		
	0 3 B	Angle of Attack Error	Deg/180	±180	14		0.01	150	250		
2 4 7	0 0 2	Control Min. Speed (VCMIN)	Knots	512	11		0.25	50	100	50	
	0 0 B	Horizontal Figure of Merit	NM	16	18		6.1 E-5	200	1200		
	0 1 F	Total Fuel	Lbs	655360	14		40	500	1000		
	0 2 C	Total Fuel	Lbs	655360	14		40	500	1000		
	0 3 B	Speed Error	Knots	256	12		0.06	150	250		
	0 4 D	Total Fuel	Lbs	655360	14		40	500	1000		
	0 5 6	Control Minimum Speed (Vcmin)	Knots	512	11		0.25	50	100		
	0 5 A	Total Fuel	Lbs	655360	14		40	100	200		
	0 6 0	Control Minimum Speed (Vcmin)	Knots	512	11		0.25	50	100		
	0 E B	Fuel to Remain	Lbs	1638400	14		100	100	125		
	1 1 4	Fuel on Board	Lbs	655320	13		40				
	1 4 0	Airspeed Minimum Vmc	Knots	512	11		0.25	62.5	125		

ATTACHMENT 2B
DATA STANDARDS - BNR DATA

Label	Eqpt ID (Hex)	Parameter Name	Units	Range (Scale)	Sig Bits	Pos Sense	Resolution	Min Transit Interval (msec) 2	Max Transit Interval (msec) 2	Max Trans-port Delay (msec) 3	Notes & Cross Ref. to Tables and Attachments
2 5 0	0 0 2	Continuous N1 Limit	% RPM	256	14		0.015	50	200	200	
	0 2 B	Maximum Continuous EPR Limit		4	12		0.001	100	200		
	0 2 C	Preselected Fuel Quantity	Lbs	655360	14		40	100	400		
	0 5 A	Preselected Fuel Quantity	Lbs	655360	14		40	100	200		
	0 3 8	Indicated Side Slip Angle	Deg/180	±180	12		0.05	31.3	62.5		
	0 5 5	**Unflagged Horizontal Deviation - Rectilinear**	**Feet**	**±24000**	**18**	**Fly Right**	**0.0915**	**33.3**	**66.6**		
	0 A D	Indicated Side Slip Angle or AOS	Deg/180	±180	14		0.01	31.3	200		
	1 1 4	Preselected Fuel Quantity	Lbs	655320	13		40				
2 5 1	0 0 1	Distance to Go	NM	4096	15		0.125	100	200		
	0 0 2	Distance to Go	NM	4096	15		0.125	100	200		
	0 0 6	Baro Corrected Altitude #3	Feet	131072	17		1.0	31.3	62.5		
	0 1 A	Flight Leg Counter						75	175		6-19
	0 3 8	Baro Corrected Altitude #3	Feet	131072	17		1.0	31.3	62.5		
	0 5 5	**Unflagged Vertical Deviation - Rectilinear**	**Feet**	**±1024**	**14**	**Fly Down**	**0.0625**	**33.3**	**66.6**		
2 5 2	0 0 1	Time to Go	Min.	512	9		1.0	100	200		
	0 0 2	Time to Go	Min.	512	9		1.0	100	200		
	0 0 6	Baro Corrected Altitude #4	Feet	131072	17		1.0	31.3	62.5		
	0 1 A	EPR Idle		4	12		0.001	100	200		
	0 2 F	EPR Idle Reference		4	12		0.001	100	200		
	0 3 8	Baro Corrected Altitude #4	Feet	131072	17		1.0	31.3	62.5		
	0 3 F	EPR Idle Reference		4	12		0.001	100	200		
	0 E B	Time Until Jettison Complete	Minutes	64	6		1	500	1000		
2 5 3	0 0 2	Go-Around N1 Limit	% RPM	256	14		0.015	50	200	200	
	0 1 E	Go-Around EPR Limit		4	12		0.001	100	200		
	0 3 8	Corrected Side Slip Angle	Deg/180	±180	12		0.05	31.3	62.5		
2 5 4	0 0 2	Cruise N1 Limit	% RPM	256	14		0.015	50	200	200	
	0 1 E	Cruise EPR Limit		4	12		0.001	100	200		
	0 4 D	Actual Fuel Quan (test)	Lbs	262144	15		8	500	1000		
	1 3 A	N1 Cruise	% N1 Nom	256	14		0.015	100	200		
	1 4 0	Altitude Rate	Ft/Min	131072	13		16	31.25	62.5		
2 5 5	0 0 2	Climb N1 Limit	% RPM	256	14		0.015	50	200	200	
	0 1 E	Climb EPR Limit		4	12		0.001	100	200		
	0 2 F	Maximum Climb EPR Rating	N/A	4	12		0.001	100	200		
	0 3 F	Maximum Climb EPR Rating	N/A	4	12		0.001	100	200		
	0 4 D	Fuel Quantity (gal)	Gallons	32768	15		1.0	500	1000		
	0 8 E	Spoiler Position	Deg/180	+180	11		0.1	50	100		
	1 3 A	N1 Climb	% N1 Nom	256	14		0.015	100	200		
	1 4 0	Impact Pressure	mb	4096	17		0.03125	62.5	125		
2 5 6	0 0 2	Time For Climb	Min.	512	9		1	100	200		
	0 0 A	V Stick Shaker	Knots	512	11		0.25	100	200		
	0 2 C	Fuel Quantity (Tanks) #1	Lbs	131072	15		4	500	1000		
	0 5 6	Time for Climb	Min.	512	9		1	100	200		
	0 5 A	Fuel Quantity-Left Outer Cell	Lbs	131072	15		4	100	200		Zero for A-321
	0 6 0	Time for Climb	Min.	512	9		1	100	200		
	1 1 4	Left Outer Tank Fuel Quantity	Lbs	131072	15		4				
	1 4 0	Equivalent Airspeed	Knots	1024	14		0.0625	62.5	125		
2 5 7	0 0 2	Time For Descent	Min.	512	9		1	100	200		
	0 2 C	Fuel Quantity (Tanks) #2	Lbs	131072	15		4	500	1000		
	0 5 6	Time for Descent	Min.	512	9		1	100	200		
	0 5 A	Fuel Quantity Left W/T Tank	Lbs	131072	15		4	100	200		
	0 6 0	Time for Descent	Min.	512	9		1	100	200		
	1 1 4	Fuel Quantity (Tanks) #2	Lbs	131072	15		4	500	1000		
	1 4 0	Total Pressure (High Range)	mb	4096	17		0.03125	62.5	125		
2 6 0	0 2 C	Fuel Quantity (Tanks) #3	Lbs	131072	15		4	500	1000		
	0 5 A	Fuel Quantity Center Tank	Lbs	131072	15		4	100	200		

ATTACHMENT 2B
DATA STANDARDS - BNR DATA

Label	Eqpt ID (Hex)	Parameter Name	Units	Range (Scale)	Sig Bits	Pos Sense	Resolution	Min Transit Interval (msec) 2	Max Transit Interval (msec) 2	Max Trans-port Delay (msec) 3	Notes & Cross Ref. to Tables and Attachments
	0 3 3	T5	Deg C	1024	12		0.25	150	250		See Note [5]
	1 0 A	LP Turbine Discharge Temp	Deg C	-55 to 850	11		0.50	100	500		
	1 0 B	LP Turbine Discharge Temperature	Deg C	-55 to 850	11		0.50	100	500		
	1 1 4	Collector Cell 1 and 2 Fuel Quantity	Lbs	131072	15		4				
2 6 1	0 2 C	Fuel Quantity (Tanks) #4	Lbs	131072	15		4	500	1000		
	0 3 3	P49	PSIA	128	14		0.008	150	250		
	0 5 A	Fuel Qty Right I/C or W/T Tank	Lbs	131072	15		4	100	200		
	1 0 A	LP Turbine Inlet Pressure	PSIA	2-120	11		0.125	100	500		
	1 0 B	LP Turbine Inlet Pressure	PSIA	2-120	11		0.125	100	500		
	1 1 4	Fuel on Board at Engine Start	Lbs	131072	15		4				
	1 4 4	Range Ring Radius	NM	512	15		1/64	800	1200		6-52
2 6 2	0 0 2	Documentary Data						500	1000		6-14
	0 0 A	Predicitive Airspeed Variation	Knots	256	10		0.25	100	200		
	0 1 C	LP Compressor Exist Pres. (PT3)	PSIA	64	13		0.008	100	200		
	0 2 C	Fuel Quantity (Tanks) #5	Lbs	131072	15		4	500	1000		
	0 3 3	LP Compressor Exist Pressure	PSIA	64	14		0.004	150	250		
	0 4 D	T/U Cap-L Tank 1-4	PF	655.35	16		0.01	TBD	TBD		
	0 5 A	Fuel Quantity-Right Outer Cell	Lbs	131072	15		4	100	200		
	1 0 A	HP Compressor Inlet Total Pres.	PSIA	2-50	11		0.032	100	500		
	1 0 B	HP Compressor Inlet Total Pres.	PSIA	2-50	11		0.032	100	500		
	1 1 4	Center Tank Fuel Quantity	Lbs	131072	15		4				
	1 4 4	Display Range	NM	512	14		1/32	800	1200		6-51
2 6 3	0 0 2	Min. Airspeed for Flap Retraction	Knots	512	11		0.25	500	1000	50	
	0 0 A	Min. Airspeed for Flap Retraction	Knots	512	11		0.25	100	200		
	0 1 C	LP Compressor Exit Temperature		256	12		0.06	100	200		
	0 2 C	Fuel Quantity (Tanks) #6	Lbs	131072	15		4	500	1000		
	0 3 3	LP Compressor Exit Temperature	Deg C	256	12		0.063	150	250		
	0 4 D	T/U Cap-L Tank 5-8	PF	655.35	16		0.01	TBD	TBD		
	0 5 6	Min. Airspeed for Flap Retraction	Knots	512	11		0.25	500	1000		
	0 6 0	Min. Airspeed for Flap Retraction	Knots	512	11		0.25	500	1000		
	1 0 A	Selected Compressor Inlet Temperature (Total)	Deg C	-55 to 160	11		0.125	100	500		
	1 0 B	Selected Compressor Inlet Temp (Total)	Deg C	-55 to 160	11		0.125	100	500		
	1 1 4	Collector Cell 3 and 4 Fuel Quantity	Lbs	131072	15		4				
2 6 4	0 0 2	Time To Touchdown	Min.	2048	11		1	100	200	145	
	0 0 A	Min. Airspeed for Slats Retraction	Knots	512	11		0.25	100	200		
	0 1 C	HP Compressor Exit Pressure		512	14		0.03	100	200		
	0 2 C	Fuel Quantity (Tanks) #7	Lbs	131072	15		4	500	1000		
	0 2 F	Burner Pressure	PSIA	512	14		0.03	100	200		
	0 4 D	T/U Cap-L Tank 9-12	PF	655.35	16		0.01	TBD	TBD		
	0 3 3	HP Compressor Exit Pressure	PSIA	512	14		0.03	150	250		
	0 3 F	Burner Pressure	PSIA	512	14		0.03	100	200		
	0 5 6	Time to Touchdown	Min.	2048	11		1	100	200		
	0 6 0	Time to Touchdown	Min.	2048	11		1	100	200		
	1 0 A	Selected Compressor Dischg Pres.	PSIA	5-600	11		1.00	62.5	250		
	1 0 B	Selected Compressor Dischg Pres.	PSIA	5-600	11		1.00	62.5	250		
	1 3 A	Burner Pressure	PSIA	512	14		0.031	100	200		
2 6 5	0 0 2	Min. Buffet Airspeed	Knots	512	11		0.25	50	100	50	
	0 0 4	Integrated Vertical Acceleration	Ft/Sec	±256	20	UP	0.000244		20		
	0 0 A	Maneuvering Airspeed	Knots	512	11		0.25	100	200		
	0 1 C	HP Compressor Exit Temp (TT4.5)		1024	12		0.25	100	200		
	0 2 C	Fuel Quantity (Tanks) #8	Lbs	131072	15		4	500	1000		
	0 3 3	HP Compressor Exit Temperature	Deg C	1024	12		0.25	150	250		
	0 3 8	Integrated Vertical Acceleration	Ft/Sec	±256	20	UP	0.000244		20		
	0 4 D	T/U Cap-L Tank 13-14	PF	655.35	16		0.01	TBD	TBD		
	0 5 6	Min. Buffet Airspeed	Knots	512	11		0.25	50	100		
	0 6 0	Min. Buffet Airspeed	Knots	512	11		0.25	50	100		
	1 0 A	Selected Compressor Dischg Temp	Deg C	-55 to 650	11		0.50	100	500		
	1 0 B	Selected Compressor Dischg Temp	Deg C	-55 to 650	11		0.50	100	500		

ATTACHMENT 2B
DATA STANDARDS - BNR DATA

Label	Eqpt ID (Hex)	Parameter Name	Units	Range (Scale)	Sig Bits	Pos Sense	Resolution	Min Transit Interval (msec) 2	Max Transit Interval (msec) 2	Max Trans-port Delay (msec) 3	Notes & Cross Ref. to Tables and Attachments
	1 1 4	Inner Tank 3 Fuel Quantity	Lbs	131072	15		4				
2 6 6	0 4 D	T/U Cap-C Tank 1-4	PF	655.35	16		0.01	TBD	TBD		
	1 1 4	Inner Tank 2 Fuel Quantity	Lbs	131072	15		4				
2 6 7	0 0 2	Maximum Maneuver Airspeed	Knots	512	11		0.25	500	1000	50	
	0 0 A	Predictive Max. Maneuver Speed	Knots	512	11		0.25	100	200		
	0 2 B	Throttle Position Command	Deg/180	±180	12		0.05	50	100		
	0 4 D	T/U Cap-C Tank 5-8	PF	655.35	16		0.01	TBD	TBD		
	0 3 3	Spare T/C	Deg C	256	12		0.063	150	250		
	0 5 6	Max. Maneuver Airspeed	Knots	512	11		0.25	500	1000		
	0 6 0	Max. Maneuver Airspeed	Knots	512	11		0.25	500	1000		
	1 0 A	HP Compressor Inlet Temp. (total)	Deg C	-55 to 160	11		0.125	500	1000		
	1 0 B	HP Compressor Inlet Temperature	Deg C	-55 to 160	11		0.125	500	1000		
	1 1 4	Inner Tank 4 Fuel Quantity	Lbs	131072	15		4				
2 7 0	0 4 D	T/U Cap-C Tank 9	PF	655.35	16		0.01	TBD	TBD		
	1 1 5	Stored TACAN Control Word						25	50		See ARINC 429P2
2 7 1	0 4 D	T/U Cap-A Tank 1-4	PF	655.35	16		0.01	TBD	TBD		
2 7 2	0 4 D	T/U Cap Tank 5-8	PF	655.35	16		0.01	TBD	TBD		
2 7 3	0 4 D	T/U Cap-A Tank 9-11	PF	655.35	16		0.01	TBD	TBD		
2 7 4	0 4 D	T/U Cap-R Tank 1-4	PF	655.35	16		0.01	TBD	TBD		
2 7 5	0 4 D	T/U Cap-R Tank 5-8	PF	655.35	16		0.01	TBD	TBD		
2 7 6	0 0 1	FCC to Simulator Control Word						50	150		Used only in simulator
	0 0 2	FMC to Simulator Control Word						33	100		Used only in simulator
	0 0 3	TCC to Simulator Control Word						50	150		Used only in simulator
	0 4 D	T/U Cap-R Tank 9-12	PF	655.35	16		0.01	TBD	TBD		
2 7 7	0 4 D	T/U Cap-R Tank 13-14	PF	655.35	16		0.01	TBD	TBD		
3 0 0	1 0 A	ECU Internal Temperature	Deg C	-55 to 125	11		0.125	500	1000		
	1 0 B	ECU Internal Temperature	Deg C	-55 to 125	11		0.125	500	1000		
3 0 1	1 0 A	Demanded Fuel Metering Valve Pos	%	100	11		0.063	62.5	250		
	1 0 B	Demanded Fuel Metering Valve Pos	%	100	11		0.063	62.5	250		
3 0 2	1 0 A	Demanded Variable Stator Vane Pos	%	100	11		0.063	100	500		
	1 0 B	Demanded Variable Stator Vane Pos	%	100	11		0.063	100	500		
3 0 3	1 0 A	Demanded Variable Bleed Valve Pos	%	100	11		0.063	100	500		
	1 0 B	Demanded Variable Bleed Valve Pos	%	100	11		0.063	100	500		
3 0 4	1 0 A	Demanded HPT Clearance Valve Pos	%	100	11		0.063	250	1000		
	1 0 B	Demanded HPT Clearance Valve Pos	%	100	11		0.063	250	1000		
3 0 5	1 0 A	Demanded LPT Clearance Valve Pos	%	100	11		0.063	250	1000		
	1 0 B	Demanded LPT Clearance Valve Pos	%	100	11		0.063	250	1000		
3 1 0	0 0 2	Present Position - Latitude	Deg/180	0-180N/ 0-180S	20		0.000172	100	200		6-27
	0 0 4	Present Position - Latitude	Deg/180	0-180N/ 0-180S	20		0.000172	100	200		
	0 2 9	Aileron Position	Deg/180	±180	11		0.088	50	100		
	0 3 8	Present Position - Latitude	Deg/180	0-180N/ 0-180S	20		0.000172	100	200		

ATTACHMENT 2B
DATA STANDARDS - BNR DATA

Label	Eqpt ID (Hex)	Parameter Name	Units	Range (Scale)	Sig Bits	Pos Sense	Resolution	Min Transit Interval (msec) 2	Max Transit Interval (msec) 2	Max Trans-port Delay (msec) 3	Notes & Cross Ref. to Tables and Attachments
	0 4 D	Comp Cap-Tank	PF	327.67	15		0.01	TBD	TBD		
	0 5 6	Present Position Latitude	Deg/180	0-180N/ 0-180S	20		0.000172	100	200		
	0 6 0	Present Position Latitude	Deg/180	0-180N/ 0-180S	20		0.000172	100	200		
	1 1 4	Right Outer Tank Fuel Quantity	Lbs	131068	15		4				
3 1 1	0 0 2	Present Position - Longitude	Deg/180	0-180E/ 0-180W	20		0.000172	100	200		
	0 0 4	Present Position - Longitude	Deg/180	0-180E/ 0-180W	20		0.000172	100	200		
	0 2 9	Aileron Trim	Deg/180	±180	11		0.088	50	100		
	0 3 8	Present Position - Longitude	Deg/180	0-180E/ 0-180W	20		0.000172	100	200		
	0 3 B	Control Wheel Roll Force	Lbs	64	10		0.0625	150	250		
	0 5 6	Present Position Longitude	Deg/180	0-180E/ 0-180W	20		0.000172	100	200		
	0 6 0	Present Position Longitude	Deg/180	0-180E/ 0-180W	20		0.000172	100	200		
	1 1 4	Trim Tank Fuel Quantity	Lbs	131072	15		4				
3 1 2	0 0 2	Ground Speed	Knots	4096	15		0.125	25	50		
	0 0 4	Ground Speed	Knots	4096	15		0.125	25	50		
	0 0 5	Ground Speed	Knots	4096	15		0.125	25	50		
	0 2 9	Rudder Position	Deg/180	±180	11		0.088	50	100		
	0 3 8	Ground Speed	Knots	4096	15		0.125	25	50		
	0 5 6	Ground Speed	Knots	4096	15		0.125	25	50		
	0 5 A	Fuel Quantity ACT 1	Lbs	131072	15		4	100	200		
	0 6 0	Ground Speed	Knots	4096	15		0.125	25	50		
	1 1 4	Additional Center Tank (Act 1) Fuel Quantity	Lbs	131072	15		4				
3 1 3	0 0 2	Track Angle - True	Deg/180	±180	12		0.05	25	50		
	0 0 4	Track Angle - True	Deg/180	±180	15		0.0055	25	50		
	0 2 5	Track Angle - True	Deg/180	±180	10		0.2	125	250		
	0 2 9	Rudder Trim	Deg/180	±180	11		0.088	50	100		
	0 3 8	Track Angle - True	Deg/180	±180	15		0.0055	25	50		
	0 5 6	Track Angle - True	Deg/180	±180	12		0.05	25	50		
	0 5 A	Fuel Quantity ACT 2	Lbs	131072	15		4	100	200		
	0 6 0	Track Angle - True	Deg/180	±180	12		0.05	25	50		
	1 1 4	Additional Center Tank (Act 2) Fuel Quantity	Lbs	131072	15		4				
3 1 4	0 0 2	Stabilizer Pos Indication (B747-400)	Deg/180	±180	12	TE Down	0.05	25	50	50	
	0 0 4	True Heading	Deg/180	±180	15		0.0055	25	50		
	0 2 5	True Heading	Deg/180	±180	10		0.2	125	250		
	0 2 9	Elevator Position	Deg/180	±180	11		0.088	50	100		
	0 3 8	True Heading	Deg/180	±180	15		0.0055	25	50		
	0 3 B	Control Wheel Pitch Force	Lbs	64	10		0.0625	150	250		
	1 1 4	Rear Center tank (RCT) Fuel Quantity	Lbs	131072	15		4				
3 1 5	0 0 1	Stabilizer Position	Deg/180	±180	12	TE Down	0.05	25	50		
	0 0 2	Wind Speed	Knots	256	8		1.0	50	100		
	0 0 4	Wind Speed	Knots	256	8		1.0	50	100		
	0 0 5	Wind Speed	Knots	256	8		1.0	50	100		
	0 2 9	Stabilizer Position	Deg/180	±180	11	TE Down	0.088	50	100		
	0 3 8	Wind Speed	Knots	256	8		1.0	50	100		
	0 5 6	Wind Speed	Knots	256	8		1.0	50	100		
	0 6 0	Wind Speed	Knots	256	8		1.0	50	100		
	0 A 1	Stabilizer Position	Deg/180	±180	12	TE Down	0.05	25	50		
3 1 6	0 0 2	Wind Direction (True)	Deg/180	+180	12	CW from	0.05	25	50	50	

ATTACHMENT 2B
DATA STANDARDS - BNR DATA

Label	Eqpt ID (Hex)	Parameter Name	Units	Range (Scale)	Sig Bits	Pos Sense	Resolution	Min Transit Interval (msec) 2	Max Transit Interval (msec) 2	Max Trans-port Delay (msec) 3	Notes & Cross Ref. to Tables and Attachments
						north					
	0 0 4	Wind Angle	Deg/180	±180	8		0.7	50	100		
	0 2 9	Oil Temperature (Engine)	Deg C	2048	12		0.5	100	200		
	0 3 8	Wind Angle	Deg/180	±180	8		0.7	50	100		
	0 5 6	Wind Direction (True)	Deg/180	+180	12	CW from north	0.05	25	50	50	
	0 6 0	Wind Direction (True)	Deg/180	+180	12	CW from north	0.05	25	50	50	
	1 0 A	Engine Oil Temperature	Deg C	-55 to 170	11		1.00	250	1000		
	1 0 B	Engine Oil Temperature	Deg C	-55 to 170	11		1.00	250	1000		
	0 D 0	Engine Oil Temperature	Deg C	2048	12		0.5				SDI 1=L SDI 2 =R
3 1 7	0 0 2	Track Angle - Magnetic	Deg/180	±180	12		0.05	25	50		
	0 0 4	Track Angle - Magnetic	Deg/180	±180	15		0.0055	25	50		
	0 0 5	Track Angle - Magnetic	Deg/180	±180	15		0.0055	25	50		
	0 2 5	Track Angle - Magnetic	Deg/180	±180	10		0.2	125	250		
	0 2 9	Oil Pressure (Engine)	PSI	4096	12		1	50	100		
	0 3 8	Track Angle - Magnetic	Deg/180	±180	15		0.0055	25	50		
	0 5 6	Track Angle Magnetic	Deg/180	±180	12		0.05	25	50		
	0 6 0	Track Angle Magnetic	Deg/180	±180	12		0.05	25	50		
	0 D 0	Engine Oil Pressure	PSI	4096	14		0.25				SDI 1 = L/SDI 2 = R
3 2 0	0 0 4	Magnetic Heading	Deg/180	±180	15		0.0055	25	50		
	0 0 5	Magnetic Heading	Deg/180	±180	15		0.0055	25	50		
	0 2 5	Magnetic Heading	Deg/180	±180	10		0.2	125	250		
	0 3 5	Own A/C Magnetic Heading	Deg/180	±180	15		0.0055	25	500		See ARINC 735
	0 3 8	Magnetic Heading	Deg/180	±180	15		0.0055	25	50		
	0 4 D	Density-Tank	Lb/Gal	8.191	13		0.001	TBD	TBD		
	0 5 5	**Aircraft Altitude**	**Feet**	**131072**	**20**	**Positive**	**0.125**	**100**	**200**		
3 2 1	0 0 2	Drift Angle	Deg/180	±180	12		0.05	25	50		
	0 0 4	Drift Angle	Deg/180	±180	11		0.09	25	50		
	0 0 5	Drift Angle	Deg/180	±180	11		0.09	25	50		
	0 3 8	Drift Angle	Deg/180	±180	12		0.05	25	50		
	0 5 6	Drift Angle	Deg/180	±180	12		0.05	25	50		
	0 6 0	Drift Angle	Deg/180	±180	12		0.05	25	50		
	1 0 A	Exhaust Gas Temperature (Total)	Deg C	-55 to 1100	11		1.00	500	1000		
	1 0 B	Exhaust Gas Temperature (Total)	Deg C	-55 to 1100	11		1.00	500	1000		
3 2 2	0 0 2	Flight Path Angle	Deg/180	+180	12		0.05	25	50		
	0 0 4	Flight Path Angle	Deg/180	±180	12		0.05	25	50		
	0 0 5	Flight Path Angle	Deg/180	±180	12		0.05	25	50		
	0 3 8	Flight Path Angle	Deg/180	±180	12		0.05	25	50		
	0 5 6	Flight Path Angle	Deg/180	+180	12		0.05	25	50		
	0 6 0	Flight Path Angle	Deg/180	+180	12		0.05	25	50		
	1 0 A	Total Compressor Discharge Temp	Deg C	-55 to 650	11		0.50	500	1000		
	1 0 B	Total Compressor Discharge Temp	Deg C	-55 to 650	11		0.50	500	1000		
3 2 3	0 0 2	Geometric Altitude	Feet	50000	17		1				
	0 0 4	Flight Path Acceleration	g	4	12		0.001	10	20		6-27
	0 0 5	Flight Path Acceleration	g	4	12		0.001	10	20		
	0 3 8	Flight Path Acceleration	g	4	12		0.001	10	20		
	0 5 6	Geometric Altitude	Feet	50000	17		1				
	0 6 0	Geometric Altitude	Feet	50000	17		1				
	1 0 A	Variable Stator Vane Position	%	-5 to 105	11		0.063	500	1000		
	1 0 B	Variable Stator Vane Position	%	-5 to 105	11		0.063	500	1000		
3 2 4	0 0 4	Pitch Angle	Deg/180	±180	14		0.01	10	20		
	0 0 5	Pitch Angle	Deg/180	±180	14		0.01	10	20		
	0 2 5	Pitch Angle	Deg/180	±180	10		0.2	125	250		
	0 3 8	Pitch Angle	Deg/180	±180	14		0.01	10	20		

ATTACHMENT 2B
DATA STANDARDS - BNR DATA

Label	Eqpt ID (Hex)	Parameter Name	Units	Range (Scale)	Sig Bits	Pos Sense	Resolution	Min Transit Interval (msec) 2	Max Transit Interval (msec) 2	Max Trans-port Delay (msec) 3	Notes & Cross Ref. to Tables and Attachments
	0 4 D	Tank VSO Quantity	Gal.	32768	15		1.0	TBD	TBD		See Att. 6 for SDI encoding
	0 5 A	Effective Pitch Angle	Deg./180	±180	14		0.01				
	1 0 A	Selected Fuel Metering Valve Pos	%	-5 to 105	11		0.063	62.5	250		
	1 0 B	Selected Fuel Metering Valve Pos	%	-5 to 105	11		0.063	62.5	250		
	1 1 4	Effective Pitch Angle	Deg	±180	13		0.02				
3 2 5	0 0 4	Roll Angle	Deg/180	±180	14		0.01	10	20		
	0 0 5	Roll Angle	Deg/180	±180	14		0.01	10	20		
	0 1 A	Engine Control Trim Feedback									
	0 2 5	Roll Angle	Deg/180	±180	10		0.2	125	250		
	0 2 F	Stator Vane Feedback	Inches	4	12		0.001	100	200		
	0 3 8	Roll Angle	Deg/180	±180	14		0.01	10	20		
	0 3 F	Stator Vane Feedback	Inches	4	12		0.001	100	200		
	0 5 5	**Anchor Point Latitude**	**Degrees**	**±180**	**20**	**North**	**0.000172**	**800**	**1200**		
	0 5 A	Effective Roll Angle	Deg/180	±180	14		0.01				
	1 0 A	Selected Variable Stator Vane Pos	%	-5 to 105	11		0.063	62.5	250		
	1 0 B	Selected Variable Stator Vane Pos	%	-5 to 105	11		0.063	62.5	250		
	1 1 4	Effective Roll Angle	Deg	±180	13		0.02				
3 2 6	0 0 4	Body Pitch Rate	Deg/Sec	128	13		0.015	10	20		
	0 0 5	Body Pitch Rate	Deg/Sec	128	13		0.015	10	20		
	0 3 8	Body Pitch Rate	Deg/Sec	128	13		0.015	10	20		
	0 4 D	Uplift Quantity	Lbs	1638400	14		100	TBD	TBD		
	0 5 5	**Anchor Point Longitude**	**Degrees**	**±180**	**20**	**East**	**0.000172**	**800**	**1200**		
	1 0 A	Compressor Discharge Static Press	PSIA	5-600	11		1.00	500	1000		
	1 0 B	Compressor Discharge Static Press	PSIA	5-600	11		1.00	500	1000		
3 2 7	0 0 4	Body Roll Rate	Deg/Sec	128	13		0.015	10	20		
	0 0 5	Body Roll Rate	Deg/Sec	128	13		0.015	10	20		
	0 3 8	Body Roll Rate	Deg/Sec	128	13		0.015	10	20		
	0 4 D	Uplift Density	Lbs/Gal	8.181	13		0.001	TBD	TBD		
	1 0 A	Fuel Metering Valve Position	%	-5 to 105	11		0.063	500	1000		
	0 5 5	**Anchor Point Altitude**	**Feet**	**131072**	**20**	**Up**	**0.125**	**800**	**1200**		
	1 0 B	Fuel Metering Valve Position	%	-5 to 105	11		0.063	500	1000		
3 3 0	0 0 4	Body Yaw Rate	Deg/Sec	128	13		0.015	10	20		
	0 0 5	Body Yaw Rate	Deg/Sec	128	13		0.015	10	20		
	0 2 F	HC/TC Cooling Valve Pos. Feedback	%	128	12	OPEN	0.03	100	200		
	0 3 8	Body Yaw Rate	Deg/Sec	128	13		0.015	10	20		
	0 3 F	HC/TC Cooling Valve Pos. Feedback	%	128	12	OPEN	0.03	100	200		
	0 5 5	**FLS Beam Slope**	**Degrees**	**±10**	**10**	**Always Negative**	**0.01**	**800**	**1200**		
	1 0 A	Selected HPT Clearance Valve Position	%	-5 to 105	11		0.063	250	1000		
	1 0 B	Selected HPT Clearance Valve Pos	%	-5 to 105	11		0.063	250	1000		
3 3 1	0 0 4	Body Longitudinal Acceleration	g	4	12		0.001	10	20		
	0 0 5	Body Longitudinal Acceleration	g	4	12		0.001	10	20		
	0 2 F	LTC Cooling Valve Pos. Feedback	%	128	12	OPEN	0.03	100	200		
	0 3 8	Body Longitudinal Acceleration	g	4	12		0.001	10	20		
	0 3 F	LTC Cooling Valve Pos. Feedback	%	128	12	OPEN	0.03	100	200		
	0 5 5	**Local Magnetic Deviation**	**Degrees**	**±180**	**18**	**East**	**0.000687**	**800**	**1200**		
	1 0 A	Selected LPT Clearance Valve Pos	%	-5 to 105	11		0.063	250	1000		
	1 0 B	Selected LPT Clearance Valve	%	-5 to 105	11		0.063	250	1000		
3 3 2	0 0 4	Body Lateral Acceleration	g	4	12		0.001	10	20		
	0 0 5	Body Lateral Acceleration	g	4	12		0.001	10	20		
	0 2 F	A/O Heat Xchr Valve Pos. Feedback	%	128	12	OPEN	0.03	100	200		
	0 3 8	Body Lateral Acceleration	g	4	12		0.001	10	20		
	0 3 F	A/O Heat Xchr Valve Pos. Feedback	%	128	12	OPEN	0.03	100	200		
3 3 3	0 0 4	Body Normal Acceleration	g	4	12		0.001	10	20		

ATTACHMENT 2B
DATA STANDARDS - BNR DATA

Label	Eqpt ID (Hex)	Parameter Name	Units	Range (Scale)	Sig Bits	Pos Sense	Resolution	Min Transit Interval (msec) 2	Max Transit Interval (msec) 2	Max Trans-port Delay (msec) 3	Notes & Cross Ref. to Tables and Attachments
	0 0 5	Body Normal Acceleration	g	4	12		0.001	10	20		
	0 2 F	Acceleration Fuel Flow Limit	Lb/Hr	32768	12		8	100	200		
	0 3 8	Body Normal Acceleration	g	4	12		0.001	10	20		
	0 3 F	Acceleration Fuel Flow Limit	Lb/Hr	32768	12		8	100	200		
	0 5 5	**Runway Threshold Latitude**	**Degrees**	**±180**	**20**	**North**	**0.000172**	**800**	**1200**		
3 3 4	0 0 4	Platform Heading	Deg/180	±180	11		0.09	20	40		
	0 0 5	Platform Heading	Deg/180	±180	11		0.09	20	40		
	0 2 F	Fuel Flow Command	Lb/Hr	32768	12		8	100	200		
	0 3 8	Platform Heading	Deg/180	±180	11		0.09	20	40		
	0 3 F	Fuel Flow Command	Lb/Hr	32768	12		8	100	200		
	0 5 5	**Runway Threshold Longitude**	**Degrees**	**±180**	**20**	**East**	**0.000172**	**800**	**1200**		
3 3 5	0 0 2	Track Angle Rate	Deg/Sec	±32	11	**CW**	0.015	10	20		
	0 0 4	Track Angle Rate	Deg/Sec	±32	11	**CW**	0.015	10	20		
	0 0 5	Track Angle Rate	Deg/Sec	±32	11	**CW**	0.015	10	20		
	0 2 F	2.5 BLD Actuator Position	%	128	12		0.031	100	200		
	0 3 8	Track Angle Rate	Deg/Sec	±32	11	**CW**	0.015	10	20		
	0 3 F	2.5 BLD Actuator Position	%	128	12		0.031	100	200		
	0 5 5	**Aircraft Latitude Fine**	**Degrees**	**0.000172**	**11**	**Positive**	**8.38E-8**	**100**	**200**		
	0 5 6	Track Angle Rate	Deg/Sec	±32	11	**CW**	0.015	10	20		
	0 6 0	Track Angle Rate	Deg/Sec	±32	11	**CW**	0.015	10	20		
	1 0 A	Selected Variable Bleed Valve Pos	%	-5 to 105	11		0.063	100	500		
	1 0 B	Selected Variable Bleed Valve Pos	%	-5 to 105	11		0.063	100	500		
3 3 6	0 0 2	Max Climb Angle	Deg	32	15	Climb	0.001	100	200		
	0 0 4	Inertial Pitch Rate	Deg/Sec	128	13		0.015	10	20		
	0 0 5	Inertial Pitch Rate	Deg/Sec	128	13		0.015	10	20		
	0 1 A	Engine Torque	%	256	12		0.063	100	200		
	0 2 F	N2 Corrected to Sta 2.5	%	128	12		0.031	100	200		
	0 3 8	Inertial Pitch Rate	Deg/Sec	128	13		0.015	10	20		
	0 3 F	N2 Corrected to Sta 2.5	%	128	12		0.031	100	200		
	0 5 5	**Aircraft Longitude Fine**	**Degrees**	**0.000172**	**11**	**Positive**	**8.38E-8**	**100**	**200**		
	1 0 A	Variable Bleed Valve Position	%	-5 to 105	11		0.063	500	1000		
	1 0 B	Variable Bleed Valve Position	%	-5 to 105	11		0.063	500	1000		
3 3 7	0 0 2	EPR - Required For Level Flight	Ratio	±4	12		0.001	100	200		Engine Types: P&W
	0 0 2	N1 - Required For Level Flight	% RPM	±256	15		0.015				Engine Types: GE
	0 0 4	Inertial Roll Rate	Deg/Sec	128	13		0.015	10	20		
	0 0 5	Inertial Roll Rate	Deg/Sec	128	13		0.015	10	20		
	0 1 A	Engine Rating	%	0-256	12		0.063	100	200		
	0 3 8	Inertial Roll Rate	Deg/Sec	128	13		0.015	10	20		
	1 0 A	HPT Clearance Valve Position	%	-5 to 105	11		0.063	500	1000		
	1 0 B	HPT Clearance Valve Position	%	-5 to 105	11		0.063	500	1000		
3 4 0	0 0 3	EPR Actual		4	12		0.001	100	200		
	0 0 4	Inertial Yaw Rate	Deg/Sec	128	13		0.015	10	20		
	0 0 4	Track Angle Grid	Deg	± 180	15		0.0055	20	110		
	0 0 5	Inertial Yaw Rate	Deg/Sec	128	13		0.015	10	20		
	0 1 A	EPR Actual		4	12		0.001	100	200		
	0 2 9	EPR Actual (Engine Direct)		4	12		0.001	50	100		
	0 2 D	EPR Actual		4	12		0.001	100	200		
	0 2 F	EPR Actual		4	12		0.001	25	50		
	0 3 3	EPR Actual		4	12		0.001	100	200		
	0 3 F	EPR Actual		4	12		0.001	25	50		
	1 3 A	N1 Take Off	% N1Nom	256	14		0.015	25	50		
	1 4 0	Pressure Ratio (Pt/Ps)	Ratio	16	14		0.001	62.5	125		
3 4 1	0 0 2	Target N1	% RPM	256	14		0.015	100	200		
	0 0 3	N1 Command	% RPM	256	14		0.015	100	200		
	0 0 3	EPR Command		4	12		0.001	100	200		
	0 0 4	Grid Heading	Deg	± 180	15		0.0055	20	110		

ATTACHMENT 2B
DATA STANDARDS - BNR DATA

Label	Eqpt ID (Hex)	Parameter Name	Units	Range (Scale)	Sig Bits	Pos Sense	Resolution	Min Transit Interval (msec) 2	Max Transit Interval (msec) 2	Max Trans-port Delay (msec) 3	Notes & Cross Ref. to Tables and Attachments
	0 1 A	N1 Command	% RPM	256	14		0.015	100	200		
	0 1 A	EPR Command		4	12		0.001	100	200		
	0 2 9	N1 Command (Engine)	% RPM	256	14		0.015	50	100		
	0 2 9	EPR Command (Engine)		4	12		0.001	50	100		
	0 2 F	N1 Command	% RPM	256	14		0.015	25	50		
	0 2 F	EPR Command		4	12		0.001	25	50		
	0 3 8	Grid Heading	Deg	± 180	15		0.0055	20	110		
	0 3 F	EPR Command		4	12		0.001	100	200		
	0 4 D	I/O S/W REV 1&2		(1)	16		N/A	TBD	TBD		
	1 0 A	Command Fan Speed	%	117.5	13		0.032	31.3	100		
	1 0 B	Command Fan Speed	%	117.5	13		0.032	31.3	100		
	1 3 A	N1 Reference	% N1Nom	256	14		0.015	25	50		
	1 4 0	Pressure Ratio (Ps/Pso)	Ratio	4	12		0.001	62.5	125		
3 4 2	0 0 2	N1 Bug Drive	% RPM	256	14		0.015	100	200		
	0 0 3	N1 Limit	% RPM	256	14		0.015	100	200		
	0 0 3	EPR Limit		4	12		0.001	100	200		
	0 1 A	N1 Maximum	% RPM	256	14		0.015	100	200		
	0 1 A	EPR Maximum		4	12		0.001	100	200		
	0 2 9	N1 Limit (TCC)	% RPM	256	14		0.015	100	200		
	0 2 9	EPR Limit (TOC)		4	12		0.001	100	200		
	0 2 F	Maximum Available EPR		4	12		0.001	100	200		
	0 3 B	EPR Limit		4	12		0.001	150	250		
	0 3 B	N1 Limit	% RPM	256	14		0.015	150	250		
	0 3 F	Maximum Available EPR		4	12		0.001	100	200		
	0 4 D	S/W REV-Tank		(1)	16		N/A	TBD	TBD		
	1 0 A	Max Allowed Fan Speed	%	117.5	13		0.032	100	500		
	1 0 B	Max Allowed Fan Speed	%	117.5	13		0.032	100	500		
	1 4 0	Air Density Ratio	Ratio	4	12		0.001	250	500		
3 4 3	0 0 3	N1 Derate	% RPM	256	14		0.015	100	200		
	0 0 3	EPR Rate		4	12		0.001	100	200		
	0 1 A	N1 Demand	% RPM	256	12		0.063	20	50		
	1 0 A	N1 Command vs. TLA	%	117.5	13		0.032	31.3	100		
	1 0 B	N1 Command vs. TLA	%	117.5	13		0.032	31.3	100		
3 4 4	0 1 A	N2	% RPM	256	14		0.015	50	100		
	0 1 C	N2	% RPM	256	14		0.015	50	100		
	0 2 9	N2	% RPM	256	14		0.015	50	100		
	0 2 F	N2	% RPM	256	14		0.015	25	50		
	0 3 3	N2	% RPM	256	14		0.015	50	200		
	0 3 F	N2	% RPM	256	14		0.015	25	50		
	1 0 A	Selected Actual Core Speed	%	128	12		0.063	31.3	100		
	1 0 B	Selected Actual Core Speed	%	128	12		0.063	31.3	100		
	1 3 A	N2 Speed	% RPM	256	14		0.015	25	50		
	0 D 0	N2	% RPM	256	13		0.03				SDI 1 = L/SDI 2 = R
3 4 5	0 1 A	Exhaust Gas Temperature	Deg C	2048	12		0.5	100	200		
	0 1 C	Exhaust Gas Temperature	Deg C	2048	12		0.5	100	200		
	0 2 9	Exhaust Gas Temperature	Deg C	2048	12		0.5	50	100		
	0 2 F	Exhaust Gas Temperature	Deg C	2048	12		0.5	25	50		
	0 3 3	Exhaust Gas Temperature	Deg C	2048	12		0.5	100	200		
	0 3 F	Exhaust Gas Temperature	Deg C	2048	12		0.5	25	50		
	1 0 A	Selected Exhaust Gas Temp (Total)	Deg C	-55 to 1100	11		1.00	62.5	250		
	1 0 B	Selected Exhaust Gas Temp (Total)	Deg C	-55 to 1100	11		1.00	62.5	250		
	1 3 A	EGT Trimmed	Deg C	2048	12		0.5	25	50		
	0 D 0	EGT	Deg C	2048	12		0.5				SDI 1 = L/SDI 2 = R
3 4 6	0 0 3	N1 Actual	% RPM	256	14		0.015	100	200		
	0 1 A	N1 Actual	% RPM	256	14		0.015	100	200		
	0 2 F	N1 Actual	% RPM	256	14		0.015	25	50		
	0 3 3	N1 Actual	% RPM	256	14		0.015	50	200		
	0 3 F	N1 Actual	% RPM	256	14		0.015	25	50		

ATTACHMENT 2B
DATA STANDARDS - BNR DATA

Label	Eqpt ID (Hex)	Parameter Name	Units	Range (Scale)	Sig Bits	Pos Sense	Resolution	Min Transit Interval (msec) 2	Max Transit Interval (msec) 2	Max Trans-port Delay (msec) 3	Notes & Cross Ref. to Tables and Attachments
	0 4 D	Cable Cap-Hi-Z	PF	65535	15		2.0	100	200		
	1 0 A	Selected Actual Fan Speed	%	128	12		0.063	31.3	100		
	1 0 B	Selected Actual Fan Speed	%	128	12		0.063	31.3	100		
	1 3 A	N1 Speed Actual	% N1Nom	256	14		0.015	25	50		
	0 D 0	N1	% RPM	256	13		0.03				SDI 1 = L/SDI 2 = R
3 4 7	0 2 9	Fuel Flow (Engine)	Lbs/Hr	32768	12		8	50	100		
	1 0 A	LPT Clearance Valve Position	%	-5 to 105	11		0.063	500	1000		
	1 0 B	LPT Clearance Valve Position	%	-5 to 105	11		0.063	500	1000		
	1 3 A	Fuel Flow	Lbs/Hr	32768	14		2	50	100		
	0 D 0	Fuel Flow	Lbs/Hr	32768	12		8				SDI 1 = L/SDI 2 = R
3 5 2	1 4 0	Maintenance Flight Controller	Flights	524, 287	19		1				
3 5 3	0 D 0	Vibration	Scalar	5.12	8		0.02				SDI 1 = L/SDI 2 = R
3 5 4	0 3 D	N1 Vibration	Scalar	5.12	9		0.01				Bit 11-Chan. A Bit 12-Chan. B
3 5 5	0 3 D	N2 Vibration	Scalar	5.12	9		0.01				Bit 11-Chan. A Bit 12-Chan. B
3 5 6	0 3 D	N2 Vibration	Scalar	5.12	9		0.01				Bit 11-Chan. A Bit 12-Chan. B
3 5 7	0 3 D	BB Vibration	Scalar	5.12	9		0.01				Bit 11-Chan. A Bit 12-Chan. B
3 6 0	0 0 2	Flight Information									6-33
	0 0 4	Potential Vertical Speed	Ft/Min	32768	15		1.0	10	20		
	0 0 5	Potential Vertical Speed	Ft/Min	32768	15		1.0	25	50		
	0 3 8	Potential Vertical Speed	Ft/Min	32768	15		1.0	10	20		
	0 3 D	N1 Rotor Imbalance Angle	Deg.	±180	9		1.0				Bit 11-Chan. A Bit 12-Chan. B
	0 5 6	Flight Information									6-33
	0 6 0	Flight Information									6-33
	1 0 A	Throttle Rate of Change	Deg/Sec	±16	9/9		1.00	31.3	100		See Notes [6] & [7]
	1 0 B	Throttle Rate of Change	Deg/Sec	±16	9/9		1.00	31.3	100		See Notes [6] & [7]
	1 4 2	RAIM Status Word	NM	16	13		0.00195				
3 6 1	0 0 4	Altitude (Inertial)	Feet	131072	20		0.125	20	40		
	0 0 5	Altitude (Inertial)	Feet	131072	18		0.5	20	40		
	0 3 8	Altitude (Inertial)	Feet	131072	20		0.125	20	40		
	0 3 D	LPT Rotor Imbalance Angle (737 only)	Deg.	±180	9		1.0				Bit 11-Chan. A Bit 12-Chan. B
	1 0 A	Derivative of Thrust vs. N1	DFN/%N1	2000	11		2.0	62.5	250		See Note [6]
	1 0 B	Derivative of Thrust vs. N1	DFN/%N1	2000	11		2.0	62.5	250		See Note [6]
3 6 2	0 0 4	Along Track Horizontal Acceleration	g	4	12		0.001	10	20		
	0 3 8	Along Track Horizontal Acceleration	g	4	12		0.001	10	20		
	1 0 A	Derivative of N1 vs. TLA	% N1/Deg	12	11		0.008	62.5	250		See Note [6]
	1 0 B	Derivative of N1 vs. TLA	% N1/Deg	12	11		0.008	62.5	250		See Note [6]
	1 1 5	Range Rate	Knots	±8192	13		1.0	50	50		
3 6 3	0 0 4	Cross Track Acceleration	g	4	12		0.001	10	20		
	0 3 8	Cross Track Acceleration	g	4	12		0.001	10	20		
	1 0 A	Corrected Thrust	LBF	64000	11		64.0	62.5	250		See Note [6]
	1 0 B	Corrected Thrust	LBF	64000	11		64.0	62.5	250		See Note [6]
3 6 4	0 0 4	Vertical Acceleration	g	4	12		0.001	10	20		
	0 0 5	Vertical Acceleration	g	4	12		0.001	10	20		
	1 3 A	N1 APR Rating	% N1Nom	256	14		0.015	100	200		
	0 3 8	Vertical Acceleration	g	4	12		0.001	10	20		

ATTACHMENT 2B
DATA STANDARDS - BNR DATA

Label	Eqpt ID (Hex)	Parameter Name	Units	Range (Scale)	Sig Bits	Pos Sense	Resolution	Min Transit Interval (msec) 2	Max Transit Interval (msec) 2	Max Trans-port Delay (msec) 3	Notes & Cross Ref. to Tables and Attachments
3 6 5	0 0 4	Inertial Vertical Velocity (EFI)	Ft/Min	32768	15		1.0	20	40		
	0 0 5	Inertial Vertical Velocity (EFI)	Ft/Min	32768	15		1.0	20	40		
	1 3 A	N1 Max Reverse	% N1Nom	256	14		0.015	100	200		
	0 3 8	Inertial Vertical Velocity (EFI)	Ft/Min	32768	15		1.0	20	40		
3 6 6	0 0 4	North-South Velocity	Knots	4096	15		0.125	50	100		6-2-1
	1 3 A	IGV Position	Deg/180	±180	12		0.05	100	200		
	0 3 8	North-South Velocity	Knots	4096	15		0.125	50	100		
3 6 7	0 0 4	East-West Velocity	Knots	4096	15		0.125	100	200		
	1 3 A	IGV Request	Deg/180	±180	12		0.05	100	200		
	0 3 8	East-West Velocity	Knots	4096	15		0.125	100	200		
3 7 0	0 0 4	g	9	8	13	UP	0.001	100	200	110	
	0 0 5	g	9	8	13	UP	0.001	100	200	110	
	0 0 B	GNSS Height WGS-84 (HAE)	Feet	± 131.072	20		0.125		1200		
	0 2 5	Decision Height Selected (EFI)	Feet	8192	16		0.125	100	200		
	0 5 5	**GNSS Height**	**Feet**					**500**	**1200**		**See ARINC 743A**
	0 C 5	Decision Height Selected (EFI)	Feet	16384	17		0.125	100	200		
3 7 1	X X X	Gen Aviation Equip. Identifier									
3 7 2	0 0 5	Wind Direction-Magnetic	Deg/180	±180	9		0.35	50	100		
	1 0 A	Actual Fan Speed	%	128	12		0.063	500	1000		
	1 0 B	Actual Fan Speed	%	128	12		0.063	500	1000		
3 7 3	0 0 5	North-South Velocity-Magnetic	Knots	4096	15		0.125	100	200		
	1 0 A	Actual Core Speed	%	128	12		0.063	500	1000		
	1 0 B	Actual Core Speed	%	128	12		0.063	500	1000		
3 7 4	0 0 5	East-West Velocity-Magnetic	Knots	4096	15		0.125	100	200		
	1 0 A	Left Thrust Reverser Position	%	-5+105	11		0.063	500	1000		
	1 0 B	Left Thrust Reverser Position	%	-5+105	11		0.063	500	1000		
3 7 5	0 0 4	Along Heading Acceleration	Gs	4	18		1.53E-5	50	110		
	0 0 5	Along Heading Acceleration	g	4	12		0.001	10	20		
	0 3 3	Spare DC1	VDC	16	12		0.004	150	250		
	0 3 8	Along Heading Acceleration	Gs	4	18		1.53E-5	50	110		
	1 0 A	Right Thrust Reverser Position	%	-5 to 105	11		0.063	500	1000		
	1 0 B	Right Thrust Reverser Position	%	-5 to 105	11		0.063	500	1000		
	X X X	GPS Differential Correction, Word A									See ARINC 743A
3 7 6	0 0 4	Cross Heading Acceleration	Gs	4	18		1.53E-5	50	110		
	0 0 5	Cross Heading Acceleration	g	4	12		0.001	10	20		
	0 3 3	Spare DC2	VDC	16	12		0.004	150	250		
	0 3 8	Cross Heading Acceleration	Gs	4	18		1.53E-5	50	110		
	X X X	GPS Differential Correction, Word B									See ARINC 743A

Notes:

1 The number entered into 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 twos 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 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.

ATTACHMENT 2B
DATA STANDARDS - BNR DATA

When words with like labels and with different SDI codes are transmitted, each of those words is considered a unique item of information. The guidance given in this document for transmit intervals should be applied to those words as if each word were identified by a different label.

3 Maximum transport delay is the worst case total delay between an input function and the output response.

COMMENTARY

Since the nature of the data varies, the definition of transport delay will differ depending on the application. In the case of a sampling system, a sample is complete when the 32-bit word constituting the output data is complete. In the case of a system involving filtering, transport delay is the phase slope of the transfer function across the frequency band of interest.

There can be situations in which it is necessary to define which portions of an equipment are included in the transport delay term. Such definitions should appear in individual equipment Characteristics when needed.

4 The values shown in parentheses are the preferred data standards for stator vane angle. However, a considerable portion of existing equipment use the other (non-parenthesized) values. Users should verify the data standards of the equipment they are or will be using.

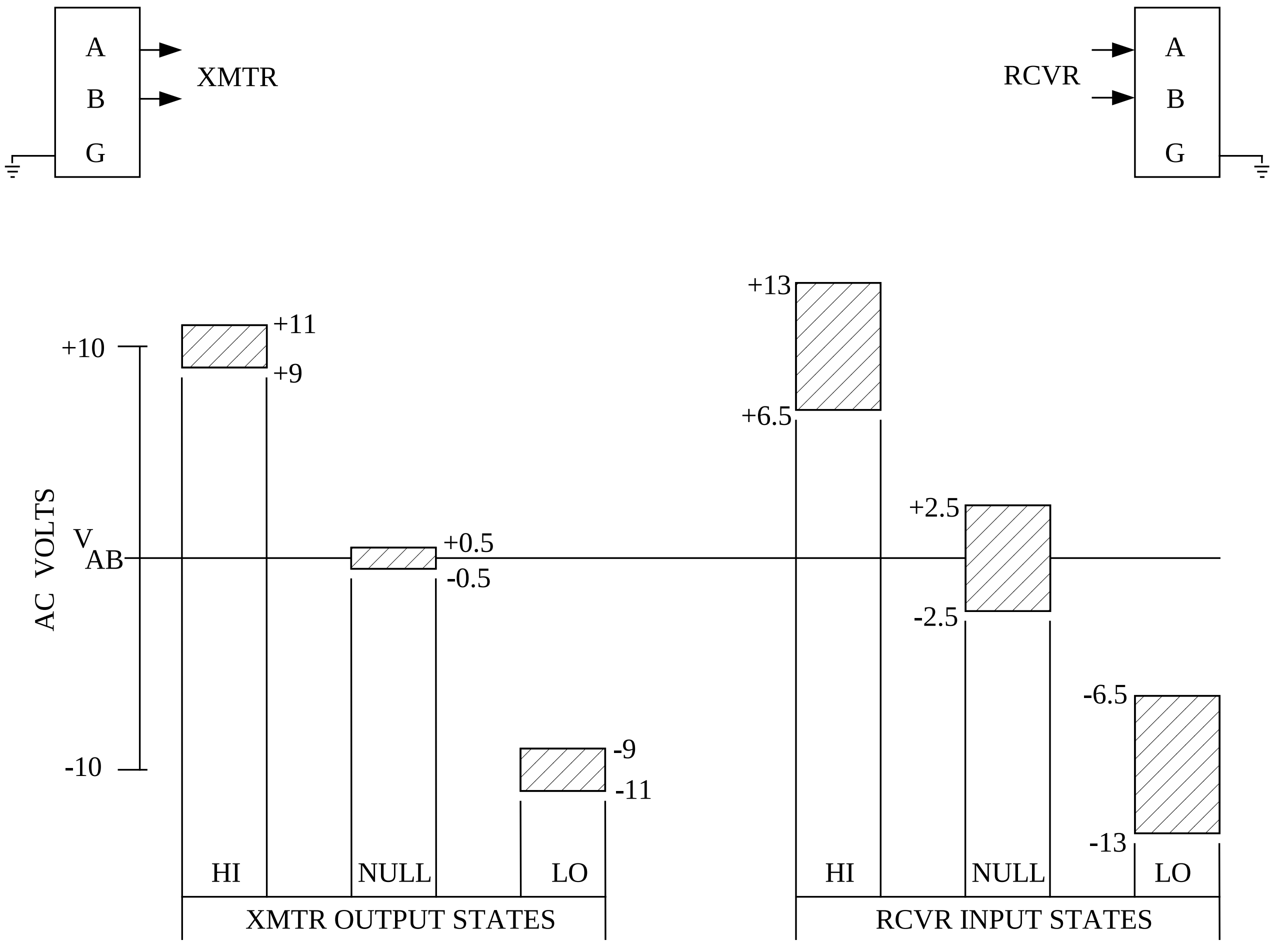
5 These labels can provide data in a degraded accuracy mode. See Section 2.1.5.1 and 2.1.5.2.

6 Optionally transmitted.

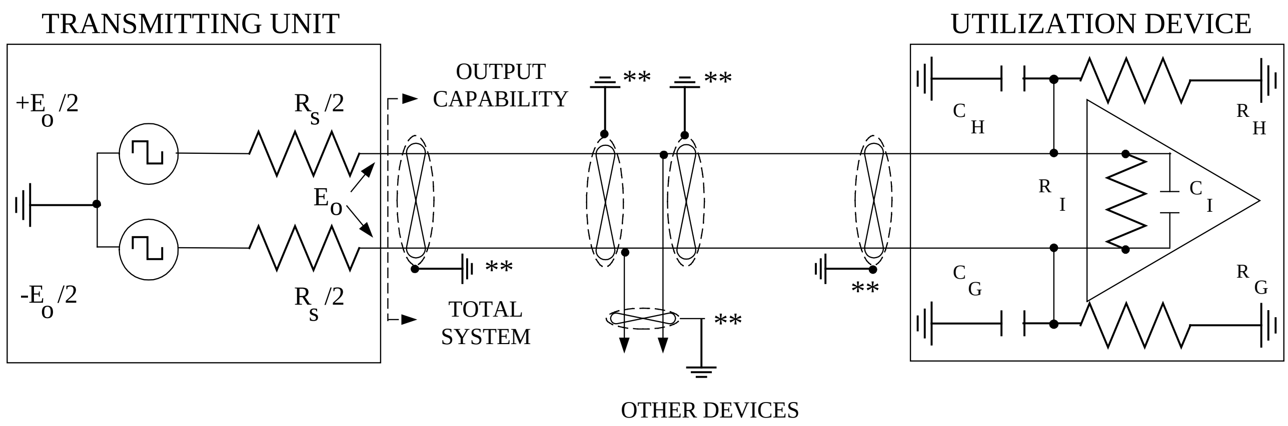
7 Binary packed word consisting of:

Word 1 = Bits 11-19 (Range = 16)
Word 2 = Bits 20-28 (Range = 16)

ATTACHMENT 3
VOLTAGE LEVELS



ATTACHMENT 4
INPUT/OUTPUT CIRCUIT STANDARDS



OUTPUT (SYSTEM) CAPABILITY		UTILIZATION DEVICE STANDARDS
Total System *Resistance	400 to 8,000 ohms	$R_I \geq$ 12,000 ohms
Total System *Capacitance	1,000 to 30,000 pF	$C_I \leq$ 50 pF
System Capacitance Unbalance	Not defined but unbalance due to aircraft interwiring should be held to a minimum	R_H or $R_G \geq$ 12,000 ohms C_H and $C_G \leq$ 50 pF

The total differential input impedance of the receiver should be limited to the values specified in Section 2.2.4.2.

This drawing describes total system characteristics rather than individual component parameters.

Notes::

* Includes aircraft interwiring

** Shields to be grounded in aircraft at both ends of all “breaks.”

ATTACHMENT 5
INTERNATIONAL STANDARDS ORGANIZATION CODE #5

The ISO Alphabet No. 5 seven-unit code set is reproduced in the table below with the BCD subset outlined in column 3:

STANDARD CODE

BIT 7 → BIT 6 → BIT 5 →					0 0 0	0 0 1	0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1
BIT 4 ↓	**BIT 3 ↓**	**BIT 2 ↓**	**BIT 1 ↓**	**Column → Row ↓**	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
0	0	0	0	0	NUL	DLE	SP	0	@	P	`	p
0	0	0	1	1	SOH	DC1	!	1	A	Q	a	q
0	0	1	0	2	STX	DC2	"	2	B	R	b	r
0	0	1	1	3	ETX	DC3	#	3	C	S	c	s
0	1	0	0	4	EOT	DC4	$	4	D	T	d	t
0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u
0	1	1	0	6	ACK	SYN	&	6	F	V	f	v
0	1	1	1	7	BEL	ETB	′	7	G	W	g	w
1	0	0	0	8	BS	CAN	(	8	H	X	h	x
1	0	0	1	9	HT	EM	)	9	I	Y	i	y
1	0	1	0	10	LF	SUB	*	:	J	Z	j	z
1	0	1	1	11	VT	ESC	+	;	K	[	k	{
1	1	0	0	12	FF	FS	´	<	L	\	l	|
1	1	0	1	13	CR	GS	-	=	M	]	m	}
1	1	1	0	14	SO	RS	•	>	N	^	n	~
1	1	1	1	15	SI	US	/	?	O	—	o	DEL

Note: b_8 is used as a parity bit.

ATTACHMENT 6
GENERAL WORD FORMATS AND ENCODING EXAMPLES

6.1. General Word Formats

TABLE 6-1

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 ⟶ ⟵ PAD ⟵ DISCRETES MSB [3] [2] LSB	SDI [1]	LABEL

Generalized BCD Word Format

TABLE 6-1-1

P	SSM	BCD CH #2	BCD CH #2	BCD CH #3	BCD CH #4	BCD CH #5	SDI	8 7 6 5 4 3 2 1
		4 2 1	8 4 2 1	8 4 2 1	8 4 2 1	8 4 2 1		
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
Example		2	5	7	8	6		DME DISTANCE (201)

BCD Word Format Example (No Discretes)

TABLE 6-2

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 ⟶ ⟵ PAD ⟵ DISCRETES MSB [3] [2] LSB	SDI [1]	LABEL

Generalized BNR Word Format

TABLE 6-2-1

	31 30	29 ... 11		8 7 6 5 4 3 2 1
P	SSM	PAD 1/2 1/4 1/8 1/16 1/32 1/64 1/128 etc	SDI	LABEL
0	1 0	0 0 1 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, Att. 2)			N-S VELOCITY (366)

BNR Word Format Example (No Discretes)

TABLE 6-3

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

Alpha Numeric (ISO Alphabet No. 5) Message – Initial Word Format

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

Alpha Numeric (ISO Alphabet No. 5) Maintenance Data –Initial Word Format

P	SSM (00)	"DATA CH #3"	DATA CH #2	DATA CH #1	LABEL (356, 357)
32	31 30	29 P 23	22 L 16	15 A 9	8 1

Alpha Numeric (ISO Alphabet No. 5) Data – Intermediate Word Format

P	SSM (10)	"DATA CH #3"	DATA CH #2	DATA CH #1	LABEL (356, 357)
32	31 30	29 (BNR ZEROES) 23	22 A 16	15 H 9	8 1

Alpha Numeric (ISO Alphabet No. 5) Data – Final Word Format

(Taken together, the following example shows encoding of the word ALPHA into three successive data words)

ATTACHMENT 6
GENERAL WORD FORMATS AND ENCODING EXAMPLE

TABLE 6-4

P	SSM	DISCRETES	SDI	LABEL
	(00)			(See Below)
32	31 30	29 MSB [2] LSB 11	10 9	8 1

LABEL	USAGE SUBGROUP
155 – 161	Maintenance
270 – 276	Discretes
350 – 354	Maintenance

Discrete Word Format

TABLE 6-5

P	SSM	ACKNOWLEDGEMENT	WORD COUNT	LABEL
	(01)	(FORMAT NOT DEFINED)		(355)
32	31 30	29 17	16 BNR EQUIV. 9	8 1

Acknowledgement Word – Initial Word Format

TABLE 6-5-1

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

Acknowledgement Word – Intermediate Word Format

TABLE 6-5-2

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

Acknowledgement Word – Final Word Format

TABLE 6-6

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	SSM		DATA				→										PADS		→		*	SDI		LABEL							
[5]	[4]																[3]					[1]		(173/174)							
* Bit No. 11 takes on the binary state "one" to annunciate that the ILS receiver is in the "tune inhibit" condition.																															

ILS Localizer/Glideslope Deviation Word

TABLE 6-7

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	SSM											DATA FIELD								**	*	SDI		LABEL							
[5]	[4]																					[1]		(202)							
* Bit No. 11 is assigned to a memory on/off annunciation function (see Section 4.7 of ARINC 709) ** Bit No. 12 is set to "1" when data is for a foreground station in frequency scanning mode.																								0	1	0	0	0	0	0	1

DME Distance Word

TABLE 6-8

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
PARITY	SSM		DATE											FLIGHT LEG				PAD [3]				SDI [1]		LABEL (260)							
			Day						Month																						
			x10		x1				x10	x1																					
			2	1	8	4	2	1	1	8	4	2	1	8	4	2	1														
	0	0	1	0	0	0	1	1	0	1	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	1	1	0	1
Example			2		3				0	8				5										0		6			2		

Date/Flight Leg Word

ATTACHMENT 6
GENERAL WORD FORMATS AND ENCODING EXAMPLES

TABLE 6-9

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
PARITY	SSM		FLIGHT NUMBER																PAD			SDI		LABEL (261)							
			x1000				x100				x10				x1																
			8	4	2	1	8	4	2	1	8	4	2	1	8	4	2	1													
	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	1	1	1	0	0	0	0	0	1	0	0	0	1	1	0	1
Example			0				1				1				7									1			6			2	

Flight Number Word

TABLE 6-10

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]	MSB DATA LSB	PAD [3]	[6]	SDI [1]	LABEL (222)

[6] Marker Beacon Output Discrete Bits

Discrete	Bit	Bit State	
		Discrete Grounded	Discrete Open
400 Hz	11	1	0
1300 Hz	12	1	0
3000 Hz	13	1	0

VOR Omnibearing

TABLE 6-11

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]		MSB DATA LSB	PAD	LEVER POSITION	SDI [1]	LABEL (127/137)

Lever	Bit				
	11	12	13	14	15
Position 1 (Cruise)	1	0	0	0	0
Position 2	0	1	0	0	0
Position 3	0	0	1	0	0
Position 4	0	0	0	1	0
Position 5 (Landing)	0	0	0	0	1

Slat/Flap Angle Word

TABLE 6-12

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]		HOURS 0-24	MINUTES 0-60	SECONDS 0-60	*	SDI	LABEL (150)
*Bit 11 of label 150 should be encoded with a “1” when the GNSS system clock is being used as the source of time. Otherwise, bit 11 should be encoded as “0”.								

UTC Binary Word

TABLE 6-13

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	PAD	FTI	SDI [1]	LABEL (164)		
							0 0 1	0 1 1	1 0
Note: When Bit 11 (Functional Test Inhibit) is a “1”, a functional test should not be performed.							4	6	1

Radio Height Word

ATTACHMENT 6
GENERAL WORD FORMATS AND ENCODING EXAMPLE

TABLE 6-14

32	31	30	29	28	27	26	25	24	23	22	21	20	1	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
P	SSM		DOCUMENTARY DATA																		PAD	SDI		LABEL							
			4	2	1	4	2	1	4	2	1	4	2	1	4	2	1	4	2	1				(262)							
[5]	[4]		Code 1			Code 2			Code 3			Code 4			Code 5			Code 6				[1]		0	1	0	0	1	1	0	1

<u>Documentary Data Word</u>

[1] <u>Source/Destination Identifier (SDI) Field</u>

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] <u>Discretes</u>

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] <u>Pad</u>

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

[4] <u>Sign/Status Matrix (SSM)</u>

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] <u>Parity Bit</u>

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

ATTACHMENT 6
GENERAL WORD FORMATS AND ENCODING EXAMPLES

TABLE 6-15

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	SSM		PAD			3^{rd} Digit				2^{nd} Digit				LSD				PAD				SDI		LABEL (046)							
1	0	0	0	0	0	0	1	1	0	0	1	0	0	1	0	0	1	0	0	0	0	0	0	0	1	1	0	0	1	0	0
Example						6				4				9										6			4			0	

Engine Serial Number (3LDs)

TABLE 6-16

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	SSM		PAD			MSD				5^{th} Digit				4^{th} Digit				PAD				SDI		LABEL (047)							
0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0	1	1	1	0	0	1	0	0
Example						0				3				2										7			4			0	

Engine Serial Number (3 MSDs)

TABLE 6-17

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	SSM		SPARE							MSD								LSD				SDI		LABEL (377)							
1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	1	0	0	1	1	1	1	1	1	1	1
										1				0				D						7			7			3	

Equipment Identifier Word
(Example provided for 10D code)

ATTACHMENT 6
GENERAL WORD FORMATS AND ENCODING EXAMPLE

TABLE 6-18

<table>
<tr><td>32</td><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td></tr>
<tr><td rowspan="5">P
A
R
I
T
Y</td><td colspan="2" rowspan="4">SSM</td><td colspan="19">DATE</td><td colspan="2" rowspan="4">SDI</td><td colspan="8" rowspan="4">LABEL
(260 031)
Chronometer
Output Only</td></tr>
<tr><td colspan="6">Day</td><td colspan="5">Month</td><td colspan="8">Year</td></tr>
<tr><td colspan="2">x10</td><td colspan="4">x1</td><td>x10</td><td colspan="4">x1</td><td colspan="4">x10</td><td colspan="4">x1</td></tr>
<tr><td>2</td><td>1</td><td>8</td><td>4</td><td>2</td><td>1</td><td>1</td><td>8</td><td>4</td><td>2</td><td>1</td><td>8</td><td>4</td><td>2</td><td>1</td><td>8</td><td>4</td><td>2</td><td>1</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td><td>1</td></tr>
<tr><td colspan="3">Example</td><td colspan="2">2</td><td colspan="4">3</td><td>0</td><td colspan="4">8</td><td colspan="4">8</td><td colspan="4">5</td><td colspan="2"></td><td colspan="3">0</td><td colspan="3">6</td><td colspan="2">2</td></tr>
</table>

TABLE 6-19

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	SSM (00)	D	PRIMARY COUNTER 0-4096 FLIGHT LEGS MSB LSB	4096-65535 LEGS MSB LSB	PAD	SDI	LABEL (251 01A) Electronic Supervisory Control

Flight Leg Counter

TABLE 6-20

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	SSM (00)		ALTITUDE MSB LSB	SEE BELOW	SDI	LABEL (206 018) Transponder

Bits			Range	Bits Used	App. Resolution
13	12	11			
0	0	0	65536	15	4
0	0	1	65536	14	8
0	1	0	65536	13	16
0	1	1	51200	12	25
1	0	0	81920	14	10
1	0	1	51200	10	100

Altitude (Variable Reduction)

ATTACHMENT 6
GENERAL WORD FORMATS AND ENCODING EXAMPLES

TCAS INTRUDER RANGE WORD

TABLE 6-21

<table>
<tr><td>32</td><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td></tr>
<tr><td>P</td><td colspan="2">SSM
[5]</td><td colspan="11">INTRUDER RANGE
[3] [4]</td><td colspan="3">INTRUDER
SENSE LVL[2]</td><td colspan="5">INTRUDER
NUMBER [1]</td><td colspan="2">SDI</td><td colspan="8">LABEL
(130)</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td><td>1</td><td>0</td></tr>
<tr><td></td><td colspan="2"></td><td colspan="11">MSB LSB</td><td colspan="3">MSB LSB</td><td colspan="5">MSB LSB</td><td colspan="2"></td><td colspan="8">LSB MSB</td></tr>
<tr><td></td><td colspan="2"></td><td colspan="11">5.25 NM</td><td colspan="3">2</td><td colspan="5">5</td><td colspan="2"></td><td colspan="3">0</td><td colspan="3">3</td><td colspan="2">1</td></tr>
</table>

Note 1: Maximum number of intruders is 31.

Note 2: Intruder Sensitivity Level Status

Bits			Meaning
18	17	16	
0	0	0	Not Reported
0	0	1	SL = 1
0	1	0	SL = 2
0	1	1	SL = 3
1	0	0	SL = 4
1	0	1	SL = 5
1	1	0	SL = 6
1	1	1	SL = 7

Note 3: Maximum range is 127-15/16 nautical miles.

Note 4: Intruder range may be reported in the form of horizontal range when intruder is available.

Note 5: Sign Status Matrix (SSM) [BNR]

Bits		Meaning
31	30	
0	0	Failure Warning
0	1	No Computed Data
1	0	Functional Data
1	1	Normal Operation

ATTACHMENT 6
GENERAL WORD FORMATS AND ENCODING EXAMPLE

TCAS INTRUDER ALTITUDE WORD

TABLE 6-22

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	SSM [5] [4]		RELATIVE ALTITUDE [3]	I.V.S. [2]	FUTURE SPARE	INTRUDER NUMBER [1]	SDI	LABEL (131)		
0	1 1	0	0 0 1 1 0 0 1	0 0	0 0 0 0	0 0 1 0 1	0 0	1 0 0	1 1 0	1 0
		S	MSB LSB			MSB LSB		LSB		MSB
			2500 FT	LEVEL		5		1	3	1

Note 1: Maximum number of intruders is 31.

Note 2: Sense of Intruders VERTICAL RATE (Z SINT)

Bits		Meaning
21	20	
0	0	No Vertical Rate (Level Flight)
0	1	Climbing
1	0	Descending
1	1	No Data

Note 3: Binary, Two's Complement Range = ± 12700 Ft.

Note 4: The No Computed Data Report of the SSM field applies to relative altitude (Bits 29-22) only. See Note 5.

Note 5: Sign Status Matrix (SSM) [BNR]

Bits		Meaning
31	30	
0	0	Failure Warning
0	1	No Computed Data
1	0	Functional Data
1	1	Normal Operation

ATTACHMENT 6
GENERAL WORD FORMATS AND ENCODING EXAMPLES

TCAS INTRUDER BEARING WORD

TABLE 6-23

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	SSM [5]	[4]		BEARING [3]										DISPLAY MATRIX [2]			INTRUDER NUMBER [1]					SDI		LABEL (132)							
1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	1	1	0	1	0
			S	MSB									LSB	MSB		LSB	MSB				LSB			LSB							MSB
				0										NO THREAT			1							2			3			1	

Note 1: Maximum number of intruders is 31.

Note 2: Display Matrix

Bits			Meaning
18	17	16	
0	0	0	No Threat
0	0	1	Traffic Advisory
0	1	0	Resolution Advisory
0	1	1	Proximate Traffic
1	0	0	Not Used
1	0	1	Not Used
1	1	0	Not Used
1	1	1	Not Used

Note 3: Binary, Fractional Binary;
Range = -180 to +180 Degrees

Note 4: The No Computed Data report in the SSM field applies to bearing information (Bits 29-19) only. See Note 5.

Note 5: Sign Status Matrix (SSM) [BNR]

Bits		Meaning
31	30	
0	0	Failure Warning
0	1	No Computed Data
1	0	Functional Data
1	1	Normal Operation

ATTACHMENT 6
GENERAL WORD FORMATS AND ENCODING EXAMPLE

TRANSPONDER ALTITUDE/TCAS OWN AIRCRAFT ALTITUDE

TABLE 6-24

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	SSM [2]		S	ALTITUDE																	ALT [1]	PAD		LABEL (203)							
0	1	1	0	0	0	1	0	1	0	0	1	0	0	1	0	0	0	0	1	1	0	0	0	1	1	0	0	0	0	0	1
				MSB																LSB				LSB							MSB
				21059																	1			3			0			2	

S = Sign Bit see Section 2.1.5.2 of this Document.

Note 1: Altitude Resolution

Bits	Meaning
11	
0	1 Ft
1	100 Ft

Note 2: Sign Status Matrix (SSM) [BNR]

Bits		Meaning
31	30	
0	0	Failure Warning
0	1	No Computed Data
1	0	Functional Data
1	1	Normal Operation

ATTACHMENT 6
GENERAL WORD FORMATS AND ENCODING EXAMPLES

Table 6-25 BCD DATA ENCODING EXAMPLES

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 [1]																			SDI		LABEL							
				MSC																		LSC										
				4	2	1	8	4	2	1	8	4	2	1	8	4	2	1	8	4	2	1			1	2	4	1	2	4	1	2
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 N1 (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) 154 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	1	0	1	0	0	0
Selected Altitude (025) 41000 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
Universal Time Constant (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 Height 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
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 Deg. 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 Deg. 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

NOTES:

[1] "P" denotes pad "zero" or valid data, see Section 2.1.2. Note possible use of pad bits for discrete functions per Section 2.3.1.2.

[2] Because of the actual maximum value of the most significant character 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 an "artificial" MSC of zero and its actual MSC encoded in the next most significant character position of the word.

ATTACHMENT 6
GENERAL WORD FORMATS AND ENCODING EXAMPLE

Table 6-25-1 BCD ENCODING OF LATITUDE AND LONGITUDE

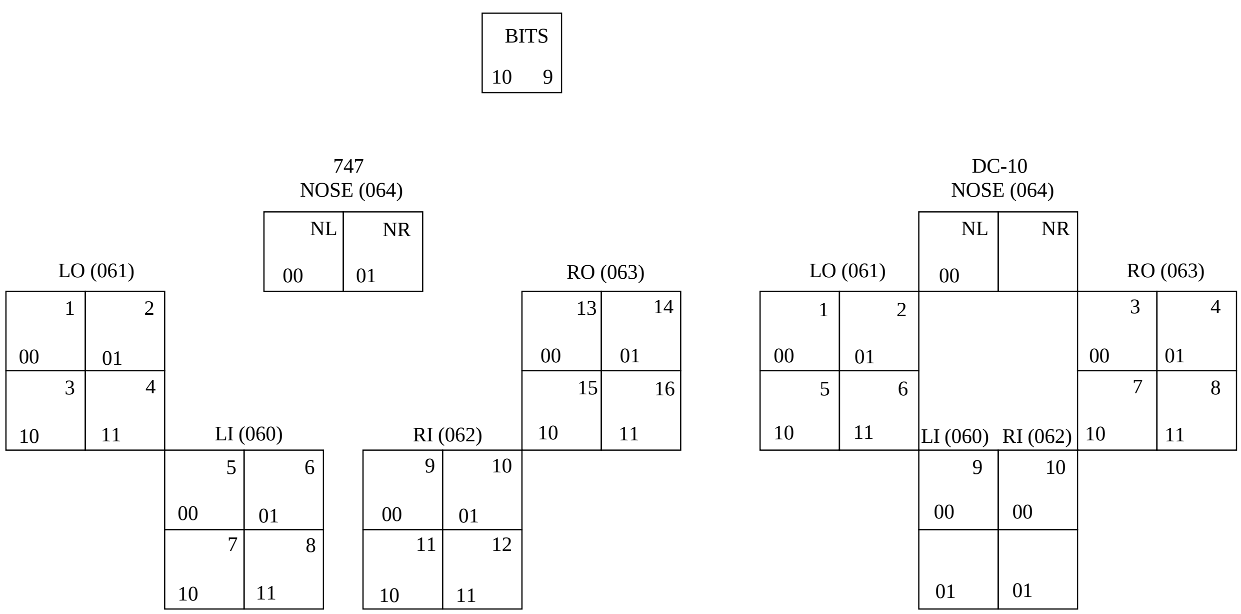
Bit No.	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
PARAMETER (Label)		SSM		DATA FIELD																					LABEL							
				MSC																				LSC								
				1	8	4	2	1	8	4	2	1	8	4	2	1	8	4	2	1	8	4	2	1	1	2	4	1	2	4	1	2
Present Position (Lat.) N 75 Deg 59.9' (010)	1	0	0	0	0	1	1	1	0	1	0	1	0	1	0	1	1	0	0	1	1	0	0	1	0	0	0	1	0	0	0	0
Present Position (Long) W 169 Deg 25.8' (011)	0	1	1	1	0	1	1	0	1	0	0	1	0	0	1	0	0	1	0	1	1	0	0	0	1	0	0	1	0	0	0	0

(See Commentary following Section 2.1.2 of this document for further information.)

ATTACHMENT 6
GENERAL WORD FORMATS AND ENCODING EXAMPLES

TABLE 6-26

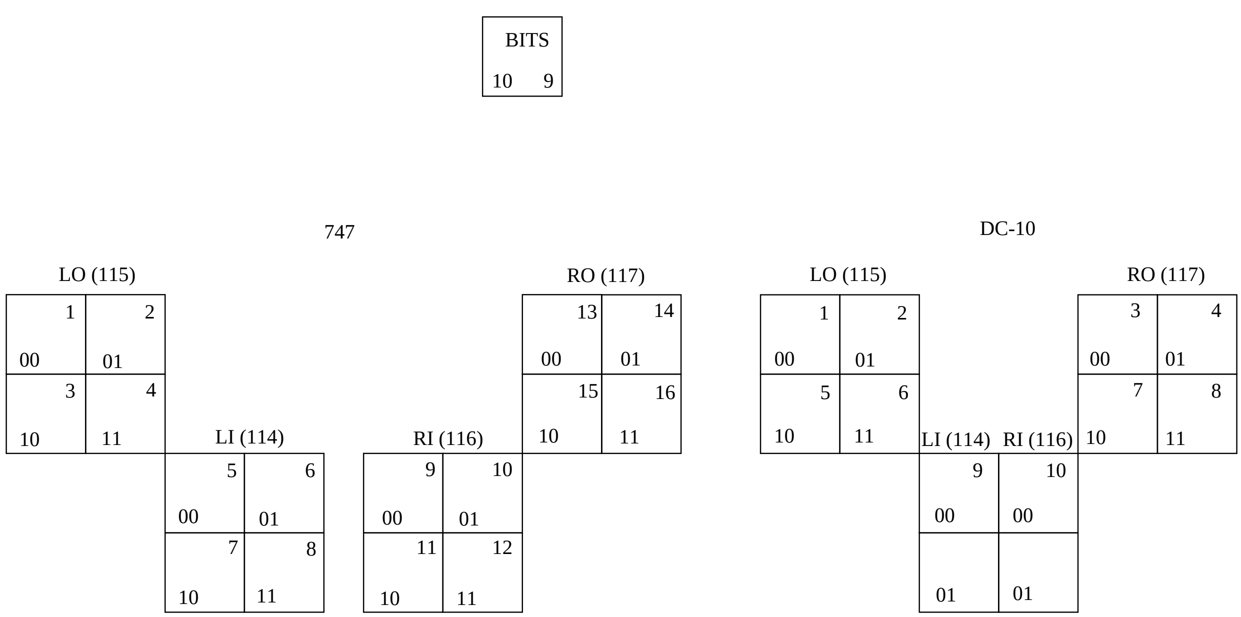
Wheel 747	Nos. DC-10	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	Bit Nos.
		PARITY	BNR	BCD	SPARES			DATA MSB 512	256	128	64	32	16	8	4	2	LSB 1	SPARE	SPARE	DIFF. LOW	THRESHOLD LOW	WHEEL FAULT	SYSTEM FAULT	WHEEL LABEL		LABEL								REF. ARINC OCT.
1	1		1	0																				0	0	1	0	1	1	0	0	1	0	115
2	2		1	0																				0	1	1	0	1	1	0	0	1	0	115
13	3		1	0																				0	0	1	1	1	1	0	0	1	0	117
14	4		1	0																				0	1	1	1	1	1	0	0	1	0	117
3	5		1	0																				1	0	1	0	1	1	0	0	1	0	115
4	6		1	0																				1	1	1	0	1	1	0	0	1	0	115
15	7		1	0																				1	0	1	1	1	1	0	0	1	0	117
16	8		1	0																				1	1	1	1	1	1	0	0	1	0	117
5	9		1	0																				0	0	0	0	1	1	0	0	1	0	114
9	10		1	0																				0	0	0	1	1	1	0	0	1	0	116
6			1	0																				0	1	0	0	1	1	0	0	1	0	114
7			1	0																				1	0	0	0	1	1	0	0	1	0	114
8			1	0																				1	1	0	0	1	1	0	0	1	0	114
10			1	0																				0	1	0	1	1	1	0	0	1	0	116
11			1	0																				1	0	0	1	1	1	0	0	1	0	116
12			1	0																				1	1	0	1	1	1	0	0	1	0	116



ATTACHMENT 6
GENERAL WORD FORMATS AND ENCODING EXAMPLE

TABLE 6-26-1

		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	Bit Nos.
Wheel 747	Nos. DC-10	PARITY	BNR	BCD	SPARES			DATA MSB 512	256	128	64	32	16	8	4	2	LSB 1	PREDICT	DIFF.TEMP.	WARM	HOT	BRAKE FAULT	SYSTEM	WHEEL LABEL		LABEL								REF. ARINC OCT.
1	1		1	0																				0	0	1	0	1	1	0	0	0	0	115
2	2		1	0																				0	1	1	0	1	1	0	0	1	0	115
13	3		1	0																				0	0	1	1	1	1	0	0	1	0	117
14	4		1	0																				0	1	1	1	1	1	0	0	1	0	117
3	5		1	0																				1	0	1	0	1	1	0	0	1	0	115
4	6		1	0																				1	1	1	0	1	1	0	0	1	0	115
15	7		1	0																				1	0	1	1	1	1	0	0	1	0	117
16	8		1	0																				1	1	1	1	1	1	0	0	1	0	117
5	9		1	0																				0	0	0	0	1	1	0	0	1	0	114
9	10		1	0																				0	0	0	1	1	1	0	0	1	0	116
6			1	0																				0	1	0	0	1	1	0	0	1	0	114
7			1	0																				1	0	0	0	1	1	0	0	1	0	114
8			1	0																				1	1	0	0	1	1	0	0	1	0	114
10			1	0																				0	1	0	1	1	1	0	0	1	0	116
11			1	0																				1	0	0	1	1	1	0	0	1	0	116
12			1	0																				1	1	0	1	1	1	0	0	1	0	116



ATTACHMENT 6
GENERAL WORD FORMATS AND ENCODING EXAMPLES

Table 6-27 BNR DATA ENCODING EXAMPLES

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)	P	SSM			DATA FIELD [1]																		SDI		LABEL							
																									1	2	4	1	2	4	1	2
Selected Course (100) 0 Deg. [3]	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	P	P	P	P	P	P	0	0	0	0	0	0	0	0	1	0
Selected Heading (101) 150 Deg. [3]	0	1	1	0	1	1	0	1	0	1	0	1	0	1	0	1	P	P	P	P	P	P	0	0	1	0	0	0	0	0	1	0
Selected Altitude (102) 41000 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	1	0
Selected Airspeed (103) 423.0 Knots	0	1	1	0	1	1	0	1	0	0	1	1	1	0	0	P	P	P	P	P	P	P	0	0	1	1	0	0	0	0	1	0
Selected Vertical Speed (104) -2200 Ft/Min [2]	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	1	0
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	1	0
Desired Track (114) 275 Deg. [3]	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	1	0
Cross Track Distance (116) 51.0 NM	1	1	1	0	0	1	1	0	0	1	1	0	0	0	0	0	0	0	0	P	P	P	0	0	0	1	1	1	0	0	1	0
Vertical Deviation (117) 600 Ft.	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	1	0
Flight Director Roll (140) +30 Deg.	1	1	1	0	0	0	1	0	1	0	1	0	1	0	1	1	P	P	P	P	P	P	0	0	0	0	0	0	0	1	1	0
Flight Director Pitch (141) -10 Deg. [2]	1	1	1	1	1	1	1	1	0	0	0	1	1	1	0	0	P	P	P	P	P	P	0	0	1	0	0	0	0	1	1	0
Fast/Slow (142) +15 Knots	0	1	1	0	0	1	1	1	1	0	0	0	0	0	0	0	P	P	P	P	P	P	0	0	0	1	0	0	0	1	1	0
UTC (150) (18:57:20)	0	1	1	0	1	0	0	1	0	1	1	1	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	1	0	1	1	0
Radio Height (164) 2450 Ft.	0	1	1	0	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	P	0	0	0	0	0	1	0	1	1	1	0
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	P	0	0	1	1	0	1	1	1	1	0
Glide Slope Deviation (174) -0.125 DDM [2]	1	1	1	1	1	1	0	1	1	0	0	0	0	0	0	0	P	P	P	P	P	P	0	0	0	0	1	1	1	1	1	0
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	1
Altitude (29.92) (203) 45000 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	1
Mach (205) 0.8325 Mach	0	1	1	0	0	0	1	1	0	1	0	0	0	0	0	0	1	0	0	0	P	P	0	0	1	0	1	0	0	0	0	1
Computed Airspeed (206) 425 Knots	1	1	1	0	0	1	1	0	1	0	1	0	0	1	0	0	0	0	P	P	P	P	0	0	0	1	1	0	0	0	0	1
True Airspeed (210) 565 Knots	0	1	1	0	0	1	0	0	0	1	1	0	1	0	1	0	0	0	0	P	P	P	0	0	0	0	0	1	0	0	0	1
Static Air Temp (213) +13 Deg. C	0	1	1	0	0	0	0	0	0	1	1	0	1	0	0	P	P	P	P	P	P	P	0	0	1	1	0	1	0	0	0	1
Total Air Temp (211) -25 Deg. C [2]	0	1	1	1	1	1	1	1	0	0	1	1	1	0	0	P	P	P	P	P	P	P	0	0	1	0	0	1	0	0	0	1
Altitude Rate (212) -15250 Ft/Min [2]	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	1
Present Pos. Lat. (310) N 81.5 Deg	1	1	1	0	0	1	1	1	0	0	1	1	1	1	1	0	1	0	1	0	1	0	0	0	0	0	0	1	0	0	1	1
Present Pos. Long. (311) W 100.25	0	1	1	1	0	1	1	1	0	0	0	1	0	1	1	0	1	1	0	0	0	0	0	0	1	0	0	1	0	0	1	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	1
Flight Path Accel (323) +2.50 g	0	1	1	0	1	0	1	0	0	0	0	0	0	1	0	1	0	0	P	P	P	P	0	0	1	1	0	0	1	0	1	1

NOTES:

[1] "P" denotes pad "zero" or valid data, see Section 2.1.2. 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^{o} are encoded as positive numbers. Angles in the range 180^{o} to 360^{o} are subtracted from 360^{o} and the resulting number encoded as a negative value per note 2. Arc minutes and seconds are encoded as decimal degrees.

ATTACHMENT 6
GENERAL WORD FORMATS AND ENCODING EXAMPLE

TABLE 6-28

AVM Command Word – Label 227 03D

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	Command/Control Bits							AVM Hex (Equipment) ID = 03D Hex												PADS		SDI		Label (227)							
								0	0	0	0	0	0	1	1	1	1	0	1					1	1	1	0	1	0	0	1

Bits		Meaning
10	9	
0	0	Engine 4 (or All Call) {not used on 757}
0	1	Engine 1 (or Engine 1 and 2)
1	0	Engine 2
1	1	Engine 3 (or Engine 3 and 4)

Bits							Parameter
31	30	29	28	27	26	25	
0	0	0	0	0	0	0	Not Used
0	0	0	0	0	0	1	Unit Self Test
0	0	0	0	0	1	0	Use Accelerometer A**
0	0	0	0	0	1	1	Use Accelerometer B**
0	0	0	0	1	0	0	PAD
0	0	0	0	1	0	1	Erase Fault History
0	0	0	0	1	1	0	Erase Flight History*
0	0	0	0	1	1	1	Read Fault History
0	0	0	1	0	0	0	Read Flight History*
0	0	1	0	0	1	0	Reserved*

*   737 Only
** 757 Only

ATTACHMENT 6
GENERAL WORD FORMATS AND ENCODING EXAMPLES

ACMS INFORMATION

ORIGIN AND DESTINATION

TABLE 6-29

Label 061 002

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	SSM	ORIGIN CHAR #3	ORIGIN CHAR #2	ORIGIN CHAR #1	OCTAL LABEL 061

Label 062 002

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	SSM	DESTINATION CHAR #1	ISO #5 CHAR “SPACE”	ORIGIN CHAR #4	OCTAL LABEL 062

Label 063 002

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	SSM	DESTINATION CHAR #4	DESTINATION CHAR #3	DESTINATION CHAR #2	OCTAL LABEL 063

NOTE: All characters are expressed in ISO #5 format, as defined in ARINC Specification 429.

ATTACHMENT 6
GENERAL WORD FORMATS AND ENCODING EXAMPLE

TABLE 6-30

TACAN Control - Label 145 002

RANGE 126
RESOLUTION 1.0
RATE 5Hz ± 10%

Bit No.	Description	
1	0	
2	1	1
3	1	
4	0	
5	0	4
6	1	
7	0	
8	1	5
9-10	SDI	
11-13	Pad Zero	
14	VOR/TAC Select (TAC=1, VOR=0)	
15	TACAN Select (TAC 1=1, TAC 2=0)	
16	Pad Zero	
17-20	BCD Units Chan Cont (LSB=17)	
21-24	Hex Tens Chan Cont (LSB=24)	
25	Pad Zero	
26	X/Y Mode (X=1, Y=0)	
27-28	Mode Cont (see Table A)	
29	Pad Zero	
30-31	SSM (see Table B)	
32	Parity (Odd)	

Table A – Mode Control

Bits 27	Bits 28	Description
0	0	REC
0	1	A/A REC
1	0	T/R
1	1	A/A T/R

Table B – SSM

Bits 30	Bits 31	Description
0	0	Valid
0	1	Functional Test
1	0	No Computed Data
1	1	Not Used

ATTACHMENT 6
GENERAL WORD FORMATS AND ENCODING EXAMPLES

ACMS INFORMATION FLIGHT NUMBER

TABLE 6-31

Label 233 EQ ID 002 MSB LSB MSB LSB

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	SSM	PAD ZERO	CHAR #2	PAD ZERO	CHAR #1	SDI	OCTAL LABEL 233

Label 234 EQ ID 002

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	SSM	PAD ZERO	CHAR #4	PAD ZERO	CHAR #3	SDI	OCTAL LABEL 234

Label 235 EQ ID 002

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	SSM	PAD ZERO	CHAR #6	PAD ZERO	CHAR #5	SDI	OCTAL LABEL 235

Label 236 EQ ID 002

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	SSM	PAD ZERO	CHAR #8	PAD ZERO	CHAR #7	SDI	OCTAL LABEL 236

Sign Matrix for BNR

Bit 31	Bit 30	Meaning
0	0	Failure Warning
0	1	No Computed data
1	0	Functional Test
1	1	Normal Operation

……..

TABLE 6-32

Label 233 EQ ID 018 MSB LSB MSB LSB

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	SSM	PAD ZERO	CHAR #2	PAD ZERO	CHAR #1	SDI	OCTAL LABEL 233

Label 234 EQ ID 018

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	SSM	PAD ZERO	CHAR #4	PAD ZERO	CHAR #3	SDI	OCTAL LABEL 234

Label 235 EQ ID 018

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	SSM	PAD ZERO	CHAR #6	PAD ZERO	CHAR #5	SDI	OCTAL LABEL 235

Label 236 EQ ID 018

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	SSM	PAD ZERO	CHAR #8	PAD ZERO	CHAR #7	SDI	OCTAL LABEL 236

Sign Matrix for BCD

Bit 31	Bit 30	Meaning
0	0	Valid
0	1	No Computed data
1	0	Functional Test
1	1	Failure Warning

NOTE: The following information is provided in order to clarify the confusion that existed in the Industry in regards to definition of the SSM for Label 233-236. It is expected that Flight ID will be sourced from FMC EQ ID of 002. Alternative implementation may include Mode “S” XPDR EQ ID 018. In this case the user cautioned that the SSM will be BCD format. See ARINC Characteristic 718A, “Mark 4 Air Traffic Control Transponder (ATCRB/MODE S)”, Attachment 3A for more detailed information.

ATTACHMENT 6
GENERAL WORD FORMATS AND ENCODING EXAMPLE

TABLE 6-33

Label 360-002

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	0	1	“STX” 0 0 0 0 0 1 0	PAD ZERO	BINARY WORD COUNT 0 0 0 0 0 1 1 1	OCTAL LABEL 360

INITIAL WORD

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	0	0	FLIGHT NUMBER CHAR #3	FLIGHT NUMBER CHAR #2	FLIGHT NUMBER CHAR #1	OCTAL LABEL 360

INTERMEDIATE WORD (SECOND)

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	0	0	FLIGHT NUMBER CHAR #6	FLIGHT NUMBER CHAR #5	FLIGHT NUMBER CHAR #4	OCTAL LABEL 360

INTERMEDIATE WORD (THIRD)

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	0	0	ORIGIN CHAR #1	FLIGHT NUMBER CHAR #8	FLIGHT NUMBER CHAR #7	OCTAL LABEL 360

INTERMEDIATE WORD (FOURTH)

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	0	0	ORIGIN CHAR #4	ORIGIN CHAR #3	ORIGIN CHAR #2	OCTAL LABEL 360

INTERMEDIATE WORD (FIFTH)

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	0	0	DESTINATION CHAR #3	DESTINATION CHAR #2	DESTINATION CHAR #1	OCTAL LABEL 360

INTERMEDIATE WORD (SIXTH)

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	0	0	PAD ZEROS	PAD ZEROS	DESTINATION CHAR #4	OCTAL LABEL 360

INTERMEDIATE WORD (SEVENTH)

NOTE: All characters are expressed in ISO #5 format, as defined in Attachment 5.

ATTACHMENT 6
GENERAL WORD FORMATS AND ENCODING EXAMPLES

TABLE 6-34

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	← 0 →	SUBSYSTEM SAL MSB	SUBSYSTEM ID (LABEL 172)

ATTACHMENT 6
GENERAL WORD FORMATS AND ENCODING EXAMPLE

TABLE 6-35
FQIS System Data - Label 241 04D

LABEL:	241
EQPT ID:	04D
PARAMETER NAME:	FQIS System Data
UNITS:	(See Below)
RANGE (SCALE):	(See Below)
SIGNIFICANT DIGITS:	(See Below)
RESOLUTION:	(See Below)
MIN TRANS INTERVAL (msec):	500
MAX TRANS INTERVAL (msec):	1024
SOURCE DESTINATION IDENTIFIER:	01 – LEFT MAIN TANK
	10 – RIGHT MAIN TANK
	11 – CENTER TANK

Label 241 is transmitted approximately once per second. The data encoding depends on the sequence which it is transmitted. Label 241 transmitting sequence, as defined below, starts with the left main tank data followed by the right main tank and then the center tank. Once all the tank data has been transmitted (63 words of data), the sequence will repeat with word number 1, left main tank, and so on. To determine the data that is transmitted at any specific time requires knowing where in the following sequence the word is taken.

LABEL 241 WORD SEQUENCE

Word	Signal	Units	Range	Sig. Dig.	Res	Data
1	LEFT MAIN TANK NO. 1	pF	319.922	12	.078125	BNR
2	LEFT MAIN TANK NO. 2	pF	319.922	12	.078125	BNR
3	LEFT MAIN TANK NO. 3	pF	319.922	12	.078125	BNR
4	LEFT MAIN TANK NO. 4	pF	319.922	12	.078125	BNR
5	LEFT MAIN TANK NO. 5	pF	319.922	12	.078125	BNR
6	LEFT MAIN TANK NO. 6	pF	319.922	12	.078125	BNR
7	LEFT MAIN TANK NO. 7	pF	319.922	12	.078125	BNR
8	LEFT MAIN TANK NO. 8	pF	319.922	12	.078125	BNR
9	LEFT MAIN TANK NO. 9	pF	319.922	12	.078125	BNR
10	LEFT MAIN TANK NO. 10	pF	319.922	12	.078125	BNR
11	LEFT MAIN TANK NO. 11	pF	319.922	12	.078125	BNR
12	LEFT MAIN TANK NO. 12	pF	319.922	12	.078125	BNR
13	LEFT MAIN TANK NO. 13	pF	319.922	12	.078125	BNR
14	LEFT MAIN TANK NO. 14	pF	319.922	12	.078125	BNR
15	LEFT MAIN BITE CAP. NO. 1	pF	319.922	12	.078125	BNR
16	LEFT MAIN COMPENSATOR	pF	319.922	12	.078125	BNR
17	LOAD SELECT 10,000	Lb	0-90000	1	10000	BCD
18	LOAD SELECT 1,000	Lb	0-9000	1	1000	BCD
19	LOAD SELECT 100	Lb	0-900	1	100	BCD
20	NO DATA TRANSMITTED DURING THIS WORD					
21	LEFT MAIN FUEL DENSITY	Lb/Gal	8.000	12	.000977	BNR (1)
22	RIGHT MAIN TANK NO. 1	pF	319.922	12	.078125	BNR
23	RIGHT MAIN TANK NO. 2	pF	319.922	12	.078125	BNR
24	RIGHT MAIN TANK NO. 3	pF	319.922	12	.078125	BNR
25	RIGHT MAIN TANK NO. 4	pF	319.922	12	.078125	BNR
26	RIGHT MAIN TANK NO. 5	pF	319.922	12	.078125	BNR
27	RIGHT MAIN TANK NO. 6	pF	319.922	12	.078125	BNR
28	RIGHT MAIN TANK NO. 7	pF	319.922	12	.078125	BNR
29	RIGHT MAIN TANK NO. 8	pF	319.922	12	.078125	BNR
30	RIGHT MAIN TANK NO. 9	pF	319.922	12	.078125	BNR
31	RIGHT MAIN TANK NO. 10	pF	319.922	12	.078125	BNR
32	RIGHT MAIN TANK NO. 11	pF	319.922	12	.078125	BNR
33	RIGHT MAIN TANK NO. 12	pF	319.922	12	.078125	BNR
34	RIGHT MAIN TANK NO. 13	pF	319.922	12	.078125	BNR
35	RIGHT MAIN TANK NO. 14	pF	319.922	12	.078125	BNR
36	RIGHT MAIN COMPENSATOR	pF	319.922	12	.078125	BNR
37	RIGHT MAIN BITE CAP. NO. 2	pF	319.922	12	.078125	BNR
38	LOAD SELECT 10,000	Lb	0-90000	1	10000	BCD
39	LOAD SELECT 1,000	Lb	0-9000	1	1000	BCD
40	LOAD SELECT 100	Lb	0-900	1	100	BCD
41	NO DATA TRANSMITTED DURING THIS WORD					
42	RIGHT MAIN DENSITY	Lb/Gal	8.000	12	.000977	BNR
43	CENTER TANK NO. 1	pF	319.922	12	.078125	BNR
44	CENTER TANK NO. 2	pF	319.922	12	.078125	BNR
45	CENTER TANK NO. 3	pF	319.922	12	.078125	BNR
46	CENTER TANK NO. 4	pF	319.922	12	.078125	BNR

ATTACHMENT 6
GENERAL WORD FORMATS AND ENCODING EXAMPLES

TABLE 6-35 (cont'd)

LABEL 241 WORD SEQUENCE (cont'd)

Word	Signal	Units	Range	Sig. Dig.	Res	Data
47	CENTER TANK NO. 5	pF	319.922	12	.078125	BNR
48	CENTER TANK NO. 6	pF	319.922	12	.078125	BNR
49	CENTER TANK NO. 7	pF	319.922	12	.078125	BNR
50	CENTER TANK NO. 8	pF	319.922	12	.078125	BNR
51	CENTER TANK NO. 9	pF	319.922	12	.078125	BNR
52	CENTER COMPENSATOR	pF	319.922	12	.078125	BNR
53	CENTER BITE CAP. NO. 3	pF	319.922	12	.078125	BNR
54	NO DATA TRANSMITTED DURING THIS WORD					
55	NO DATA TRANSMITTED DURING THIS WORD					
56	NO DATA TRANSMITTED DURING THIS WORD					
57	NO DATA TRANSMITTED DURING THIS WORD					
58	NO DATA TRANSMITTED DURING THIS WORD					
59	LOAD SELECT 10,000	Lb	0-90000	1	10000	BCD
60	LOAD SELECT 1,000	Lb	0-9000	1	1000	BCD
61	LOAD SELECT 100	Lb	0-900	1	100	BCD
62	NO DATA TRANSMITTED DURING THIS WORD					
63	CENTER TANK DENSITY	Lb/Gal	8.000	12	.000977	BNR

NOTES:

(1) Add 4 Lb/Gal adjustment to density data, i.e., 0000 = 4.0 Lb/Gal, FFF = 8.0 Lb/Gal.

FQIS (EQ ID 04D) SDI Encoding for Labels 012, 013, 020, 022, 023, 030, 255, 310, 320, 324, 342, 346, 354

Bits		Data
9	10	
0	0	Aux
1	1	Center
1	0	Left
0	1	Right

FQIS (EQ ID 04D) SDI Encoding for Labels 156, 157, 160

Bits		Data
9	10	
0	0	#1
1	0	#2
0	1	#3
1	1	#4

ATTACHMENT 6
GENERAL WORD FORMATS AND ENCODING EXAMPLE

TABLE 6-36

S/G HARDWARE PART NO. – Label 060 025

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	SSM	BCD CHARACTER ***	RESERVED	SDI	OCTAL LABEL 060

Bit No.	Function	Bit Status	
		1	0
10	SDI (Indicates Sequence ID)*		
11	RESERVED (Own P/N)	Own P/N	Other P/N
12	RESERVED (Position ID)**		
13	RESERVED (Position ID)**		

* Refer to Table 1 below
** Refer to Table 2 below
*** Unused Characters (Digits) are Pad Zero

Table 1

Bits		Sequence ID
10	9	
0	1	First Three Digits
1	0	Next Four Digits
1	1	Last Three Digits

Table 2

Bits		Position ID
13	12	
0	0	Left
1	0	Center As Left
1	1	Center As Right
0	1	Right

ATTACHMENT 6
GENERAL WORD FORMATS AND ENCODING EXAMPLES

TABLE 6-37

S/G SOFTWARE PART NO. – Label 061 025

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	SSM	BCD CHARACTER ***	RESERVED	SDI	OCTAL LABEL 061

Bit No.	Function	Bit Status 1	Bit Status 0
10 11 12 13	SDI (Indicates Sequence ID)* RESERVED (Own P/N) RESERVED (Position ID)** RESERVED (Position ID)**	Own P/N	Other P/N

* Refer to Table 1 below
** Refer to Table 2 below
*** Unused Characters (Digits) are Pad Zero

Table 1

Bits 10	Bits 9	Sequence ID
0	1	First Three Digits
1	0	Next Four Digits
1	1	Last Three Digits

Table 2

Bits 13	Bits 12	Position ID
0	0	Left
1	0	Center As Left
1	1	Center As Right
0	1	Right

ATTACHMENT 6
GENERAL WORD FORMATS AND ENCODING EXAMPLE

TABLE 6-37

OP. SOFTWARE PART NO. – Label 207 025

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	SSM	BCD CHARACTER ***	RESERVED	SDI	OCTAL LABEL 207

Bit No	Function	Bit Status	
		1	0
10 11 12 13	SDI (Indicates Sequence ID)* RESERVED (Own P/N) RESERVED (Position ID)** RESERVED (Position ID)**	Own P/N	Other P/N

* Refer to Table 1 below
** Refer to Table 2 below
*** Unused Characters (Digits) are Pad Zero

Table 1

Bits		Sequence ID
10	9	
0	1	First Three Digits
1	0	Next Four Digits
1	1	Last Three Digits

Table 2

Bits		Position ID
13	12	
0	0	Left
1	0	Center As Left
1	1	Center As Right
0	1	Right

ATTACHMENT 6
GENERAL WORD FORMATS AND ENCODING EXAMPLES

TABLE 6-38
Tank Unit Data – Label 241 160

Word Number	SDI	DESCRIPTION	UNITS
1	1	Tank Unit #1	pF
2	1	Tank Unit #2	pF
3	1	Tank Unit #3	pF
4	1	Tank Unit #4	pF
5	1	Tank Unit #5	pF
6	1	Tank Unit #6	pF
7	1	Tank Unit #7	pF
8	1	Tank Unit #8	pF
9	1	Tank Unit #9	pF
10	1	Tank Unit #10	pF
11	1	Tank Unit #11	pF
12	1	Tank Unit #12	pF
13	1	Tank Unit #13	pF
14	1	Tank Unit #14	pF
15	1	BITE Capacitor	pF
16	1	Compensator	pF
17	1	Load Select	Lbs.
18	1	Load Select	Lbs.
19	1	Load Select	Lbs.
20	1	Undefined	-
21	1	Fuel Density	Lbs/Gal
22	2	Tank Unit #1	pF
23	2	Tank Unit #2	pF
24	2	Tank Unit #3	pF
25	2	Tank Unit #4	pF
26	2	Tank Unit #5	pF
27	2	Tank Unit #6	pF
28	2	Tank Unit #7	pF
29	2	Tank Unit #8	pF
30	2	Tank Unit #9	pF
31	2	Tank Unit #10	pF
32	2	Tank Unit #11	pF
33	2	Tank Unit #12	pF
34	2	Tank Unit #13	pF
35	2	Tank Unit #14	pF
36	2	Compensator	pF
37	2	BITE Capacitor #2	pF
38	2	Load Select	Lbs
39	2	Load Select	Lbs
40	2	Load Select	Lbs
41	2	Undefined	-
42	2	Fuel Density	Lbs/Gal
43	3	Tank Unit #1	pF
44	3	Tank Unit #2	pF
45	3	Tank Unit #3	pF
46	3	Tank Unit #4	pF
47	3	Tank Unit #5	pF
48	3	Tank Unit #6	pF
49	3	Tank Unit #7	pF
50	3	Tank Unit #8	pF
51	3	Tank Unit #9	pF
52	3	Compensator	pF
53	3	BITE Capacitor #3	pF
54	3	Undefined	-
55	3	Undefined	-
56	3	Undefined	-
57	3	Undefined	-
58	3	Undefined	-
59	3	Load Select	Lbs
60	3	Load select	Lbs
61	3	Load Select	Lbs
62	3	Undefined	-
63	3	Fuel Density	Lbs/Gal

ATTACHMENT 6
GENERAL WORD FORMATS AND ENCODING EXAMPLE

TABLE 6-38-1
Tank Unit Data – Label 241 160 (cont'd)
RAW DATA TABLE
All Data Entries are 12-bit Center Justified Words

Table Organization:	Words 1-20 raw data for left tank Word 1 = Tank Unit #1 Word 2 = Tank Unit #2 Word 3 = Tank Unit #3 Word 4 = Tank Unit #4 Word 5 = Tank Unit #5 Word 6 = Tank Unit #6 Word 7 = Tank Unit #7 Word 8 = Tank Unit #8 Word 9 = Tank Unit #9 Word 10 = Tank Unit #10 Word 11 = Tank Unit #11 Word 12 = Tank Unit #12 Word 13 = (Spare) Word 14 = (Spare) Word 15 = BITE Capacitor #1 Word 16 = Compensator Word 17 = Load Select 10,000 Digit Word 18 = Load Select 1,000 Digit Word 19 = Load Select 100 Digit Word 20 = None Word 21-40 raw data for right tank Word 21 = Tank Unit #1 Word 22 = Tank Unit #2 Word 23 = Tank Unit #3 Word 24 = Tank Unit #4 Word 25 = Tank Unit #5 Word 26 = Tank Unit #6 Word 27 = Tank Unit #7 Word 28 = Tank Unit #8 Word 29 = Tank Unit #9 Word 30 = Tank Unit #10 Word 31 = Tank Unit #11 Word 32 = Tank Unit #12 Word 33 = (Spare) Word 34 = (Spare) Word 35 = Compensator Word 36 = BITE Capacitor #2 Word 37 = Load Select 10,000 Digit Word 38 = Load Select 1,000 Digit Word 39 = Load Select 100 Digit Word 40 = None Words 41-60 raw data for Center Tank Word 41 = Tank Unit #1 Word 42 = Tank Unit #2 Word 43 = Tank Unit #3 Word 44 = Tank Unit #4 Word 45 = Tank Unit #5 Word 46 = Tank Unit #6 Word 47 = Tank Unit #7 Word 48 = Tank Unit #8 Word 49 = Tank Unit #9 Word 50 = Compensator Word 51 = BITE Capacitor #3 Word 52 = (Spare) Word 53 = (Spare) Word 54 = (Spare) Word 55 = (Spare) Word 56 = (Spare) Word 57 = Load Select 10,000 Digit Word 58 = Load Select 1,000 Digit Word 59 = Load Select 100 Digit Word 60 = None

ATTACHMENT 6
GENERAL WORD FORMATS AND ENCODING EXAMPLES

TABLE 6-39

Note: Bit examples for 24- bit ICAO address labels 24/216 have been moved to Part 2 of ARINC 429.

ATTACHMENT 6
GENERAL WORD FORMATS AND ENCODING EXAMPLES

TABLE 6-40

RADIO SYSTEMS MANAGEMENT WORD FORMATS

ADF Function	PARITY (odd)	SIGN/STATUS MATRIX	1000 kHz (1)	100 kHz (0)	10 kHz (5)	1 kHz (7)	0.5 kHz	SPARE	ANT	BFO	RESERVED (SDI)	LABEL ADF Frequency (032)		
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 6 4	2 1
Example	1	0 0	0 0 1	0 0 0 0	0 1 0 1	0 1 1 1	1	0	0	0	0 0	0 1 0	1 1 0	0 0
Notes							[1]		[2]	[2]		2	3	0

[1] When bit no. 14 is “zero,” the radio should tune to the whole kilohertz frequency encoded in the word. When bit no. 14 is “one,”the radio should tune 0.5 kHz above this frequency.

[2]

Bit	Zero	One
11	BFO off	BFO on
12	ADF Mode	ANT Mode

TABLE 6-41

DME Function	PARITY (odd)	SIGN/STATUS MATRIX	10 MHz	1 MHz	0.1 MHz	0.00/0.05 MHz	IDENT DISPLAY	MLS FREQ.	ILS FREQ.	DME Mode	SDI	LABEL DME Frequency (035)		
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 1 0 1	0 1 1 0	1	0 1	0	0	0 0 0	0 0	1 0 1	1 1 0	0 0
Notes [1] [5]						[2]	[7]	[3]		[4]		5	3	0

[1] Directed Frequency #1, 115.65 MHz, VOR

[2] Bit 18 is used only for VOR & ILS frequencies and is limited to .00 or .05

[3] Bits 15 & 14 codes: VOR (0,0), ILS (0,1) or MLS (1,0), (1,1) is spare
.
[4] Refer to table in Section 4.1.2 of ARINC Characteristic 709 for mode codes
.
[5] Although not encoded in the tuning word all VOR & ILS frequencies have 1 as hundreds digit. Although not encoded in the tuning word all MLS frequencies have 5 as the thousand digit and 0 as the hundred digit. Add 5031 MHz to the coded value to obtain the MLS frequency.

[6] (Original note deleted)

[7] Bit 16 when equal to “one” specifies that a displayable BCD output is to be provided for that station, and when bit 17 is a “one,” an ident output is to be generated for that station.

ATTACHMENT 6
GENERAL WORD FORMATS AND ENCODING EXAMPLES

TABLE 6-42

RADIO SYSTEMS MANAGEMENT WORD FORMATS

HF COM Word #1 Function	PARITY (Odd)	SIGN/STATUS MATRIX	10 MHz (2)	1 MHz (3)	0.1 MHz (5)	0.01 MHz (7)	0.001 MHz (9)	USB/LSB MODE SSM/AM MODE WORD IDENT.	LABEL HF COM Frequency (037)		
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	1 0	0 0 1 1	0 1 0 1	0 1 1 1	1 0 0 1	0 0 0	1 1 1	1 1 0	0 0
Notes								[1] [2]	7	3	0

[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.

TABLE 6-42-1

HF COM Word #2 Function	PARITY (odd)	SIGN/STATUS MATRIX	0.1 kHz (5)	NOT USED	RESERVED WORD IDENT.	LABEL HF COM Frequency (037)		
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 1	1 1 1	1 1 0	0 0
					[1]	7	3	0

[1] Bit No. 10 is reserved for CW mode select. The CW mode is selected when bit number 10 is a “one”. When the second word is transmitted, it should immediately follow the first HF word.

ALTERNATE FORM

TABLE 6-43

HF COM Word #1 Function	PARITY (odd)	SIGN/STATUS MATRIX	10MHz (2)	1 MHz (3)	0.1 MHz (5)	0.01MHz (7)	0.001MHz (9)	WORD IDENT.	SDI	LABEL HF COM Frequency (205)		
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	1 0	0 0 1 1	0 1 0 1	0 1 1 1	1 0 0 1	0	0 1	1 0 1	0 0 0	0 1
										5	0	2

ATTACHMENT 6
GENERAL WORD FORMATS AND ENCODING EXAMPLES

TABLE 6-43-1

HF COM Word #2 Function	PARITY (odd)	SIGN/STATUS MATRIX	0.1 kHz (5)	NOT USED	WORD IDENT.	SDI	LABEL HF COM Frequency (205)		
Bit No. Example	32 0	31 30 0 0	29 28 27 26 0 1 0 0	25 24 23 22 21 20 19 18 17 16 15 14 13 12 0 0 0 0 0 0 0 0 0 0 0 0 0 0	11 1	10 9 0 0	8 7 6 1 0 1	5 4 3 0 0 0	2 1 0 1
							5	0	2

RADIO SYSTEMS MANAGEMENT WORD FORMATS

TABLE 6-44

ILS Function	PARITY (odd)	SIGN/STATUS MATRIX	10 MHz (0)	1 MHz (9)	0.1 MHz (3)	0.01 MHz (0)	SPARE	ILS CAT.	RES. (SDI)	LABEL Frequency (033)		
Bit No. Example	32 1	31 30 0 0	29 28 27 0 0 0	26 25 24 23 1 0 0 1	22 21 20 19 0 0 1 1	18 17 16 15 0 0 0 0	14 13 0 0	12 11 0 0	10 9 0 0	8 7 6 1 1 0	5 4 3 1 1 0	2 1 0 0
										3	3	0

BIT POSITION	12	11
CATEGORY NOT	0	0
ILS CAT I	0	1
ILS CAT II	1	0
ILS CAT III	1	1

TABLE 6-44-1

VOR/ILS Function	PARITY (odd)	SIGN/STATUS MATRIX	10 MHz (0)	1 MHz (9)	0.1 MHz (3)	0.01 MHz (0)	ILS MODE	SPARE	RES. (SDI)	LABEL VOR/ILS Frequency (034)		
Bit No. Example	32 1	31 30 0 0	29 28 27 0 0 0	26 25 24 23 1 0 0 1	22 21 20 19 0 0 1 1	18 17 16 15 0 0 0 0	14 0 [1]	13 12 11 0 0 0	10 9 0 0	8 7 6 0 0 1	5 4 3 1 1 0	2 1 0 0
										4	3	0

[1] Bit number 14 should be set to “zero” for VOR frequencies and “one” for ILS frequencies by the tuning information sources.

ATTACHMENT 6
GENERAL WORD FORMATS AND ENCODING EXAMPLES

TABLE 6-45

VHF/COM Function	PARITY (odd)	SIGN/STATUS MATRIX	10 MHz (2)	1 MHz (8)	0.1 MHz (5)	0.01 MHz (3)	0.001 MHz (0)	RES (SDI)	LABEL VHF COM Frequency (030)		
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 1 0	1 0 0 0	0 1 0 1	0 0 1 1	0 0 0 0	0 0	0 0 0	1 1 0	0 0
									0	3	0

TABLE 6-46

RADIO SYSTEMS MANAGEMENT WORD FORMATS

ATC TRANSPONDER Function	PARITY (odd)	SIGN/STATUS MATRIX	Pilot Selected Mode A Reply Code 0-7 (3) A4 A2 A1	0-7 (6) B4 B2 B1	0-7 (2) C4 C2 C1	0-7 (0) D4 D2 D1	Hijack Mode	Control Function	ALT. DATA SOURCE SEL.	Ident (SPI)	CONTROL FUNCTION	ALT. REP. ON/OFF	RES. (SDI)	LABEL Beacon Transponder Code (031)		
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 1 1	1 1 0	0 1 0	0 0 0	0	0 0	0	0	0	0	0 0	1 0 0	1 1 0	0 0
Notes								[2]	[1]		[2]	[1]		1	3	0

[1]

Bit	Zero	One
11	Altitude Report On	Altitude Reporting Off
13	Ident. (SPI) OFF	Ident. ON
14	Use #1 Alt. Data Source	Use #2 Alt. Data Source

Control Panel Function			
Function	16	15	12
DABS ON/ ASAS OFF	0	0	1
Reset Aural Warning Signal	0	1	0

LABEL_Beacon Transponder Code (031) New Bit Assignment	
Bit 17	Meaning
0	Transponder IS NOT operating in the Hijack Mode
1	Transponder IS operating in the Hijack Mode

ATTACHMENT 6
GENERAL WORD FORMATS AND ENCODING EXAMPLES

TABLE 6-47

TACAN Control – Label 146 112

RANGE 126
RESOLUTION 1.0
RATE 5Hz ±10%

Bit No.	Description
1	0
2	1 1
3	1
4	0 4
5	0
6	1
7	1 6
8	0
9-10	SDI
11	Distance Memory (DIST MEM=1)
12	Bearing Memory (BRG MEM=1)
13	Pad Zero
14	VOR/TAC Select (TAC=1, VOR=0)
15	TACAN Select (TAC 1=1, TAC 2=0)
16	Pad Zero
17-20	BCD Units Chan Cont (LSB=17)
21-24	Hex Tens Chan Cont (LSB=24)
25	Pad Zero
26	X/Y Mode (X=1, Y=0)
27-28	Mode Cont (See Table A)
29	Pad Zero
30-31	SSM (See Table B)
32	Parity (Odd)

RADIO SYSTEMS MANAGEMENT WORD FORMATS

Table A – Mode Control

Bits 27	Bits 28	Description
0	0	REC
0	1	A/A REC
1	0	T/R
1	1	A/A T/R

Table B - SSM

Bits 30	Bits 31	Description
0	0	Valid
0	1	Functional Test
1	0	No Computed Data
1	1	Not Used

ATTACHMENT 6
GENERAL WORD FORMATS AND ENCODING EXAMPLES

TABLE 6-48

TACAN Control Word – Label 147 115

Bit No.		Function	1	0	Note
1	0	1			
2	1				
3	1				
4	0	4 Label Number (147)			
5	0				
6	1				
7	1	7			
8	1				
9		SEL	TACAN 1	TACAN 2	
10		SEL	ANTENNA 2	ANTENNA 1	
11		LOBE	ANTENNA LOBE		
12		AUTO/MAN TUNE	AUTOTUNE	MANUAL TUNE	
13		A/A AGC Disable	ENABLE	DISABLE	
14		Pad		X	
15 -16		TACAN/MLS Select			[1]
17		(LSB)			
18		BCD Channel Code Units			
19					
20		(MSB)			
21		(LSB)			
22		HEX Channel Code Tens			
23					
24		(MSB)			
25		TST	TEST	NO TEST	
26		X/Y	X	Y	
27-28		Mode Control			[2]
29		INT	NORMAL	INVERSE	
30-31		SSM			[3]
32		Parity (odds)			

[1] TACAN/MLS Select

Bits		Description
15	16	
0	0	TACAN
1	0	MLS W
0	1	Not Used
1	1	MLS Z

[2] Mode Control

Bits		Description
27	28	
0	0	REC
1	0	T/R
0	1	A/A REC
1	1	A/A T/R

[3] SSM

Bits		Description
30	31	
0	0	Valid Data
0	1	No Computed Data
1	0	Functional Test
1	1	Not Used

ATTACHMENT 6
GENERAL WORD FORMATS AND ENCODING EXAMPLES

TABLE 6-49

Horizontal Alarm Limit/Horizontal Integrity Threshold (BNR) – Label 124 – IE2

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	SSM [Note 1]			Horizontal Alarm Limit (HAL) /Horizontal Integrity Threshold [Notes 2, 3]													Pad [Note 4]		Phase of Flight [Note 5]					Octal Label		
																								4	2	1
																								0 0 1	0 1 0	1 0

[1] SSM (Status Matrix):

BITS		Meaning
31	30	
0	0	Failure Warning
0	1	No Computed Data (NCD)
1	0	Functional Test
1	1	Normal Operation

[2] Horizontal Alarm Limit (HAL) / Horizontal Integrity Threshold

The LDPU's optional internal GNSS receiver will generate a horizontal position integrity alarm when the EPU (Estimated Position Uncertainty) exceeds the Horizontal Alarm Limit for a period of time equal to the Time To Alarm for the current phase of flight. If the value of the HPL (Horizontal Protection Level, label 130) output from the internal GNSS receiver exceeds the horizontal integrity threshold specified in label 124, then horizontal integrity is deemed to be unavailable.

In the HAL field, the LSB (bit 16) has a weight of 1 meter, while the MSB (bit 28) has a weight of 4096 m.

[3] "All Ones" Value for HAL Field

If an "all ones" value is encoded into bits 28 to 18, the HAL value should be assumed to be the default value for the phase of flight specified in bits 13 to 11. If the HAL value is "all ones" (8191 meters) and the phase of flight code is "000" ("unspecified") then the SSM field should be set to NCD.

[4] Pad Bits

The pad bits, bits 15 and 14, should be set to 0.

[5] Phase of Flight

The "phase of flight" field, bits 13 to 11, informs an optional GNSS receiver within the LDPU of the current phase of flight, so that the GNSS receiver may adjust its internal parameters to meet requirements for that phase of flight.

BITS			**Phase of Flight**	**Alarm Limit**		**Time To Alarm**
13	12	11		Horizontal	Vertical	
0	0	0	Not Specified	Unchanged	Unchanged	Unchanged
0	0	1	Oceanic	4 NM (7408 m)	N/A	8 s
0	1	0	En Route	2 NM (3704 m)	N/A	8 s
0	1	1	Terminal/Departure	1 NM (1852 m)	N/A	8 s
1	0	0	Non-Precision Approach	0.3 NM (555.6 m)	N/A	8 s
1	0	1	LNAV/VNAV Precision Appr.	As specified in bits 28 to 18	As specified in Vertical Alarm Limit word, label TBD	1 s
1	1	0	APV-II Precision Approach			1 s
1	1	1	GLS Precision Approach			1 s

ATTACHMENT 6
GENERAL WORD FORMATS AND ENCODING EXAMPLES

TABLE 6-50

Vertical Alarm Limit / Vertical Integrity Threshold (BNR) – Label 127 – IE2

<table>
<tr><td>32</td><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8 7 6</td><td>5 4 3</td><td>2 1</td></tr>
<tr><td rowspan="3"><u>P</u></td><td colspan="2" rowspan="3">SSM
Note 1</td><td rowspan="3"></td><td colspan="8" rowspan="3">Vertical Alarm Limit (VAL)
/Vertical Integrity Threshold
[Note 2]</td><td colspan="10" rowspan="3">Pad
[Note 3]</td><td colspan="2" rowspan="3"></td><td colspan="3"><u>Octal Label</u></td></tr>
<tr><td>7</td><td>2</td><td>1</td></tr>
<tr><td>1 1 1</td><td>0 1 0</td><td>1 0</td></tr>
</table>

[1] <u>SSM (Status Matrix)</u>:

<table>
<tr><td colspan="2">BITS</td><td rowspan="2">Meaning</td></tr>
<tr><td>31</td><td>30</td></tr>
<tr><td>0</td><td>0</td><td>Failure Warning</td></tr>
<tr><td>0</td><td>1</td><td>No Computed Data</td></tr>
<tr><td>1</td><td>0</td><td>Functional Test</td></tr>
<tr><td>1</td><td>1</td><td>Normal Operation</td></tr>
</table>

[2] <u>Vertical Alarm Limit (VAL) / Vertical Integrity Threshold</u>

The LDPU’s optional internal GNSS receiver will generate a vertical position integrity alarm when the estimated error in vertical position exceeds the Vertical Alarm Limit for longer than the time-to-alarm for the current phase of flight. (The phase of flight is specified in label 124.) If the value of the VPL (Vertical Protection Level, label 130) output from the internal GNSS receiver exceeds the vertical alarm limit specified in bits 28-21, then vertical position integrity is defined to be “unavailable.”

The LSB, bit 21, has a weight of 1 meter, while the MSB, bit 28, has a weight of 128 m.

[3] <u>Pad Bits</u>

The pad bits, bits 20 to 11, should be set to 0.

ATTACHMENT 6
GENERAL WORD FORMATS AND ENCODING EXAMPLES

TABLE 6-51

CDTI Display Unit - Label 262 - 144

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	SSM		S	Display Range														Spare				SDI		Octal Label		
	0 0		+	20 NM																		0 0		2 6 2		
0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	010	011	01

Bit			**Description**	**Notes**
1	Label 1st digit		1	
2	Label 1st digit	___2	0	
3	Label 2nd digit		1	
4	Label 2nd digit		1	
5	Label 2nd digit	___6	0	
6	Label 3rd digit		0	
7	Label 3rd digit		1	
8	Label 3rd digit	___2	10	
9	Reserved for SDI		0	
10	Reserved for SDI		0	
11	Reserved		0	
12	Reserved		0	
13	Reserved		0	
14	Reserved		0	
15	Display Range		LSB (1/32 NM)	[1]
16	Display Range		(1/16 NM)	[1]
17	Display Range		(1/8 NM)	[1]
18	Display Range		(1/4 NM)	[1]
19	Display Range		(1/2 NM)	[1]
20	Display Range		(1 NM)	[1]
21	Display Range		(2 NM)	[1]
22	Display Range		(4 NM)	[1]
23	Display Range		(8 NM)	[1]
24	Display Range		(16 NM)	[1]
25	Display Range		(32 NM)	[1]
26	Display Range		(64 NM)	[1]
27	Display Range		(128 NM)	[1]
28	Display Range		MSB (256 NM)	[1]
29	sign (always positive) 0			
30	SSM			[2]
31	SSM			[2]
32	Parity			

NOTES

[1] All zeroes = “Range is less than 1/32 NM,” All ones = “Range is 512 NM.”

[2] Sign/Status Matrix (SSM):

Bits		**Meaning**
31	**30**	
0	0	Failure Warning
0	1	No Computed Data
1	0	Functional Test
1	1	Normal Operation

TABLE 6-52

ATTACHMENT 6
GENERAL WORD FORMATS AND ENCODING EXAMPLES

Range Ring Radius – 261 144

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	SSM			**Range Ring Radius**															**Spare**		RR T	SDI		Octal Label
	Valid			**2 NM**																		0 0		1 6 2
1	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	100 011 01

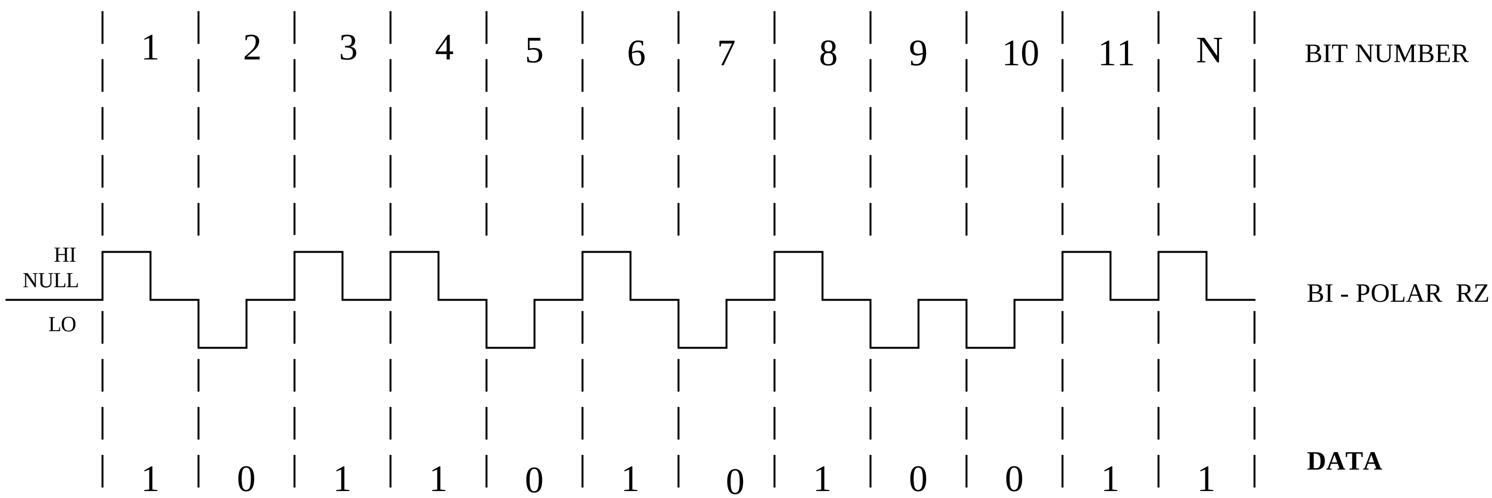
Bit			**Description**	**Notes**
1	Label 1st digit		1	
2	Label 1st digit	___2	0	
3	Label 2nd digit		1	
4	Label 2nd digit		1	
5	Label 2nd digit	___6	0	
6	Label 3rd digit		0	
7	Label 3rd digit		0	
8	Label 3rd digit	___1	1	
9	Reserved for SDI		0	
10	Reserved for SDI		0	
11	RRT,Range Ring Type		(0 = floating, 1 = locked)	
12	Spare		0	
13	Spare		0	
14	Range ring radius		LSB (1/64 NM)	
15	Range ring radius		(1/32 NM)	
16	Range ring radius		(1/16 NM)	
17	Range ring radius		(1/8 NM)	
18	Range ring radius		(1/4 NM)	
19	Range ring radius		(1/2 NM)	
20	Range ring radius		(1 NM)	
21	Range ring radius		(2 NM)	
22	Range ring radius		(4 NM)	
23	Range ring radius		(8 NM)	
24	Range ring radius		(16 NM)	
25	Range ring radius		(32 NM)	
26	Range ring radius		(64 NM)	
27	Range ring radius		(128 NM)	
28	Range ring radius		MSB (256 NM)	
29	sign (always positive) 0			
30	SSM			[1]
31	SSM			[1]
32	Parity			

NOTES

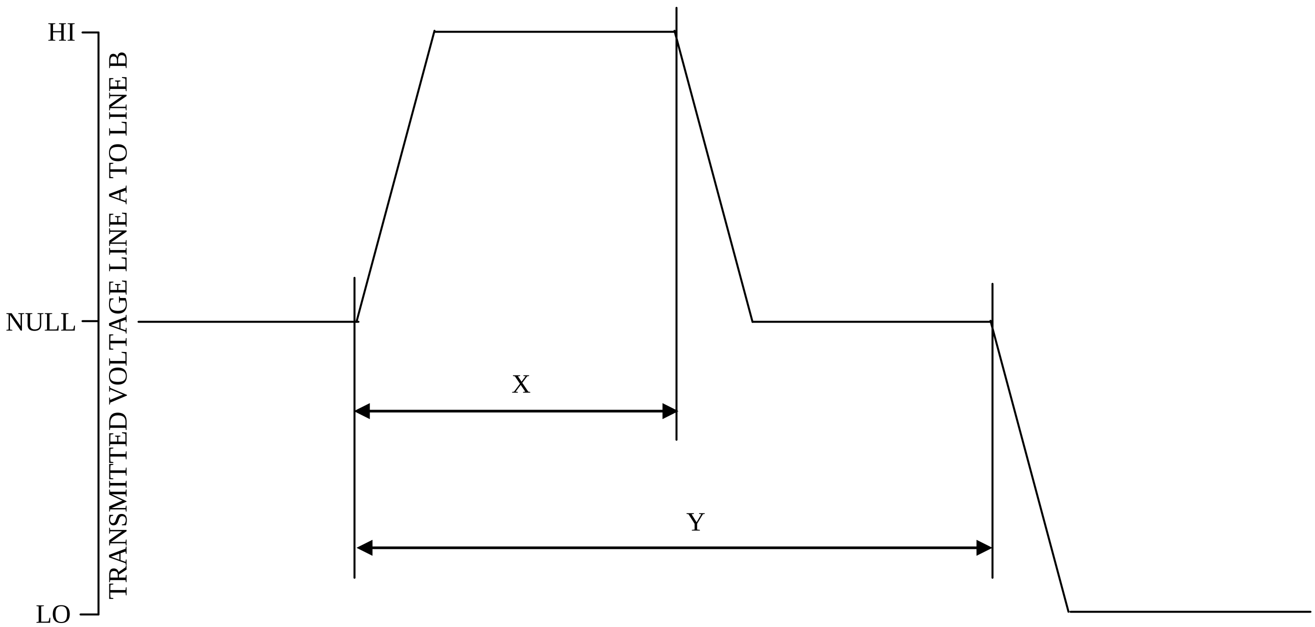
[1] Sign/Status Matrix (SSM)

Bits		**Meaning**
31	**30**	
0	0	Failure Warning
0	1	No Computed Data
1	0	Functional Test
1	1	Normal Operation

ATTACHMENT 7
DATA BIT ENCODING LOGIC



ATTACHMENT 8
OUTPUT SIGNAL TIMING TOLERANCES



PARAMETER	HIGH SPEED OPERATION	LOW SPEED OPERATION
Bit Rate	100k bps ± 1%	12 – 14.5kbps
Time Y	10 μsec ± 2.5%	Z* μsec ± 2.5%
Time X	5 μsec ± 5%	Y/2 ± 5%
Pulse Rise Time**	1.5 ± 0.5 μsec	10 ± 5 μsec
Pulse Fall Time**	1.5 ± 0.5 μsec	10 ± 5 μsec

* Z = 1 where R = bit rate selected from 12 – 14.5kbps range

** Pulse rise and fall times are measured between the 10% and 90% voltage amplitude points on the leading and trailing edges of the pulse and include permitted time skew between the transmitter output voltages A-to-ground and B-to-ground. These rise and fall times are for open circuit output measurements – Appendix 1 provides waveforms for typical test performance.

ATTACHMENT 9A
GENERAL AVIATION LABELS AND DATA STANDARDS

Note: This material was deleted by Supplement 18. For more information go to the GAMA website:

http://www.gama.aero/files/GAMA_PUBLICATION_11-ARINC_429,GENERAL_AVIATION_SUBSET_VERSION_5.1.pdf

ATTACHMENT 9B
GENERAL AVIATION WORD EXAMPLES

Note: This material was deleted by Supplement 18. For more information go to the GAMA website:

http://www.gama.aero/files/GAMA_PUBLICATION_11-ARINC_429,GENERAL_AVIATION_SUBSET_VERSION_5.1.pdf

ATTACHMENT 9C
GENERAL AVIATION EQUIPMENT IDENTIFIERS

Note: This material was deleted by Supplement 18. For more information go to the GAMA website:

http://www.gama.aero/files/GAMA_PUBLICATION_11-ARINC_429,GENERAL_AVIATION_SUBSET_VERSION_5.1.pdf

ATTACHMENT 10
MANUFACTURER SPECIFIC STATUS WORD

32	31 30 29 28 27 26 25 24 23 22 21 19 18 17	16 15 14 13 12 11	10 9	8 7 6 5 4 3 2 1
P	Company Private Use (1)	Company I.D. (Binary)	SDI (2)	Label (171)

BIT	16 15 14 13 12 11	Company
	0 0 0 0 0 1	B&D INSTRUMENTS
	0 0 0 0 1 0	BEECH AIRCRAFT
	0 0 0 0 1 1	BENDIX AVIONICS
	0 0 0 1 0 0	CANADIAN MARCONI
	0 0 0 1 0 1	CESSNA AIRCRAFT
	0 0 0 1 1 0	COLLINS AVIONICS
	0 0 0 1 1 1	DELCO ELECTRONICS
	0 0 1 0 0 0	FOSTER RNAV
	0 0 1 0 0 1	GABLES CONTROLS
	0 0 1 0 1 0	GLOBAL SYSTEMS
	0 0 1 0 1 1	GULFSTREAM AEROSPACE
	0 0 1 1 0 0	HONEYWELL
	0 0 1 1 0 1	KING RADIO
	0 0 1 1 1 0	LEAR JET
	0 0 1 1 1 1	LITTON AERO PRODUCTS
	0 1 0 0 0 0	OFFSHORE NAVIGATION
	0 1 0 0 0 1	RACAL AVIONICS
	0 1 0 0 1 0	SPERRY
	0 1 0 0 1 1	UNIVERSAL NAVIGATION SYSTEMS
	0 1 0 1 0 0	3M AVIATION SAFETY SYSTEMS
	0 1 0 1 0 1	ALLIED SIGNAL GENERAL AVIATION AVIONICS
	0 1 0 1 1 0	ALLIED SIGNAL GLOBAL WULFSBAG
	0 1 0 1 1 1	BF GOODRICH AVIONICS
	0 1 1 0 0 0	GARMIN
	0 1 1 0 0 1	ARNAV
	0 1 1 0 1 0	COMPUTER INSTRUMENT CORPORATION
	0 1 1 0 1 1	RYAN
	0 1 1 1 0 0	SPARE
	1 1 1 1 1 1	SPARE

Notes:

1. This word is used for manufacturer-specific information exchange (e.g., sub-LRU-Level BITE status). The Company I.D. fields should be used to differentiate each manufacturer's unique use of the Company Private Use field.
2. Per Section 2.1.4

ATTACHMENT 11
SYSTEM ADDRESS LABELS

SYSTEM ADDRESS LABEL (OCTAL)	SYSTEMS
140	**MULTI FUNCTION PROBE (MFP-1)**
141	**SIDE SLIP ANGLE PROBE (SSA-1)**
142	**INTEGRATED STATIC PROBE (ISP1-1)**
143	**INTEGRATED STATIC PROBE (ISP1-2)**
144	**MULTI FUNCTION PROBE (MFP-2)**
145	**SIDE SLIP ANGLE PROBE (SSA-2)**
146	**INTEGRATED STATIC PROBE (ISP2-1)**
147	**INTEGRATED STATIC PROBE (ISP2-2)**
150	**MULTI FUNTION PROBE (MFP-3)**
151	**SIDE SLIP ANGLE PROBE (SSA-3)**
152	CABIN INTERPHONE SYSTEM - B777
153	**INTEGRATED STATIC PROBE (ISP3-1)**
154	**INTEGRATED STATIC PROBE (ISP3-2)**
155	**ON-BOARD AIRPORT NAVIGATION SYSTEM (OANS)**
156	CVR #2
157	CVR
163	DFDR (B747) AND SSFDR (A330/340)
170	DFDAU (MANDATORY LOAD FUNCTION)
173	SDU #2
174	RFU
175	HGA/IGA HPA
177	LGA HPA
201	GPS/GNSS SENSOR
210	FCMC COM A340-500/600
211	FCMC MON A340-500/600
212	FCMC INT A340-500/600
220	MCDU 1
221	MCDU 2
222	MCDU 3
223	PRINTER 1
224	PRINTER 2
225	HEAD-UP DISPLAY (HUD)
226	DATA LOADER (ARINC 615)
230	MCDU 4
231	**SDU ORT #1**
232	**SDU ORT #2**
234	EIVMU 1
235	EIVMU 2
236	EIVMU 3
237	EIVMU 4
241	APM-MMR
242	MMR
244	ILS
245	MLS
246	AHRS
247	HIGH-SPEED DATA (HSDU #1)
250	HIGH-SPEED DATA (HSDU #2)
251	VDR #1
252	VDR #2
253	VDR #3
254	NETWORK SERVER SYSTEM (NSS)
255	ELECTRONIC FLIGHT BAG (EFB) LEFT

ATTACHMENT 11
SYSTEM ADDRESS LABELS

SYSTEM ADDRESS LABEL (OCTAL)	SYSTEMS
256	ELECTRONIC FLIGHT BAG (EFB) RIGHT
266	CABIN VIDEO SYSTEM (AIRSHOW)
300	FMC 1
301	FMC 2
302	DFDAU
303	CFDIU
304	ACARS MU/CMU
305	WBS
306	TCAS
307	SDU #1
310	GPWS
311	GNLU 1
312	GNLU 2
313	GNLU 3
314	GNU 1
315	GNU 2
316	GNU 3
317	**AFIRS (AUTOMATED FLIGHT INFO. REPORTING SYSTEM)**
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
334	CABIN TELECOMMUNICATIONS UNIT (CTU)
335	**CURSOR CONTROL DEVICE (CCD) LEFT – 1**
336	**CURSOR CONTROL DEVICE (CCD) RIGHT – 2**
337	**SMOKE DETECTION SYSTEM (B-747)**
340	HF DATA RADIO/DATA UNIT #1
344	HF DATA RADIO/DATA UNIT #2
345	REMOTE DATA CONCENTRATOR
346	**INTEGRATED AIR SYSTEM CONTROLLER**
347	**LANDING GEAR CONTROL&INTERFACE UNIT (LGCIU) (AIRBUS)**
360	ACESS
361	EFIS
362	PASSENGER SERVICES SYSTEM (PSS) (B767)
363	CABIN SERVICE SYSTEM (CSS) 747-400
364	AUDIO ENTERTAINMENT SYSTEM (AES)BOEING
365	ENGINE INDICATION UNIT
366	MULTICAST
367	BRIDGE
372	CABIN TERMINAL 3
373	CABIN TERMINAL 4
374	CABIN TERMINAL 1
375	CABIN TERMINAL 2
376	OMEGA NAV. SYSTEMS

APPENDIX A
LABORATORY VERIFICATION OF ARINC 429 ELECTRICAL CHARACTERISTICS

A1-1.0 Introduction

Selection of the electrical characteristics of the ARINC 429 followed verification of the suitability of proposed values in laboratory tests performed by the Boeing Commercial Airplane Co. Boeing presented two reports to AEEC's Systems Architecture and Interfaces Subcommittee on these activities, one at the meeting held in Arlington, Virginia, in March 1977 and the other at the meeting held in Los Angeles, California, in May 1977. The material in this Appendix is excerpted from these reports.

A1-2.0 Electromagnetic Emission and Susceptibility Tests

Electromagnetic emission and susceptibility tests were conducted to determine if the proposed 100 kbps waveform was suitable for use in a commercial airplane EMI environment. The EMI conditions used for the tests were derived from RTCA Document DO-160, "Environmental Conditions and Test Procedures for Airborne Electronic/Electrical Equipment and Instruments" dated February 28th, 1975.

A1-2.1 Cable and Test Configuration

The cable used for the tests was standard aircraft type twisted shielded wire of 22 AWG. The wire configuration consisted of approximately 60 ft. of cable which was subjected to the EMI environment within a screened room. This cable was connected in series with 300 ft. of cable not subjected to the EMI environment. The test was configured to simulate the maximum length wire run with DO-160 conditions applied.

The 60 Ft. length of cable was connected to the transmitter for the emission tests and to the receiver for the susceptibility tests.

A1-2.2 Transmitter Characteristics

The block schematic of the bipolar line driving transmitter built for the tests is shown in Figure a-(i). The waveform was shaped at the pulse generator such that it exhibited the following characteristics:

Differential Output Voltage:

HI	+10V
NULL	0V
LO	-10V

Risetime = Falltime = l.0 μ sec
Bit Rate= 100 kilobits/second
HI time= NULL time= LO time

A1-2.3 Receiver Input Circuit Description

To perform the susceptibility tests, receivers were constructed utilizing various methods of common mode rejection and various processing schemes.

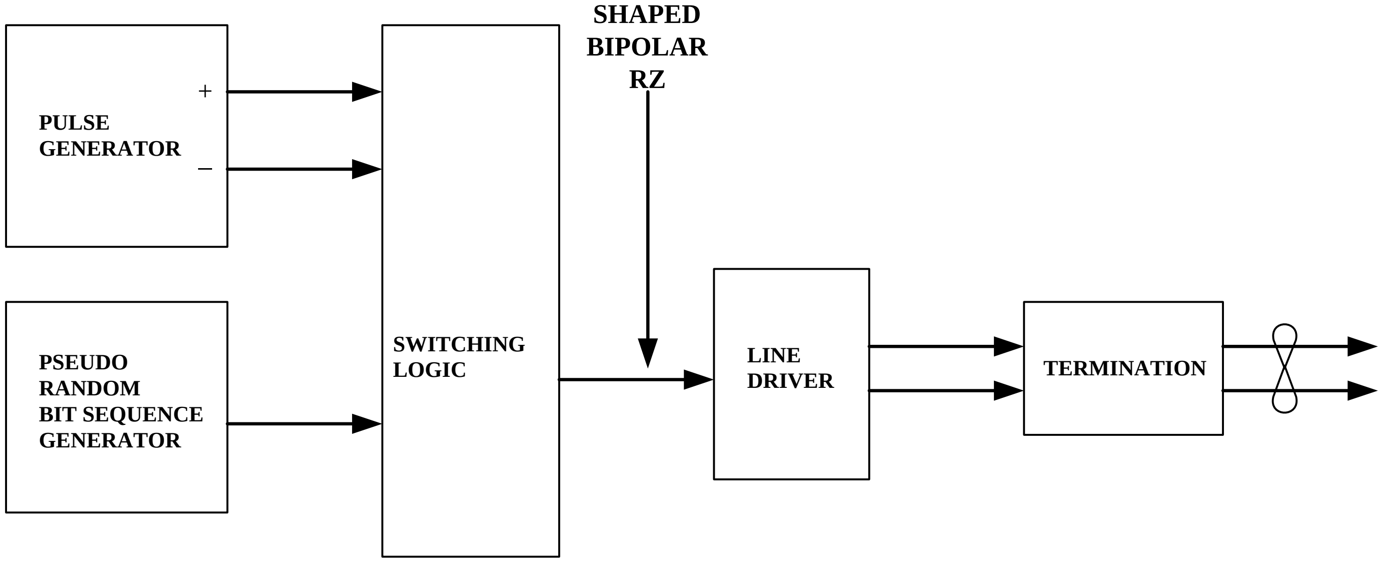
Differential Amplifier Input. Figure a-(ii) shows schematics of the differential input stages used for the receivers. The differential amplifier input stage required resistors to local ground at the input to provide a path for the input current for the voltage followers. Voltage protection was used to prevent damage to the voltage followers in the event of high voltage, common mode spikes. The voltage follower stages provided a controlled impedance for the differential amplifier stage.

Opto-Isolator Input The opto-isolator input stage utilized two H-P 5082-4371 isolators connected in opposite polarity to detect the bipolar data. The HP 5082-4371 input has a forward conduction "knee" at approximately 1.4 volts. A second simple LED (HP 5082-4650) was connected in series with each opto-isolator to provide a combined knee voltage of approximately 3 volts. A series resistor RL of 1000 ohms was placed in series with the LED/opto-isolator network to limit the receiver current to 7mA at 10 volts (differential) applied at the input. At 4.5V differential on the line, one opto-isolator conducts 1.5 mA.

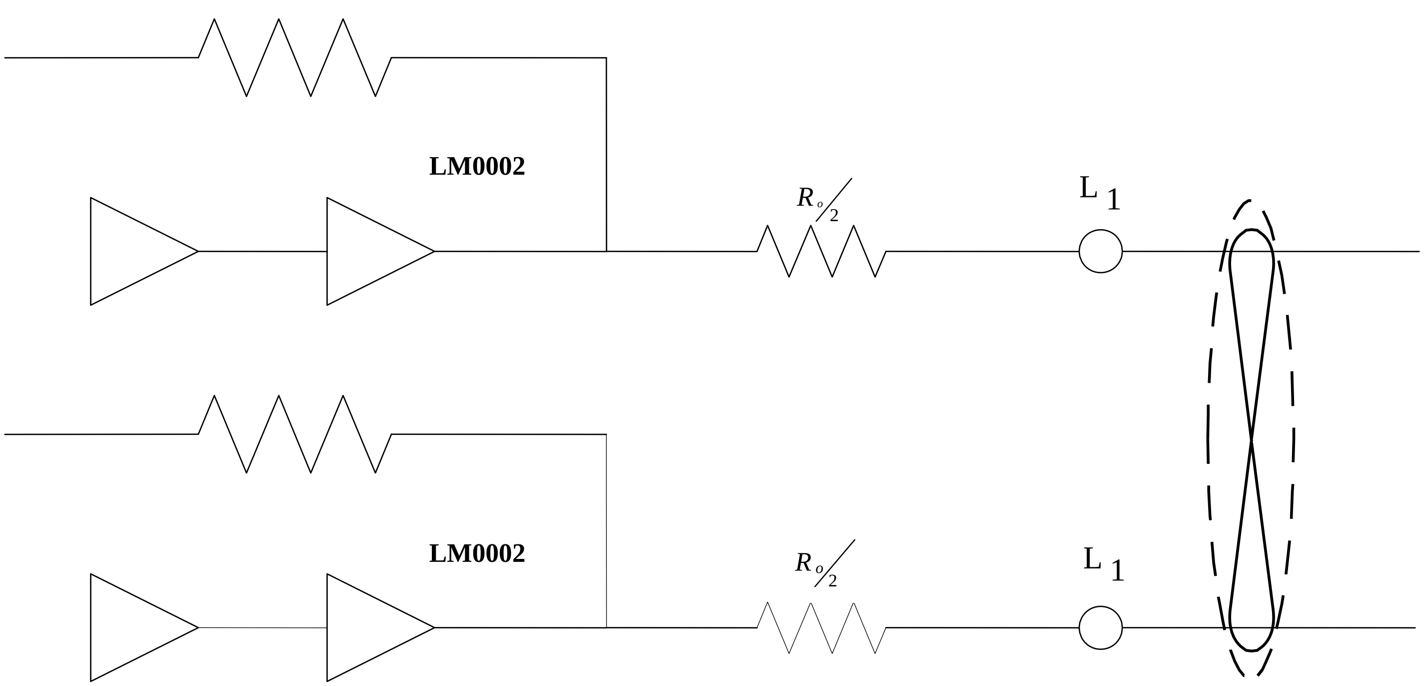
One circuit configuration which enables the opto-isolator to operate at 100 kilobits per second at these low input currents is shown in figure a-(iii). A potential of +15 volts is applied to pin 8 to provide maximum gain in the first transistor. During conduction, a charge on the second transistor is discharged via pin 7 and R2 to a potential of +0.5 volts set by R1 and R3. Discharging to a +0.5 volt potential reduces the possibility of a loss of the first bit following a long null period. This problem has been observed when discharging pin 7 to ground potential.

APPENDIX A
LABORATORY VERIFICATION OF ARINC 429 ELECTRICAL CHARACTERISTICS

FIGURE a-(i)
BIPOLAR TRANSMITTER BLOCK SCHEMATIC

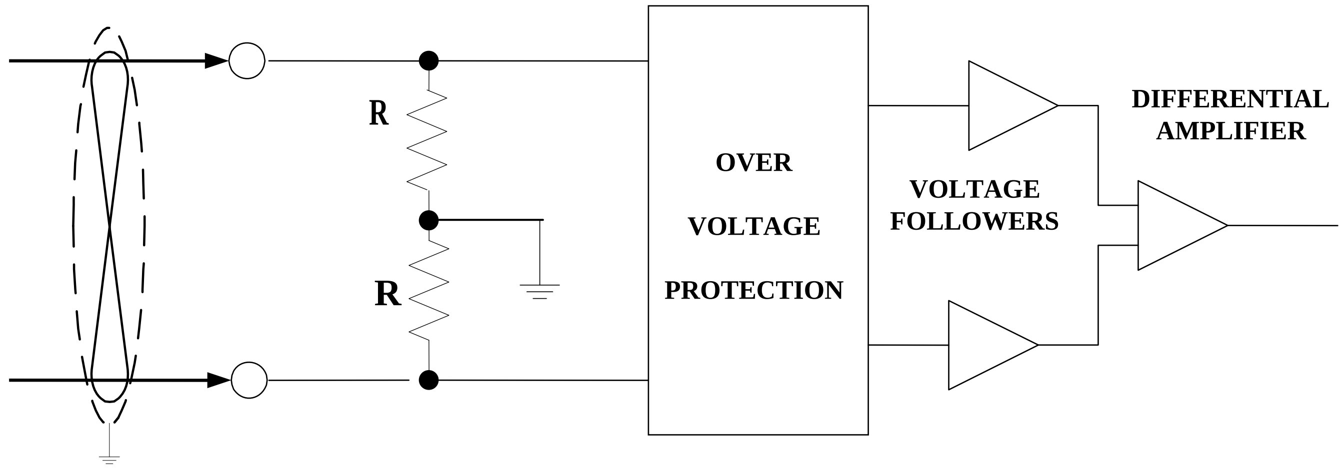


DETAIL OF LINE DRIVER AND TERMINATION



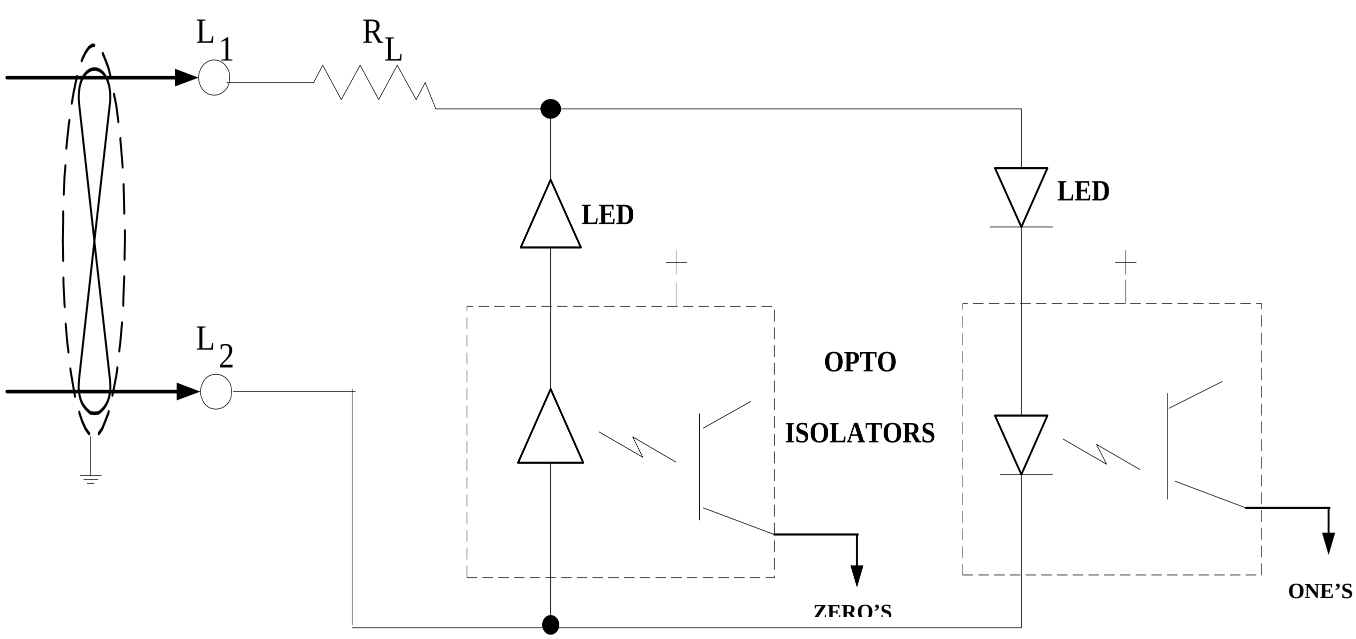
APPENDIX A
LABORATORY VERIFICATION OF ARINC 429 ELECTRICAL CHARACTERISTICS

FIGURE a-(ii)
RZ BIPOLAR RECEIVER INPUT TYPES TESTED



R > 12 K Ohms (Provides Path for V. F. Input Current)

Figure (a) Differential amplifier input schematic.



R_L = CURRENT LIMITING = 1000 OHMS
LED = LED IN SERIES WITH OPTO ISOLATOR TO PROVIDE ON NULL LEVEL
OPTO-ISOL = HP 5082-4371

Figure (b) OPTO-ISOLATED INPUT SCHEMATIC

APPENDIX A
LABORATORY VERIFICATION OF ARINC 429 ELECTRICAL CHARACTERISTICS

A1-2.4 Receiver Data Detection Technique

Two data detection schemes were used, (i) data sampling (sample and decision) and (ii) integrate and dump (Figure a-(iv).

The data sampling system detects positive-going or negative-going edges which exceed ±3 volts differential voltage. The edges cause a timing circuit to time for approximately 2 μsec. When the timing circuit has timed out, a sample of the input is taken. If the sample is HI, a ONE is declared. If the sample is LO, a ZERO is declared. If the sample is NULL, and error diagnostic can be output, since a NULL state is known to be invalid at the data sampling time. An error diagnostic will be output if, for example, during a period of NULL on the line, a short-duration noise spike causes the input to exceed the ±3V threshold, so initiating the edge detector timing circuit, but dissipates rapidly so that a NULL is estimated at the data sampling time.

The integrate-and-dump processor circuit detects positive or negative-going edges which exceed the ±3V differential threshold. The edge detection causes an integration circuit to integrate the input voltage for a period of 5 μsec. The output of the integrator is sampled (timing is derived from the edge detector) at the end of the integration period. If it is above zero voltage, a ONE is declared; if it is below zero voltage, a ZERO is declared.

A threshold level could be introduced about zero voltage to provide an indication of the total energy contained in the pulse. If the integrator output fell within the threshold, an error diagnostic could be presented indicating the at the detection of the bit was marginal.

A1-2.5 Test Data Message

The test waveform was a continuous pseudo-random bit pattern. This continuous pattern did not test the initial synchronization or “false-alarm” aspects in a word-by-word transmission environment with NULL on the transmission line between words.

A1-2.6 Emission of RF Energy Test Results

The following tests were performed under conditions of light (one receiver) and heavy (20 receivers) line loading.

A. Conducted RF Interference (RTCA DO-160 Paragraph 21.2)
The interference measured was within the limits specified in DO-160 Figure 21-2.

B. Radiated RF Interference (RTCA DO-160 Paragraph 21.3)
The interference measured was within the limits specified in DO-160 Figure 21-5.

It should be noted that the 20dB limit exceedance permitted in DO-160 was not taken. The transmitter output spectrum can be further improved by the addition of filtering to attenuate output frequencies above those of interest in the digital data.

A1-2.7 Susceptibility Test Results

The tests were performed to determine the susceptibility of the ARINC 429 to RF, AF and spike interference levels specified in DO-160 under conditions of light (one receiver) and heavy (20 receivers) line loading.

The following receiver configurations were tested:

(i) Differential Amplifier input, time sample processing
(ii) Differential Amplifier input, integrate-and-dump processing
(iii) Opto-isolator input, time sample processing
(iv) Opto-isolator input, integrate-and-dump processing

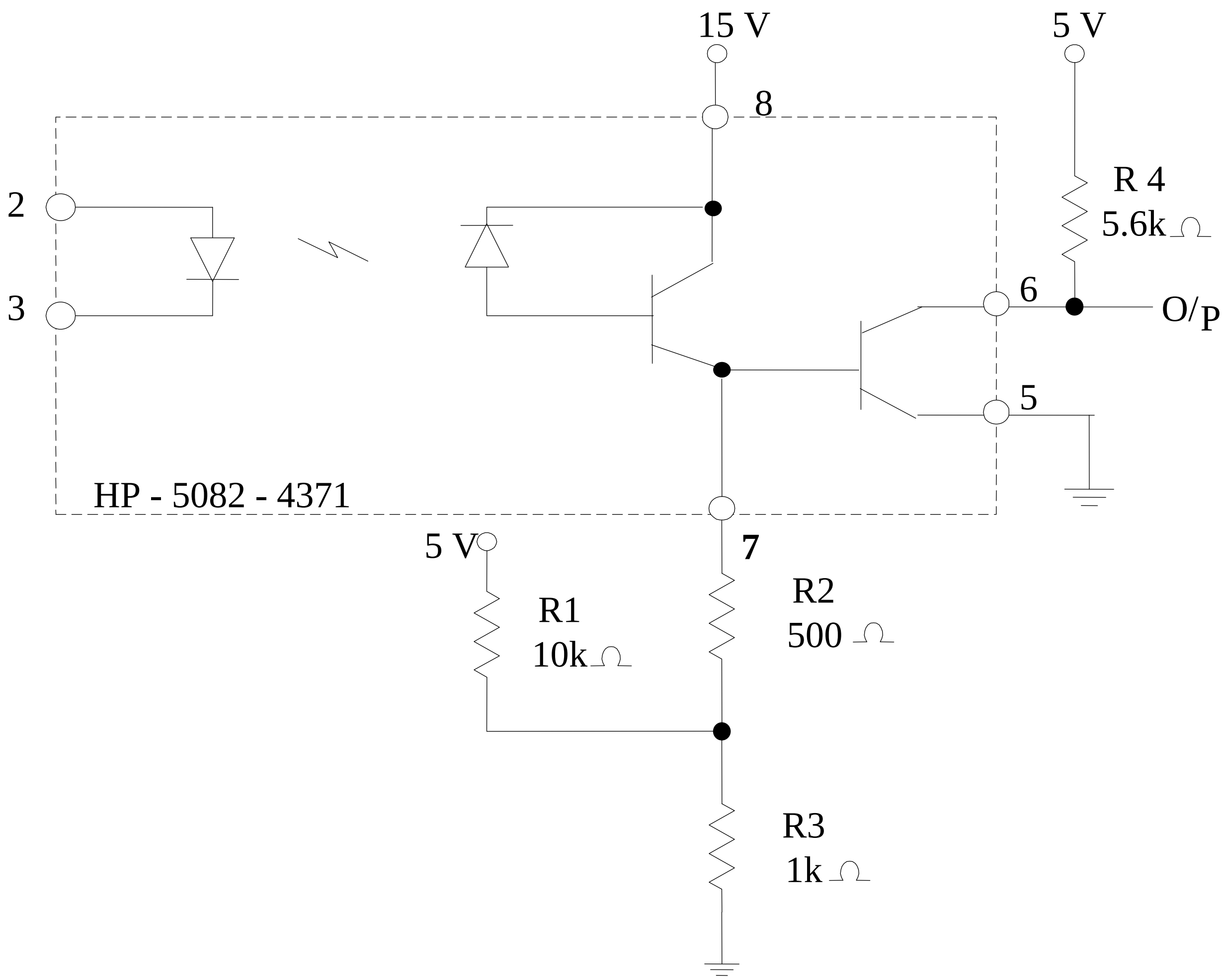
The data transmitted consisted of a continuous pseudo-random bit sequence. Error checking was made on a bit-by-bit basis.

A. Conducted RF Susceptibility (DO-160 Paragraph 20.20B Category Z)
No bit errors were detected with RF applied to any of the line loading and receiver configurations.

B. Magnetic Fields Induced Into Interconnecting Cables (DO-160 Paragraph 19.3)
Test performed at a level above those specified in DO-160 Figure 19-1. No bit errors were detected with the field applied to the cable for any cable loading or receiver configuration.

APPENDIX A
LABORATORY VERIFICATION OF ARINC 429 ELECTRICAL CHARACTERISTICS

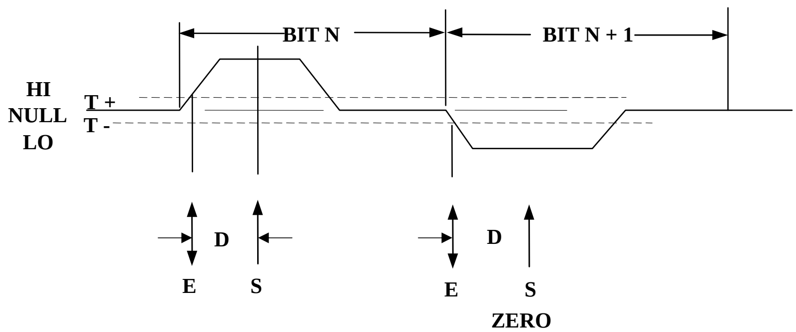
FIGURE a-(iii)
OPTO-ISOLATOR FRONT-END CIRCUIT SCHEMATIC



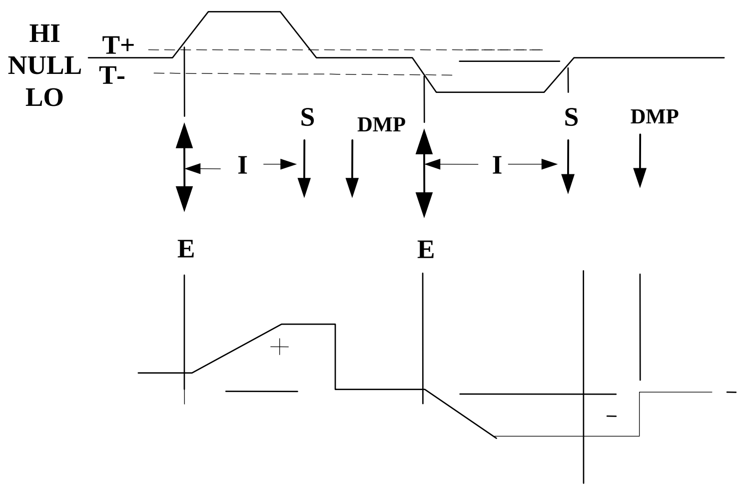
APPENDIX A
LABORATORY VERIFICATION OF ARINC 429 ELECTRICAL CHARACTERISTICS

FIGURE a-(iv)
DATA DETECTION

(a) SAMPLE - AND - DECISION



(b) INTEGRATE - AND - DUMP



LEGEND:

E	=	**EDGE DETECT (BIT TIMING)**
D	=	**DELAY**
S	=	**SAMPLE**
I	=	**INTEGRATION INTERVAL**
DMP	=	**DUMP INTEGRATOR CHARGE**

APPENDIX A
LABORATORY VERIFICATION OF ARINC 429 ELECTRICAL CHARACTERISTICS

C. Electric Fields Induced Into Interconnecting Cables (DO-160 Paragraph 19.4)
The tests were perform with voltage levels above those specified in DO-160 Figure 19-1 Category Z. No bit errors were detected with the field applied for any cable loading or receiver configuration.

D. Spikes Induced Into Interconnecting Cables (DO-160 Paragraph 19.5, Category Z)
The spikes were generated and applied to the cable as shown in DO-160, Figure 19-4. Bit errors were counted during the application of 50 transients and also following the transient test. The following results were observed:

Receiver Configuration	Line Light	Loading Heavy
Diff. Amp., Sample Det	0	0
Diff. Amp., Int. & Dump Det	0	0
Opto-Isolator, Sample Det	8	15
Opto-Isolator, Int & Dump Det	0	1

All configurations performed with zero bit errors for approximately 10^7 bits following the transient test.

A1-3.0 Pulse Distortion Tests For Typical Aircraft wire Installations

Laboratory testing and computer simulation studies were conducted to investigate the pulse distortion introduced on typical aircraft wire installations.

A1-3.1 Laboratory Tests

Receivers and a transmitter were constructed to operate using the ARINC 429 high-speed (100 kbps) waveform. Lengths of twisted shielded cable were connected to form a representative wiring configuration for digital data. The wire length and stub configuration were selected to represent postulated installations on a B747 airplane. The cable used for lab tests was 20 and 22 AWG twisted shielded cable with wrapped KAPTON insulation, no. BMS B-51, Class 2 type III. The pulse distortions at the receiver nodes of the wiring systems were recorded. The characteristics of the 20 AWG cable were measured and used to develop the cable model used in the computer simulation.

A1-3.2 Computer Simulation

A computer program was developed to evaluate pulse distortion on lines with stubs. The ARINC 429 transmitter impedance and voltage waveform was modeled. The cable model was developed from the measured cable characteristics. The ARINC 429 receiver input impedance was modeled.

The computer simulation was run and results were plotted for various line length and stub configurations representing postulated installations on a B747 airplane.

A1-3.3 Results

The results of the laboratory tests and computer simulation for the same cable configuration showed good agreement, with a maximum difference of 0.4 volts on rising and falling edges. The computer simulation showed slightly higher cable loss effect than the lab test. The lab test results were recorded using an oscilloscope camera; the computer results were plotted. Only the plotted results are presented here.

Figure a-(v) shows the schematic for the first simulation. This configuration represents a transmitter, a receiver and a single length of twisted shielded cable 200 feet long. The cable is modeled as Blocks 1 to 4, for later stub connection.

At the transmitter and receive ends of the cable, the shields are grounded via a 0.05 μH inductor (which models the inductance of the ground lead). At other nodes, the shields and cable inners are carded through, representing a continuous length of cable.

Figure a-(vi) Transmitter open circuit differential output voltage. This waveform was used for all the simulation runs.

Figure a-(vii) The transmitter output voltage and receiver input voltage for the configuration in Figure a-(v).

Figure a-(viii) shows the schematic for the second simulation. This configuration represents a transmitter at an engine location, with receivers at the equipment bay and the flight deck. Four receiver loading configurations are shown with maximum loading of twenty receivers. The waveforms for this simulation run are shown in Figures a-(ix) through a-(xvi).

APPENDIX A
LABORATORY VERIFICATION OF ARINC 429 ELECTRICAL CHARACTERISTICS

Figures a-(ix) and a-(x) Transmitter and receiver waveform for loading configuration 1.

Figures a-(xi) to a-(xvi) Waveforms for loading configurations 2, 3 and 4.

Figure a-(xvii) shows the schematic for the third simulation. This configuration represents a transmitter at the flight deck with receivers at the equipment bay, the inner engine and the outer engine.

Figures a-(xviii) to a-(xxi) Waveforms for the third simulation.

Figure a-(xxii) shows the schematic for the fourth simulation. This configuration represents a transmitter at the equipment bay with receivers at the equipment bay, the flight engineer’s panel, the first officer’s panel and the captain’s panel.

Figures a-(xxiii) to a-(xxvi) Waveforms for the fourth simulation.

Figure a-(xxvii) shows the schematic for the fifth simulation. This is a long line simulation and is included to show the operation of the system with lines longer than would realistically be used in a B747-sized airplane. This configuration represents a transmitter with one receiver close (10 feet) and one receiver remote (500 feet).

Figures a-(xxviii) and a-(xxix) Waveforms for the “long line” configuration.

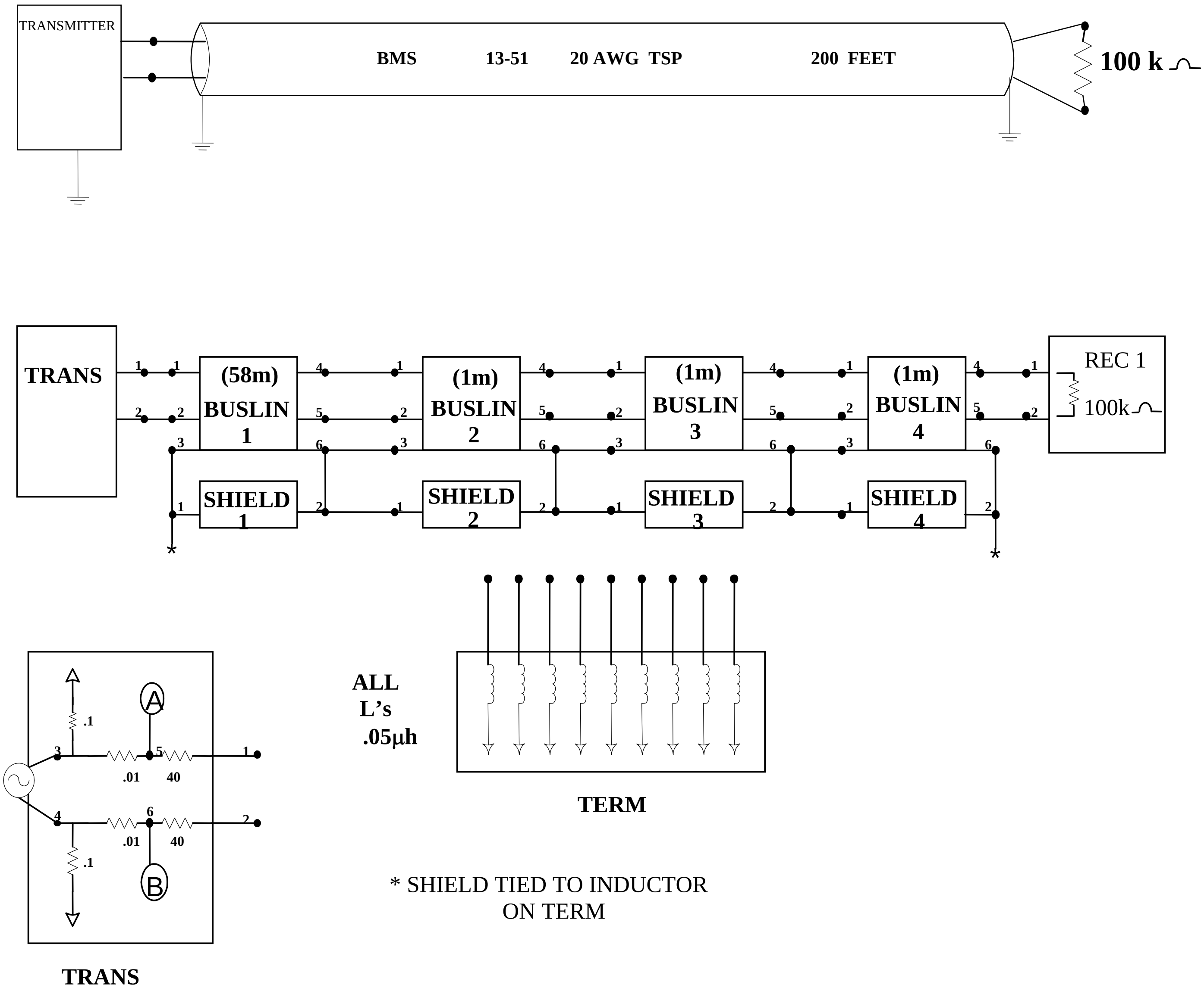
A1-3.4   Conclusions

From laboratory tests and simulations, it is concluded that no intolerable bit distortion is introduced into the high-speed ARINC 429 waveform due to cable lengths and stub configurations likely to be encountered on a B747-size transport aircraft.

If installations are anticipated involving longer line lengths or cables with radically different electrical characteristics, then further investigation may be required.

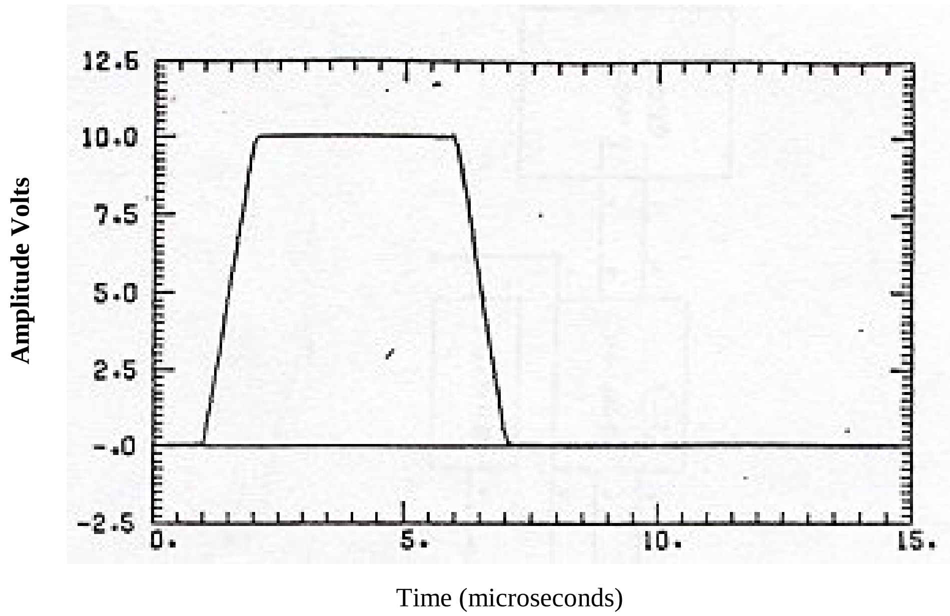
APPENDIX A
LABORATORY VERIFICATION OF ARINC 429 ELECTRICAL CHARACTERISTICS

FIGURE a-(v)



APPENDIX A
LABORATORY VERIFICATION OF ARINC 429 DITS ELECTRICAL CHARACTERISTICS

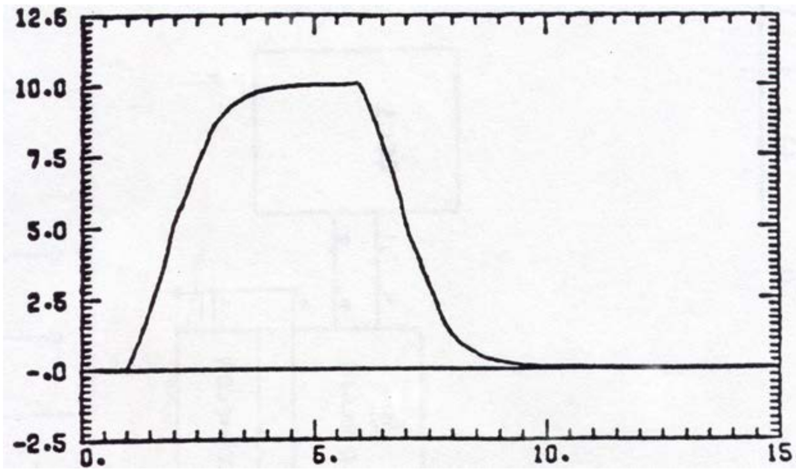
FIGURE a-(vi)



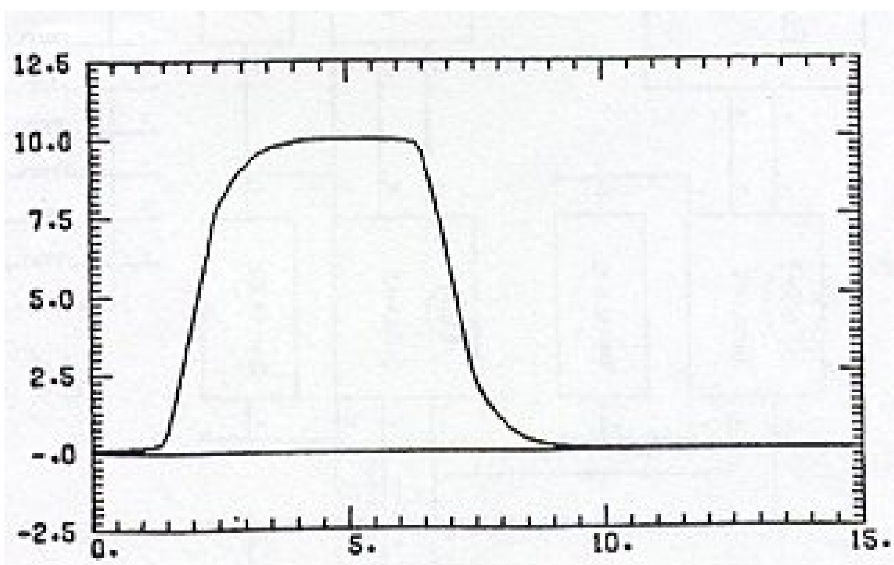
TRANSMITTER LEAD A TO LEAD B VOLTAGE

APPENDIX A
LABORATORY VERIFICATION OF ARINC 429 DITS ELECTRICAL CHARACTERISTICS

FIGURE a-(vii)



TRANSMITTER OUTPUT VOLTAGE

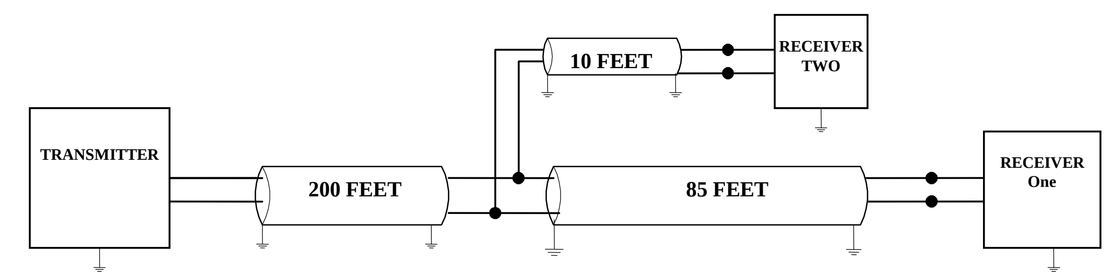


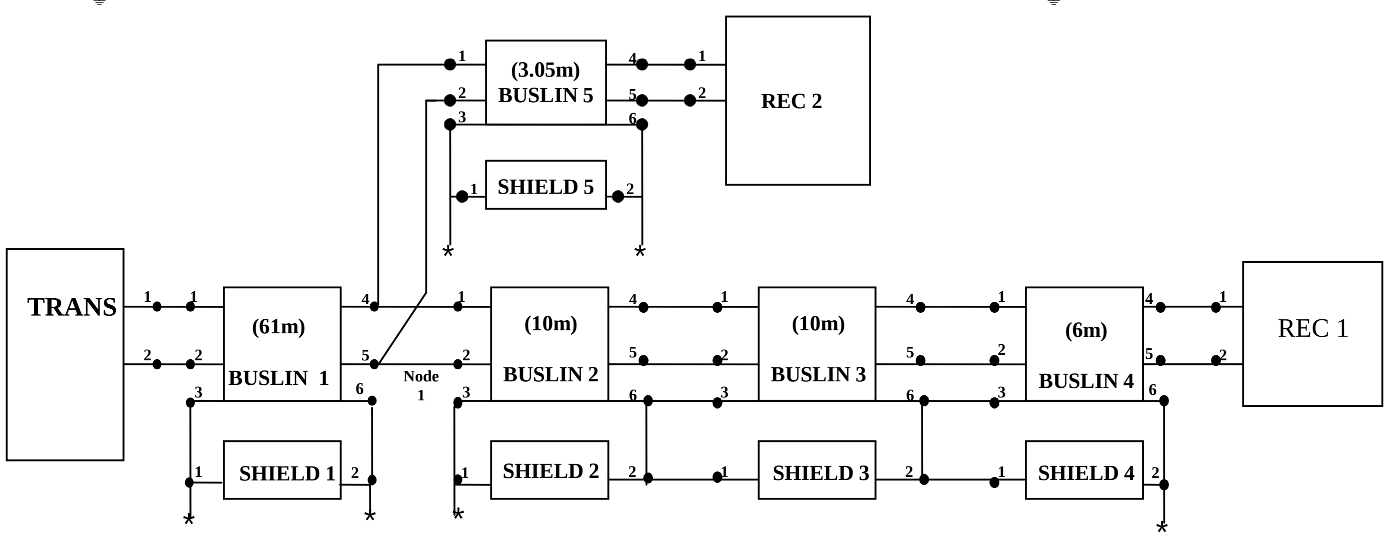
OPEN CIRCUIT VOLTAGE AT RECEIVER ONE

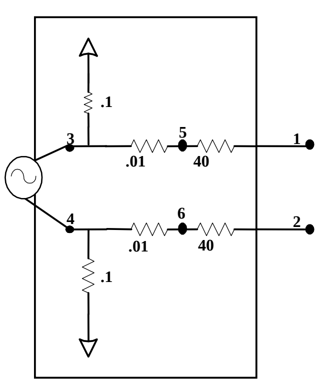
APPENDIX A
LABORATORY VERIFICATION OF ARINC 429 DITS ELECTRICAL CHARACTERISTICS

FIGURE a-(viii)

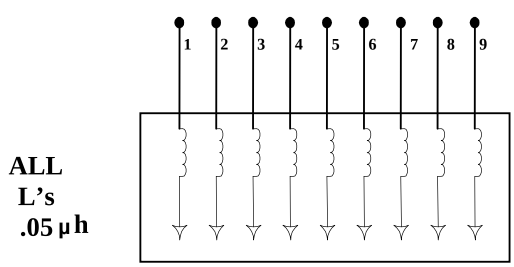
Configuration	# Load Rec 1	# Load Rec 2
1	1	1
2	1	10
3	10	1
4	10	10





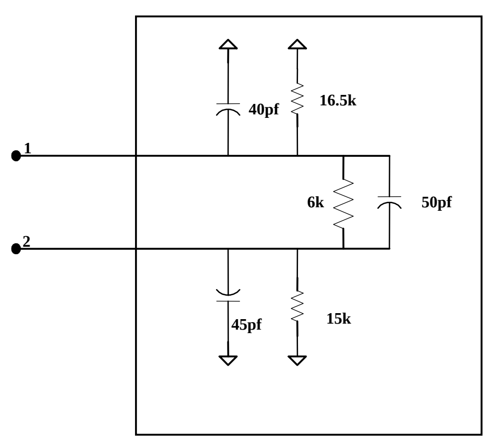


TRANS



TERM

* SHIELD TIED TO INDUCTOR
ON TERM BLOCK

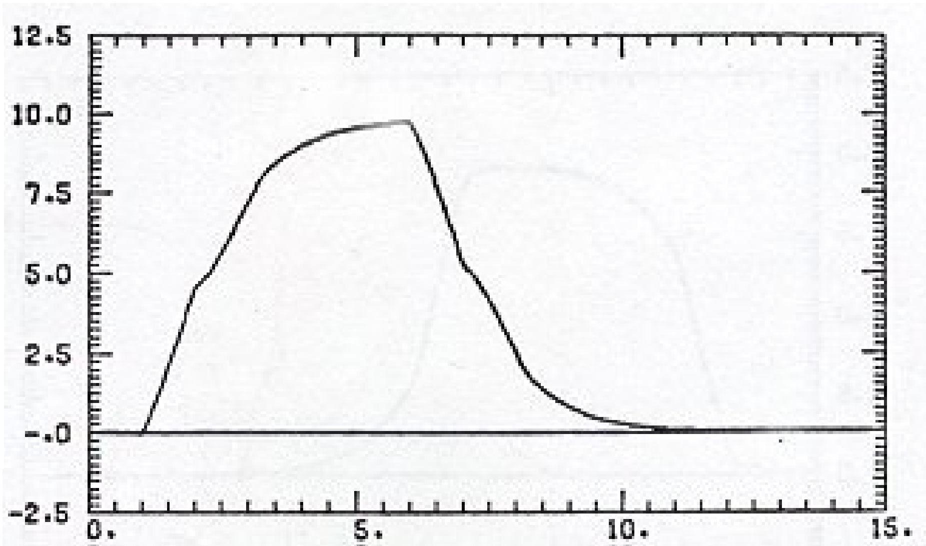


REC 1

APPENDIX A
LABORATORY VERIFICATION OF ARINC 429 DITS ELECTRICAL CHARACTERISTICS

FIGURE a-(ix)

Amplitude Volts

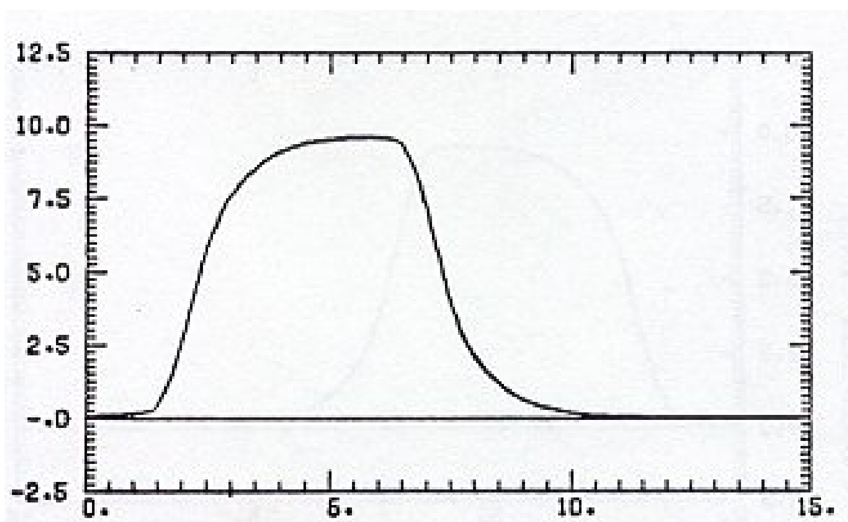


CONFIGURATION 1

Time (microseconds)

TRANSMITTER OUTPUT VOLTAGE

Amplitude Volts



CONFIGURATION 1

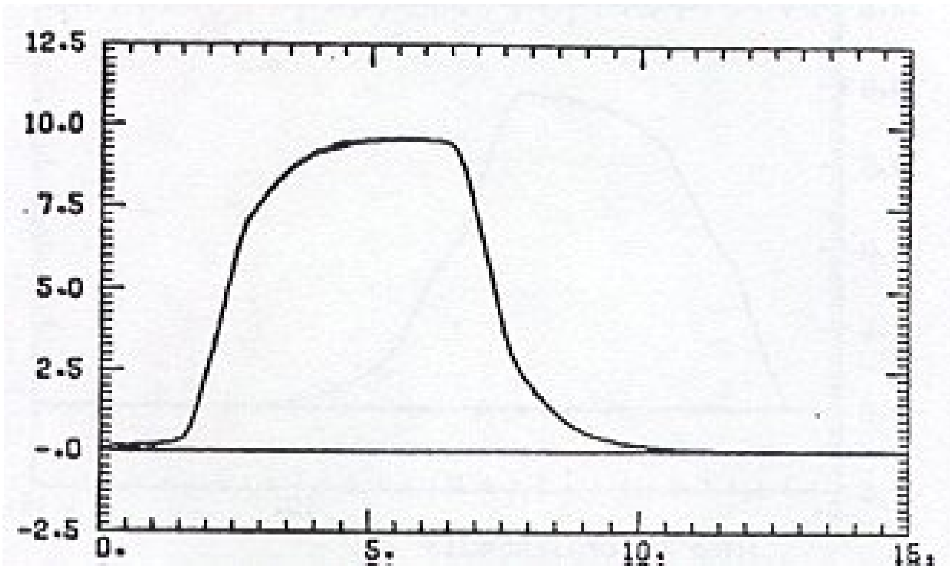
Time (microseconds)

VOLTAGE AT FIRST NODE

APPENDIX A
LABORATORY VERIFICATION OF ARINC 429 DITS ELECTRICAL CHARACTERISTICS

FIGURE a-(x)

Amplitude Volts

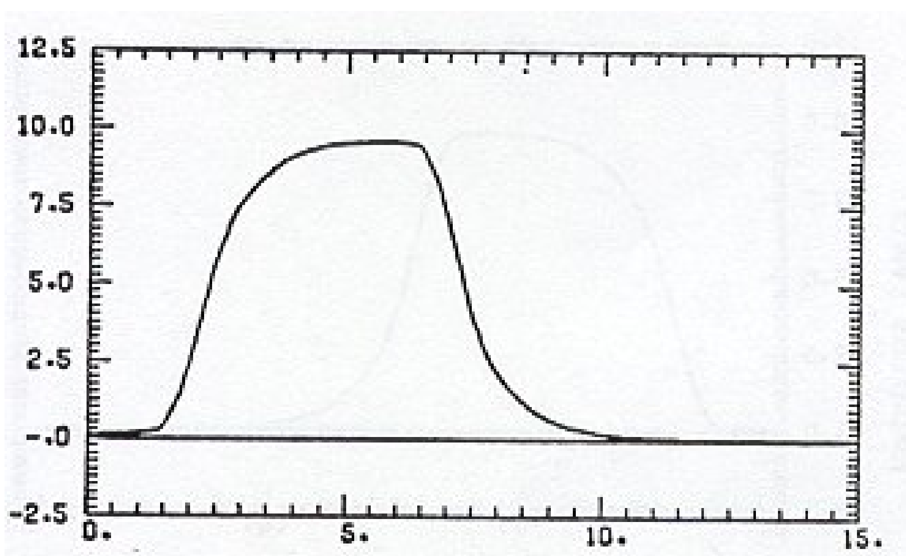


CONFIGURATION 1

Time (microseconds)

VOLTAGE AT RECEIVER ONE

Amplitude Volts



CONFIGURATION 1

Time (microseconds)

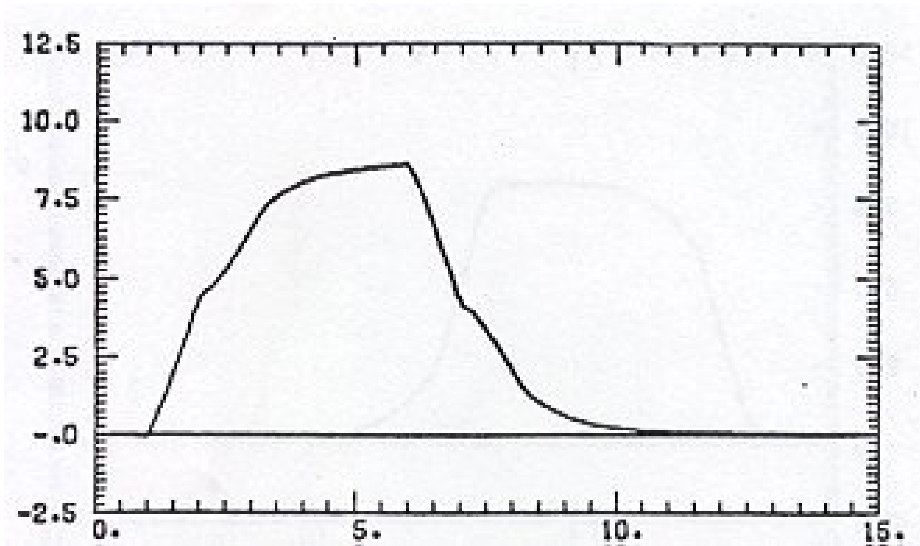
VOLTAGE AT RECEIVER TWO

APPENDIX A
LABORATORY VERIFICATION OF ARINC 429 DITS ELECTRICAL CHARACTERISTICS

FIGURE a-(xi)

CONFIGURATION 2

Amplitude Volts

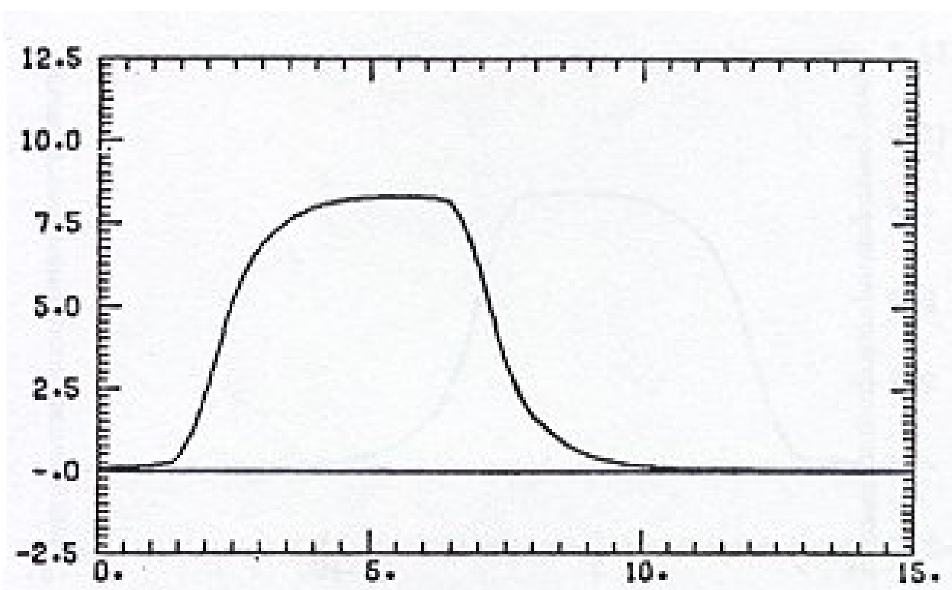


Time (microseconds)

TRANSMITTER OUTPUT VOLTAGE

CONFIGURATION 2

Amplitude Volts

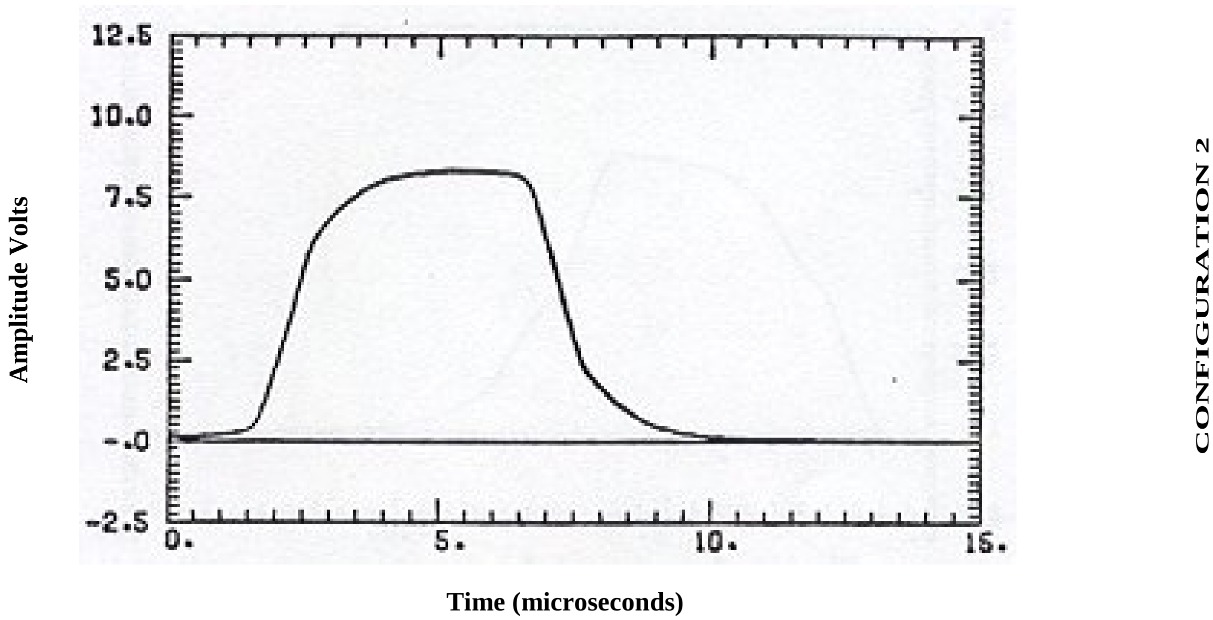


Time (microseconds)

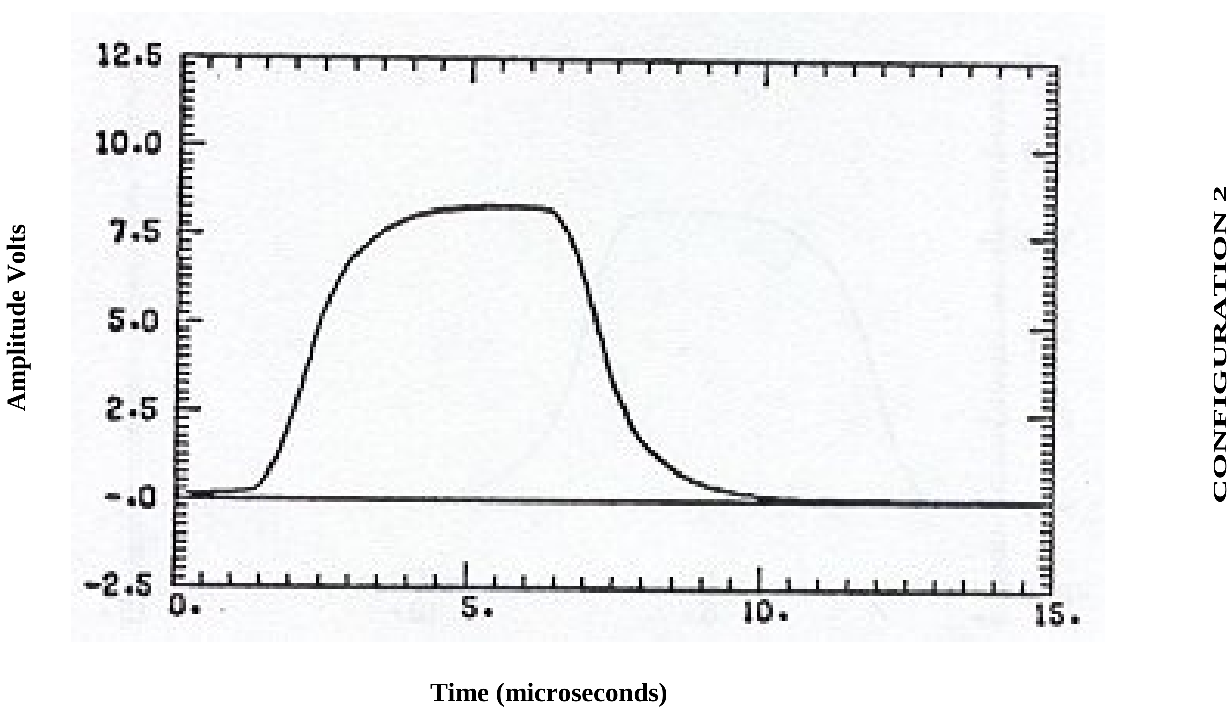
VOLTAGE AT FIRST NODE

APPENDIX A
LABORATORY VERIFICATION OF ARINC 429 ELECTRICAL CHARACTERISTICS

FIGURE a-(xii)



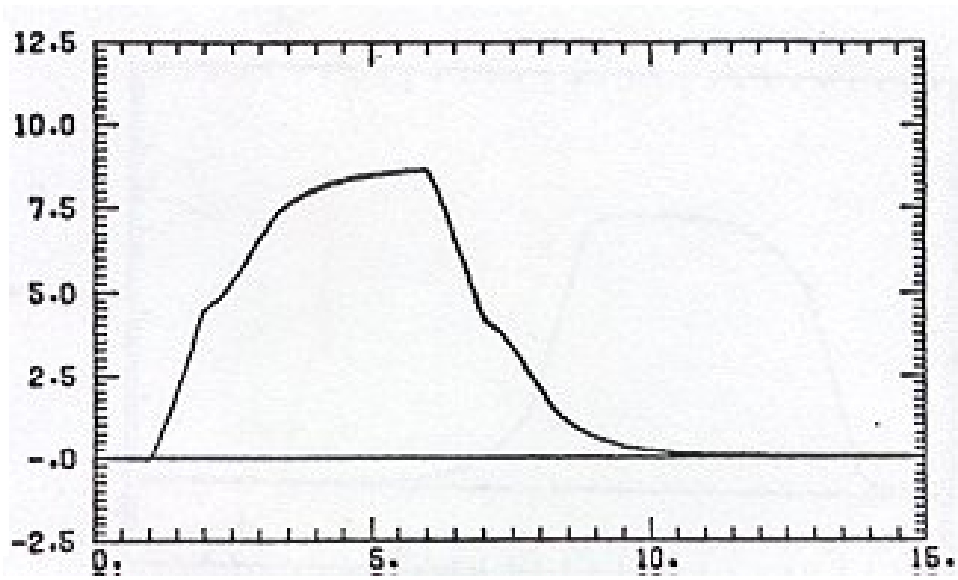
VOLTAGE AT RECEIVER ONE



VOLTAGE AT RECEIVER TWO

APPENDIX A
LABORATORY VERIFICATION OF ARINC 429 ELECTRICAL CHARACTERISTICS

FIGURE a-(xiii)

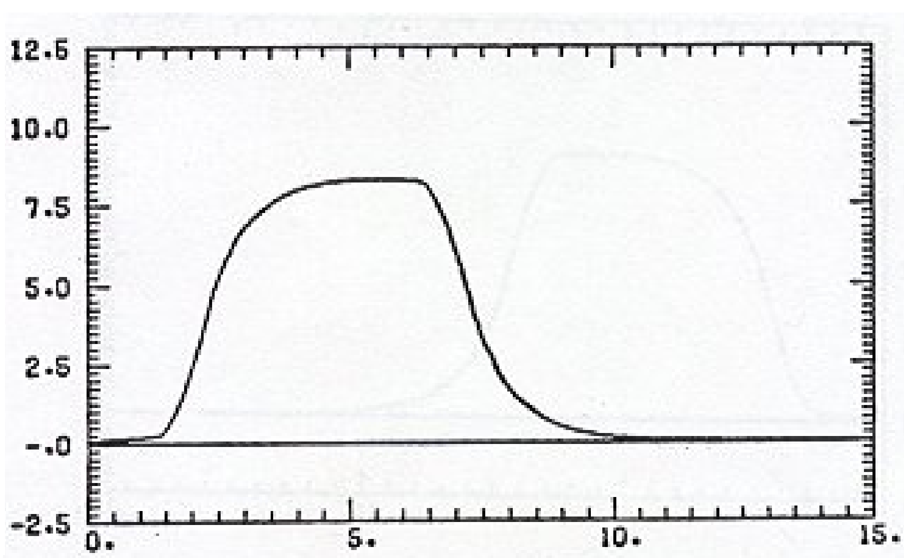


Amplitude Volts

Time (microseconds)

CONFIGURATION 3

TRANSMITTER OUTPUT VOLTAGE



Amplitude Volts

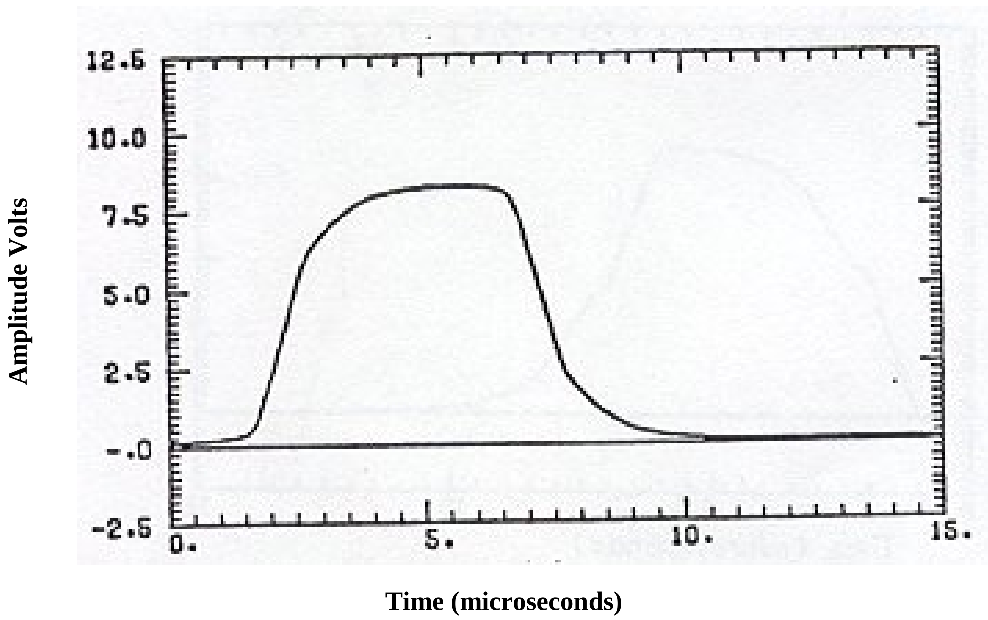
Time (microseconds)

CONFIGURATION 3

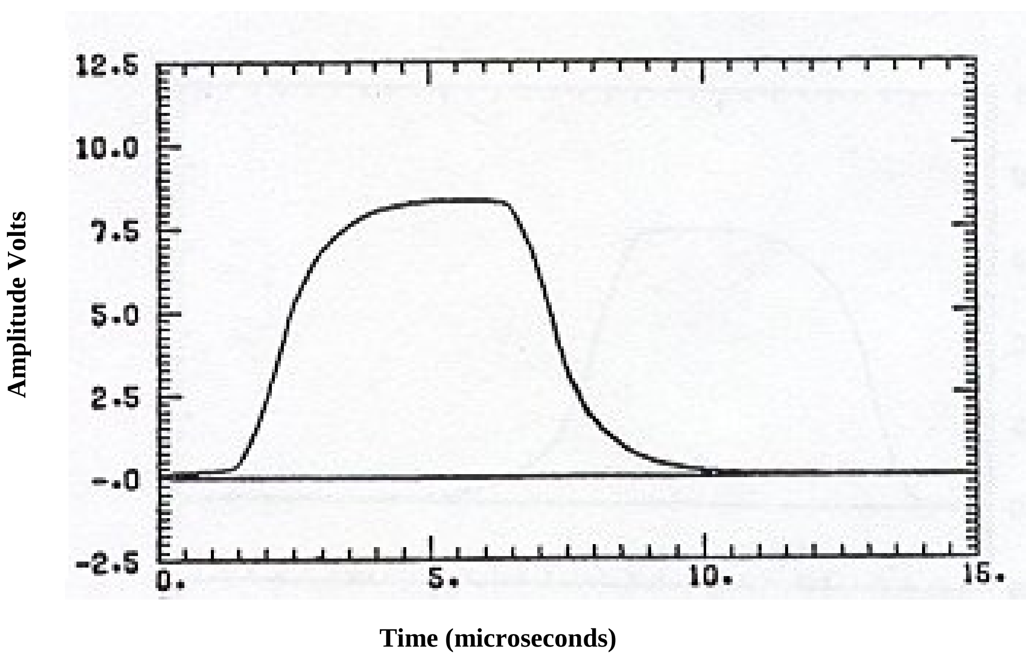
VOLTAGE AT FIRST NODE

APPENDIX A
LABORATORY VERIFICATION OF ARINC 429 ELECTRICAL CHARACTERISTICS

FIGURE a-(xiv)



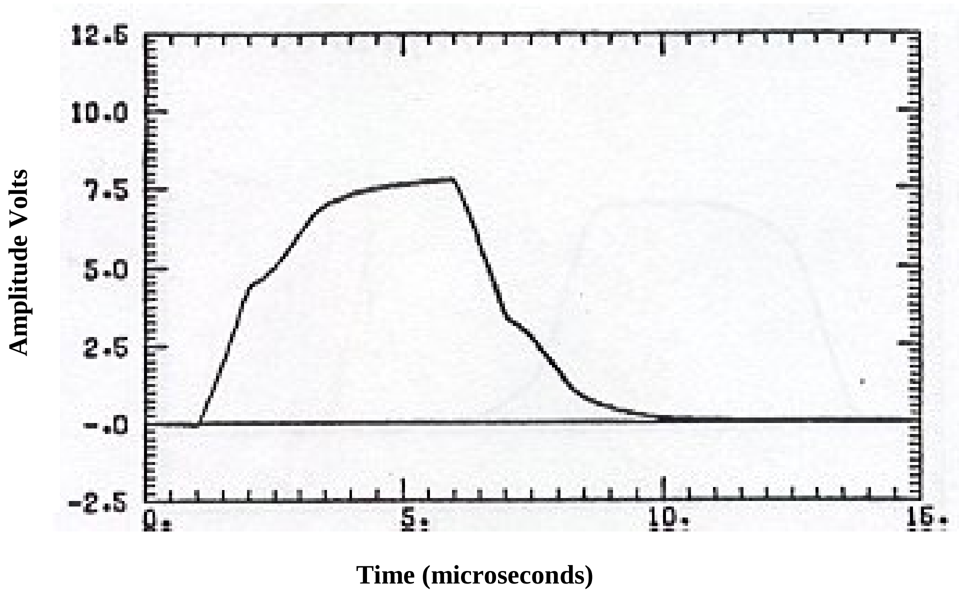
VOLTAGE AT RECEIVER ONE



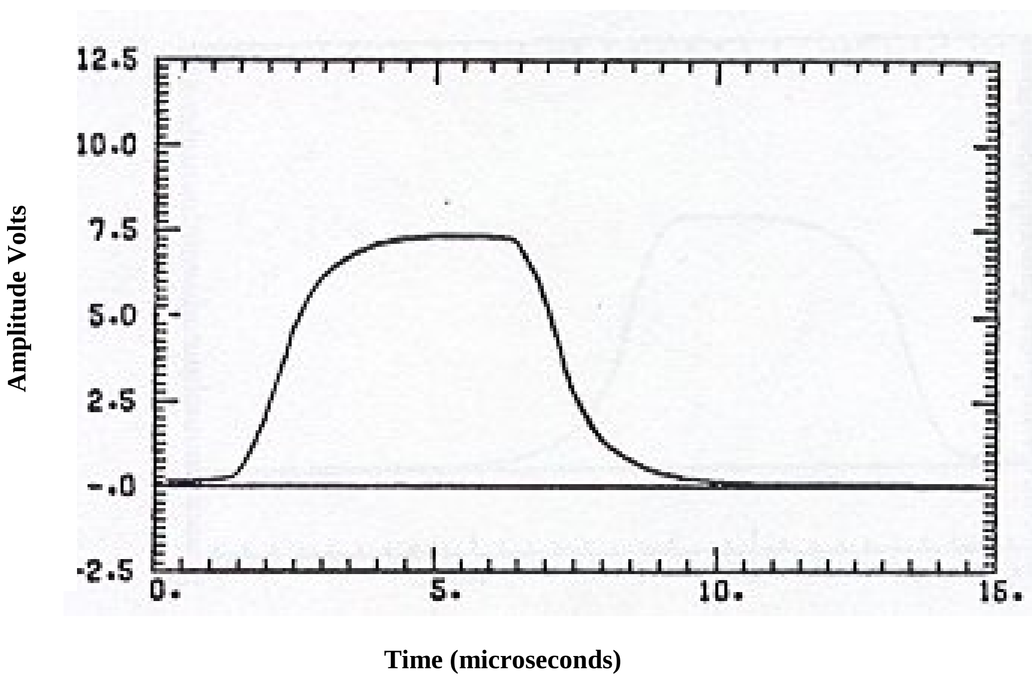
VOLTAGE AT RECEIVER TWO

APPENDIX A
LABORATORY VERIFICATION OF ARINC 429 ELECTRICAL CHARACTERISTICS

FIGURE a-(xv)



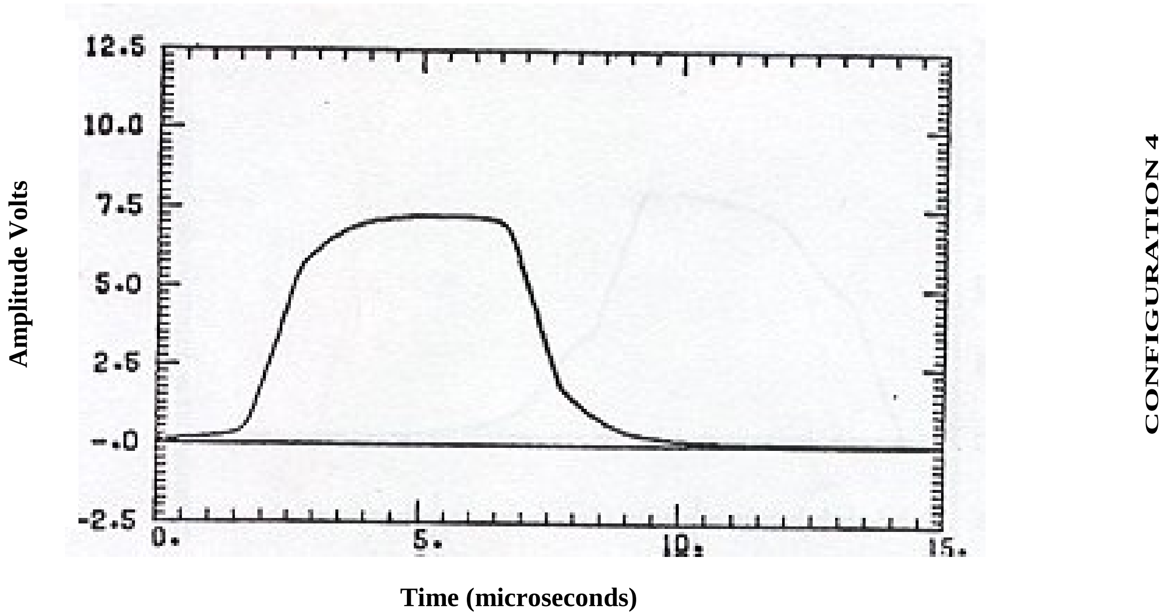
TRANSMITTER OUTPUT VOLTAGE



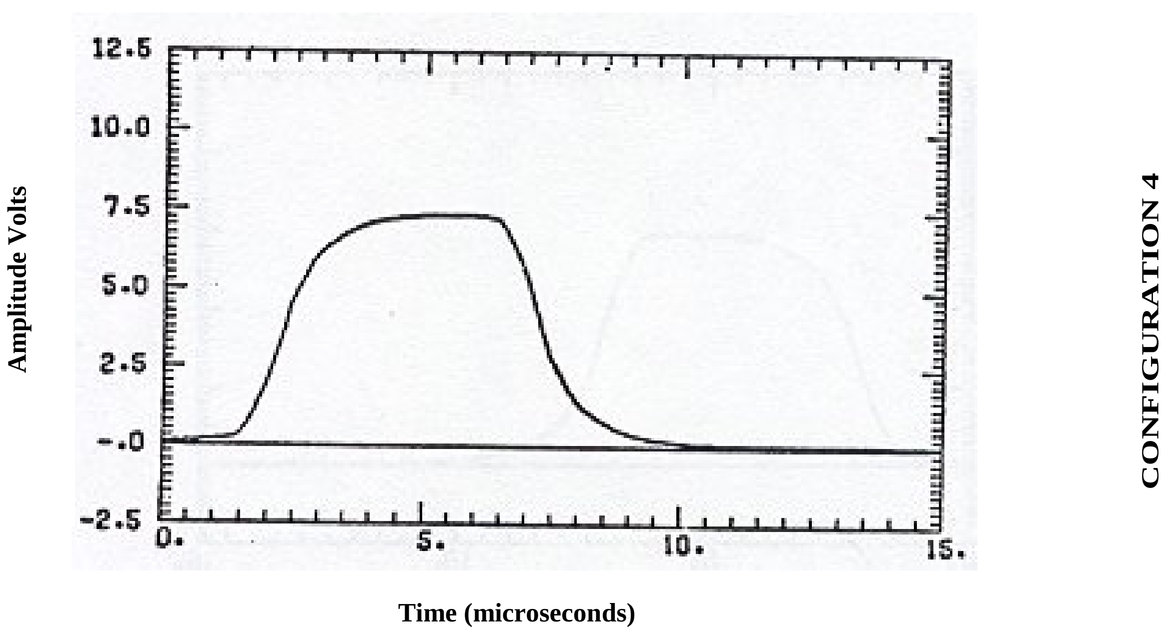
VOLTAGE AT FIRST NODE

APPENDIX A
LABORATORY VERIFICATION OF ARINC 429 ELECTRICAL CHARACTERISTICS

FIGURE a-(xvi)



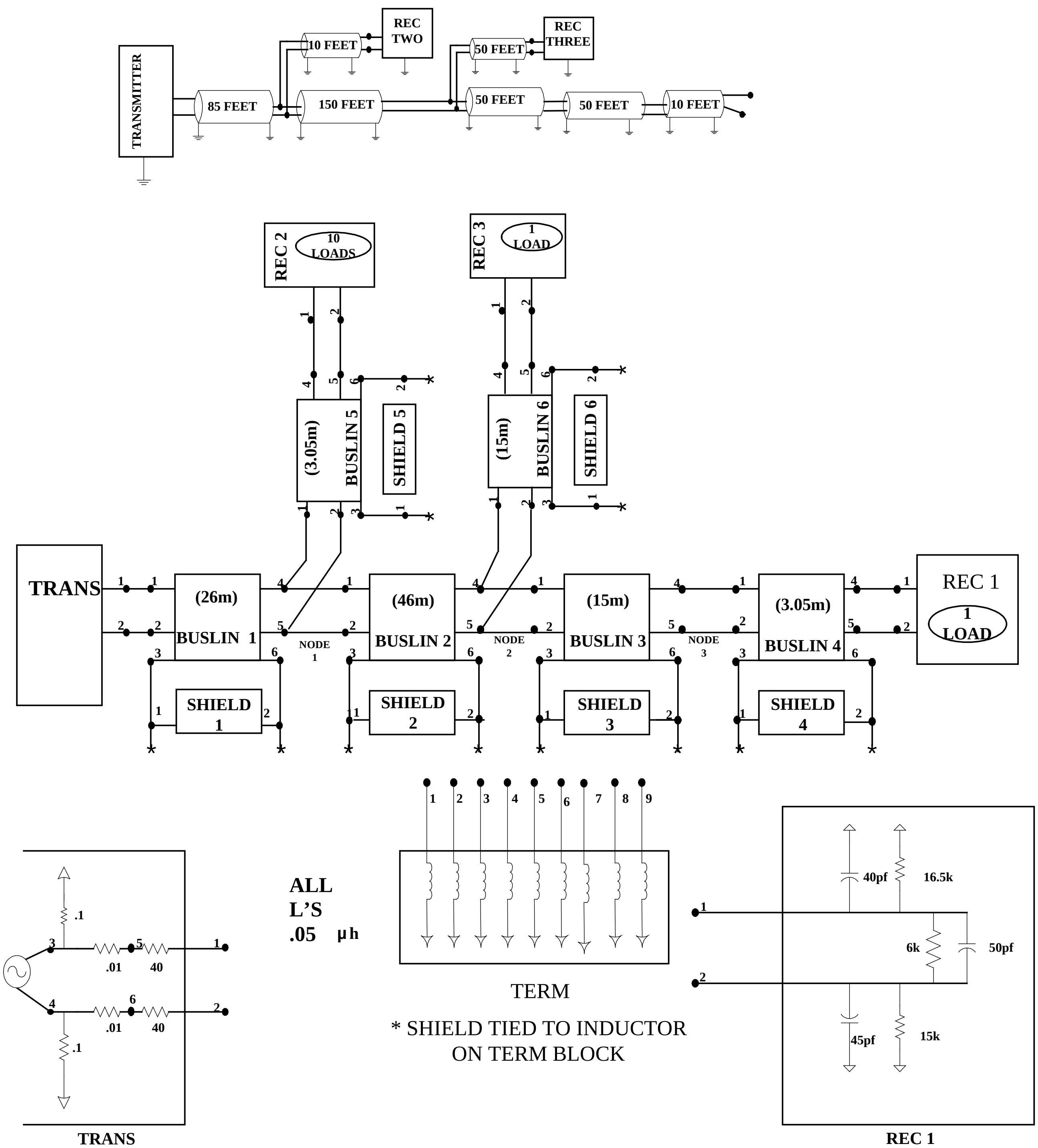
VOLTAGE AT RECEIVER ONE



VOLTAGE AT RECEIVER TWO

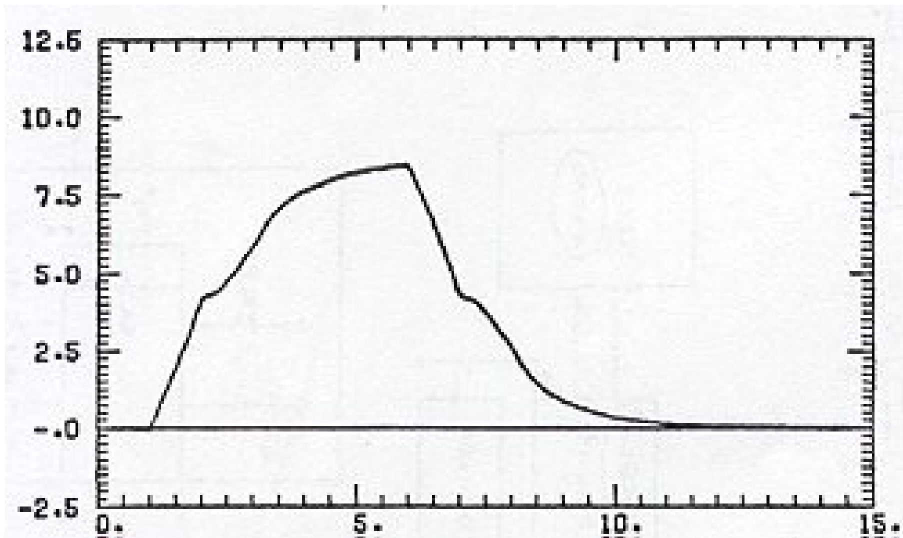
APPENDIX A
LABORATORY VERIFICATION OF ARINC 429 ELECTRICAL CHARACTERISTICS

FIGURE a-(xvii)



APPENDIX A
LABORATORY VERIFICATION OF ARINC 429 ELECTRICAL CHARACTERISTICS

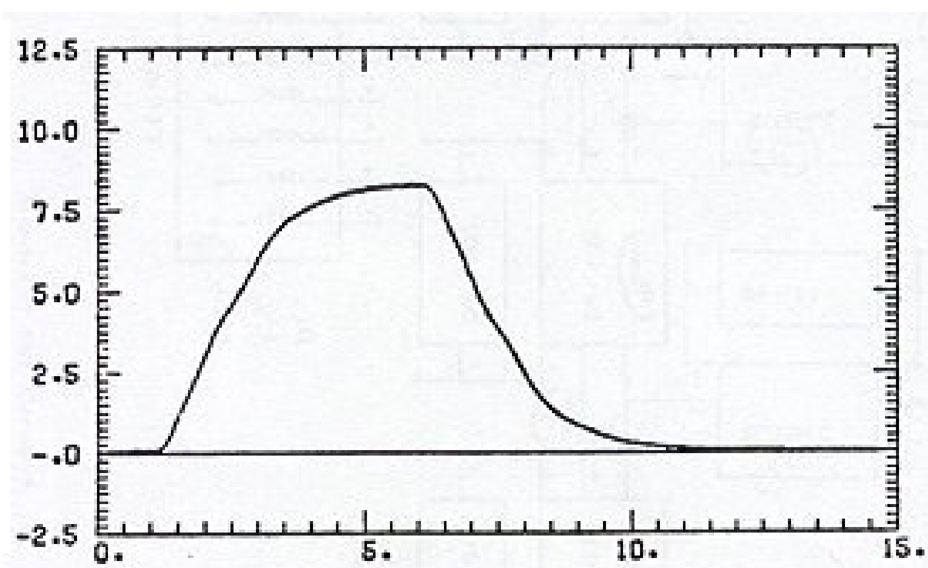
FIGURE a-(xviii)



Amplitude Volts

Time (microseconds)

TRANSMITTER OUTPUT VOLTAGE



Amplitude Volts

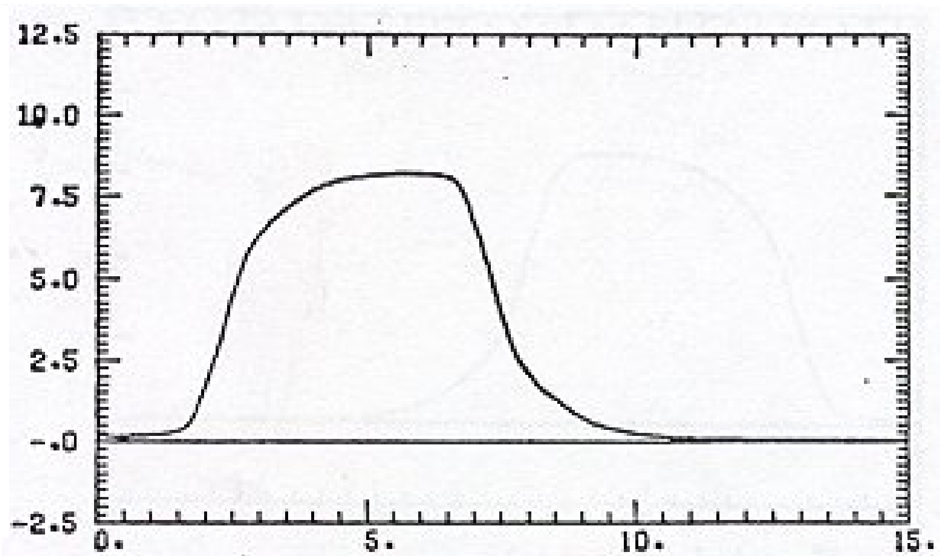
Time (microseconds)

VOLTAGE AT FIRST NODE

APPENDIX A
LABORATORY VERIFICATION OF ARINC 429 ELECTRICAL CHARACTERISTICS

FIGURE a-(xix)

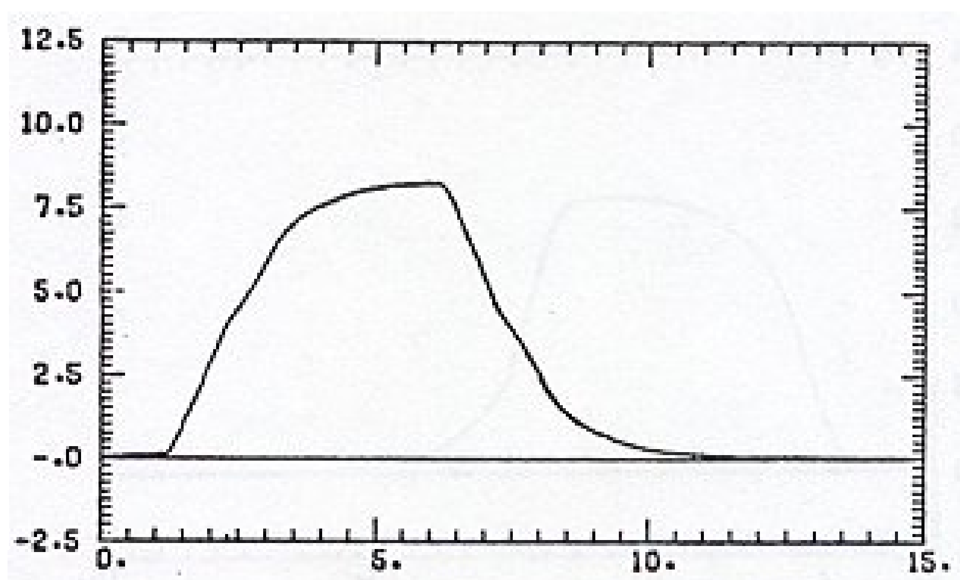
Amplitude Volts



Time (microseconds)

VOLTAGE AT RECEIVER ONE

Amplitude volts

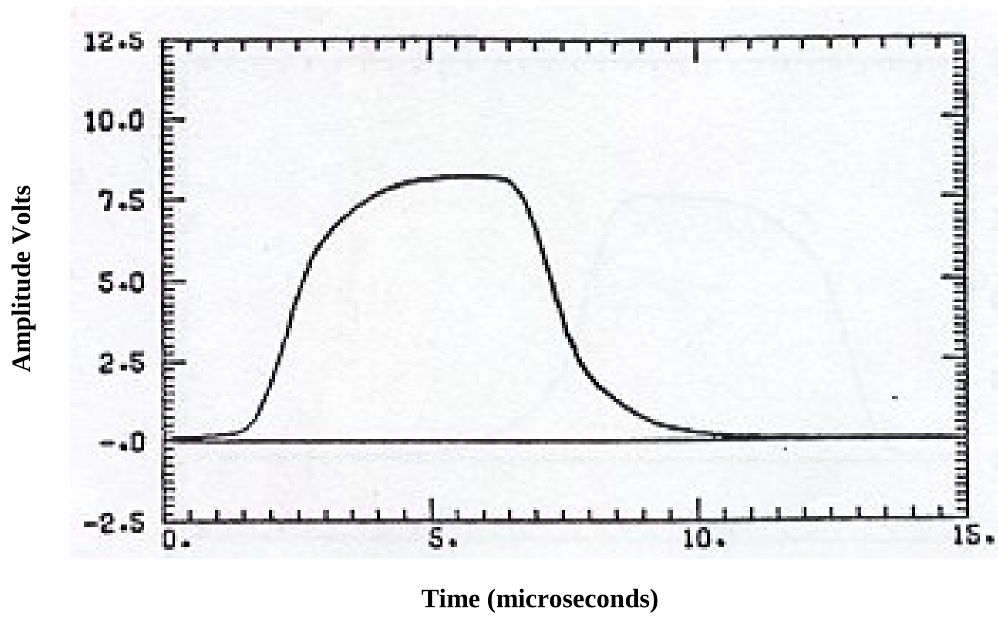


Time (microseconds)

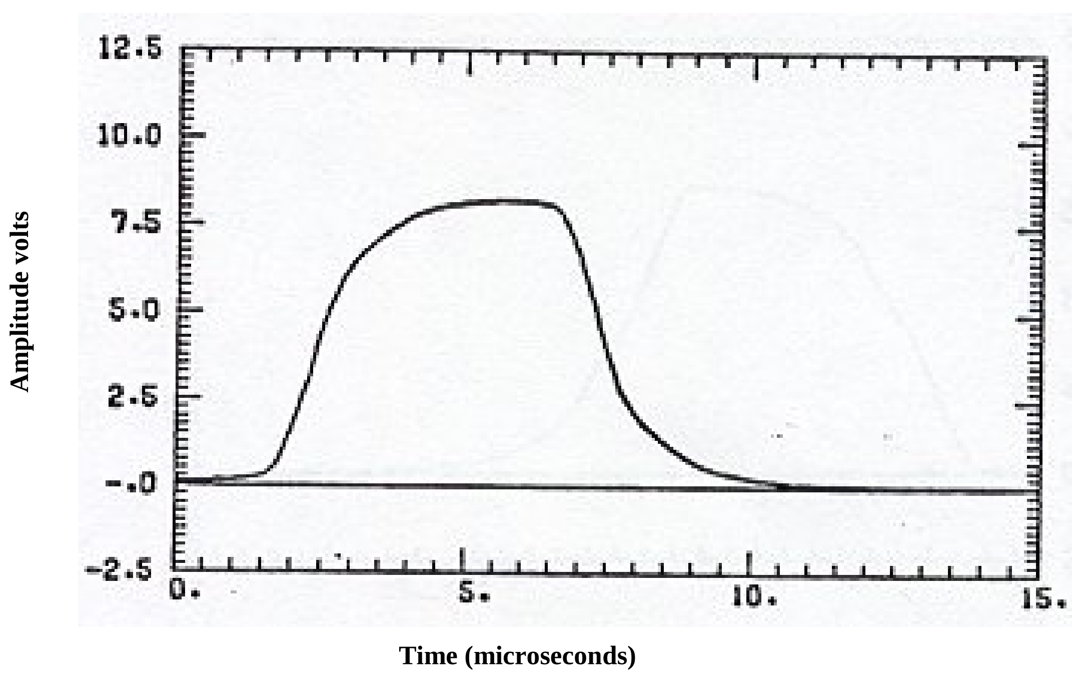
VOLTAGE AT RECEIVER TWO

APPENDIX A
LABORATORY VERIFICATION OF ARINC 429 ELECTRICAL CHARACTERISTICS

FIGURE a-(xx)



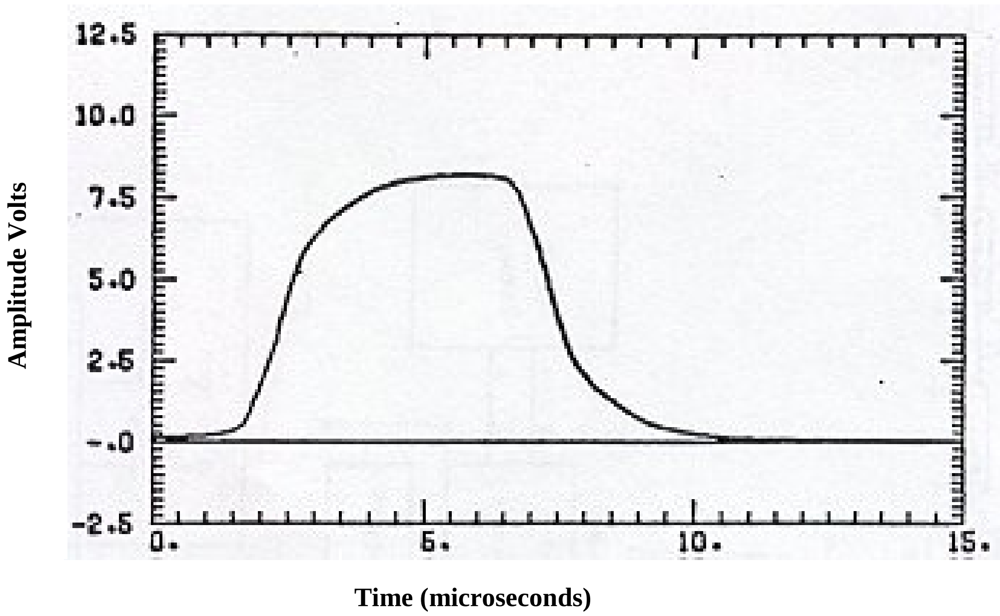
VOLTAGE AT SECOND NODE



VOLTAGE AT RECEIVER THREE

APPENDIX A
LABORATORY VERIFICATION OF ARINC 429 ELECTRICAL CHARACTERISTICS

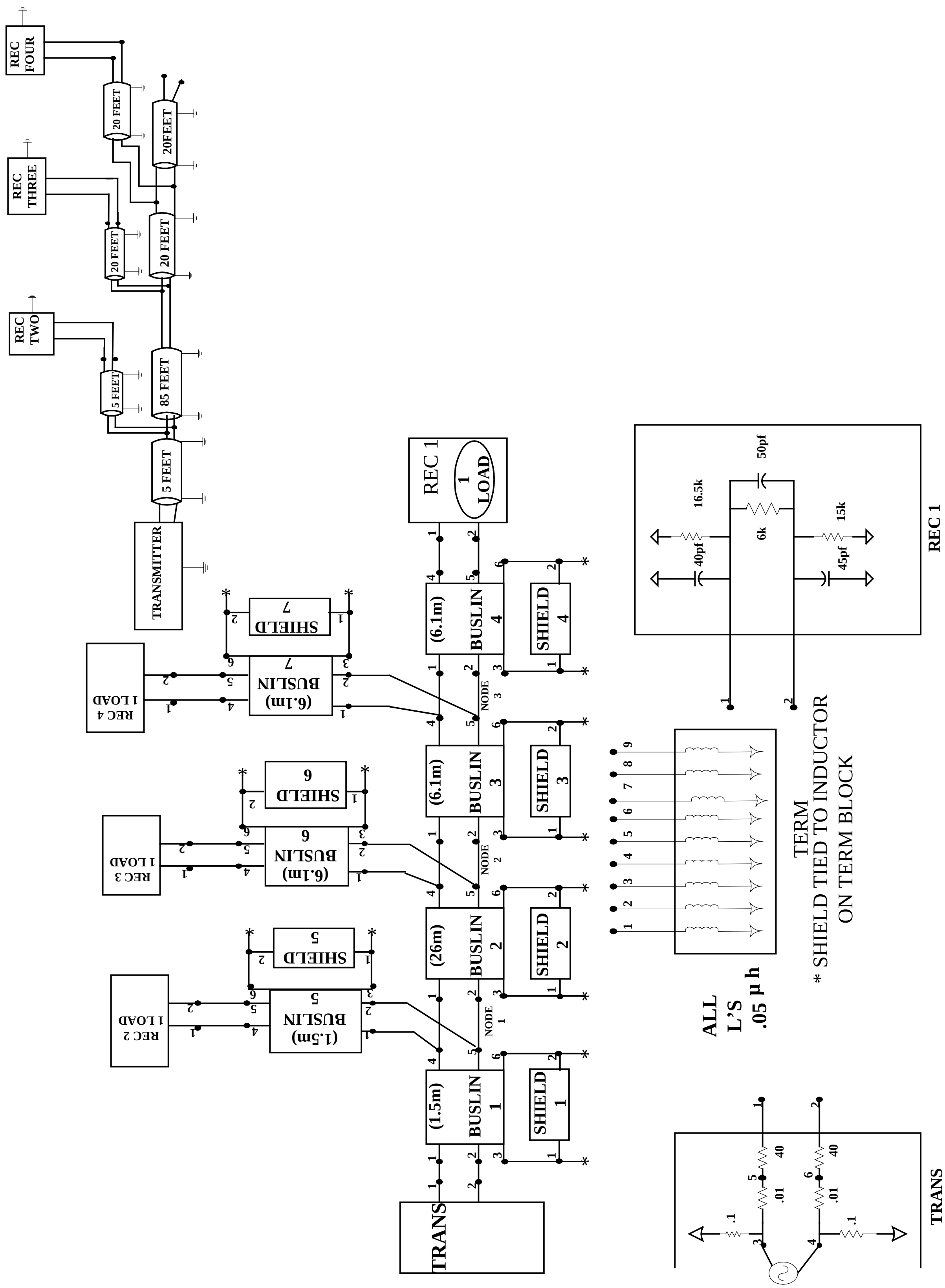
FIGURE a-(xxi)



VOLTAGE AT THREE NODE

APPENDIX A
LABORATORY VERIFICATION OF ARINC 429 ELECTRICAL CHARACTERISTICS

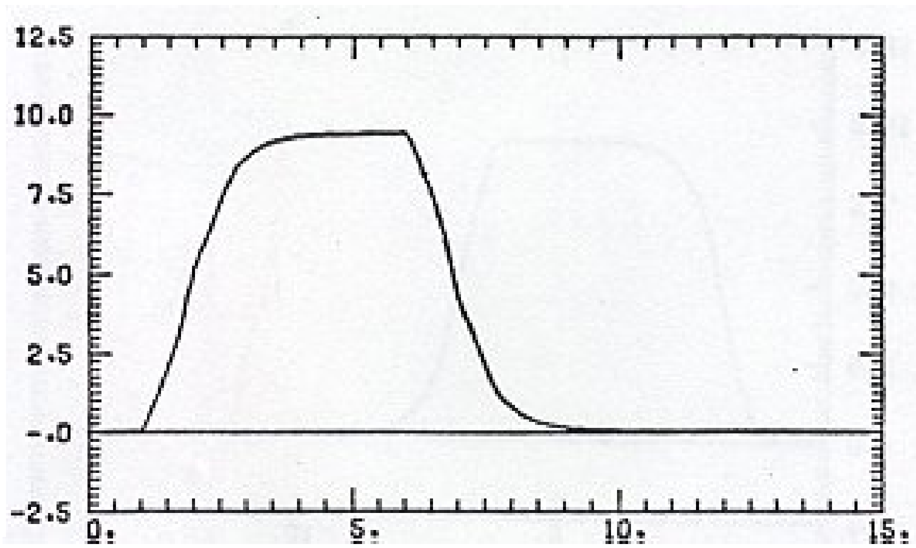
FIGURE a-(xxii)



APPENDIX A
LABORATORY VERIFICATION OF ARINC 429 ELECTRICAL CHARACTERISTICS

FIGURE a-(xxiii)

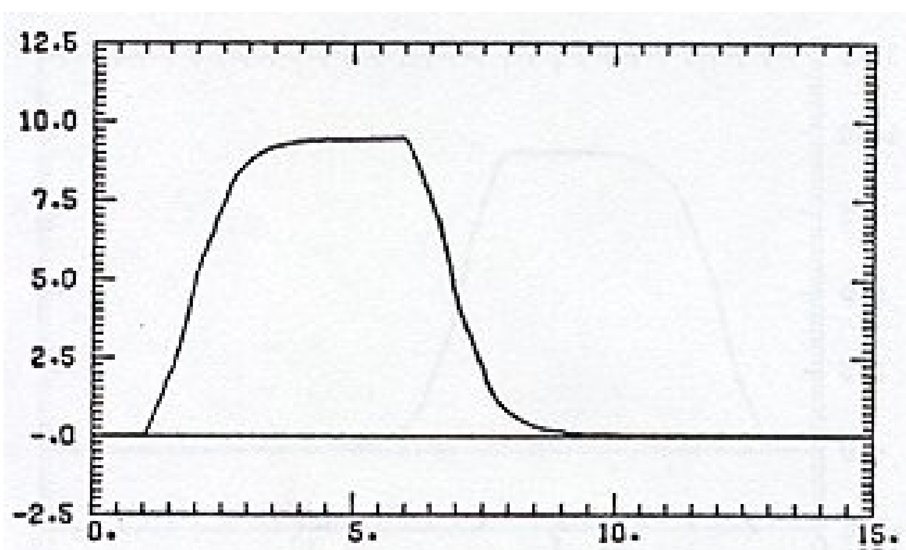
Amplitude Volts



Time (microseconds)

TRANSMITTER OUTPUT VOLTAGE

Amplitude Volts

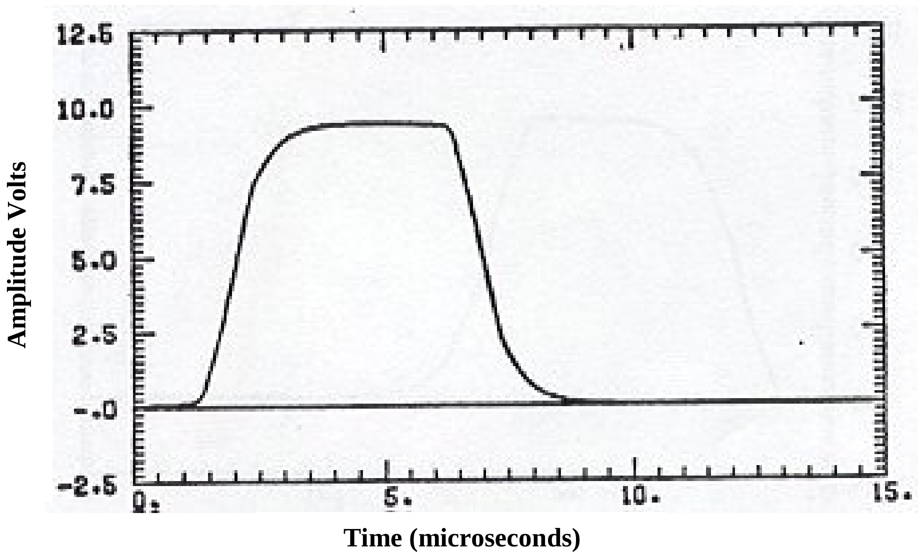


Time (microseconds)

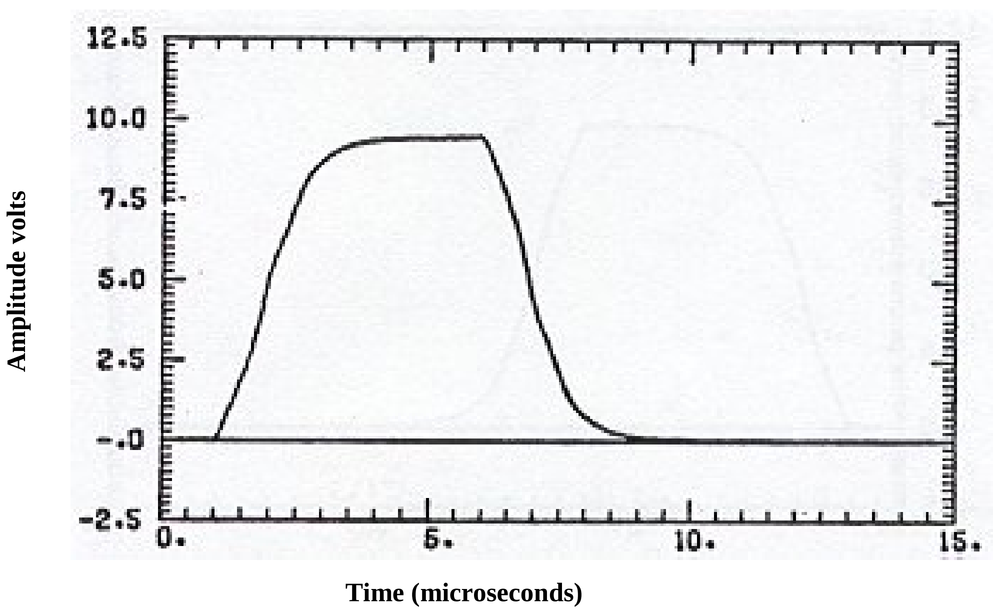
VOLTAGE AT FIRST NODE

APPENDIX A
LABORATORY VERIFICATION OF ARINC 429 ELECTRICAL CHARACTERISTICS

FIGURE a-(xxiv)



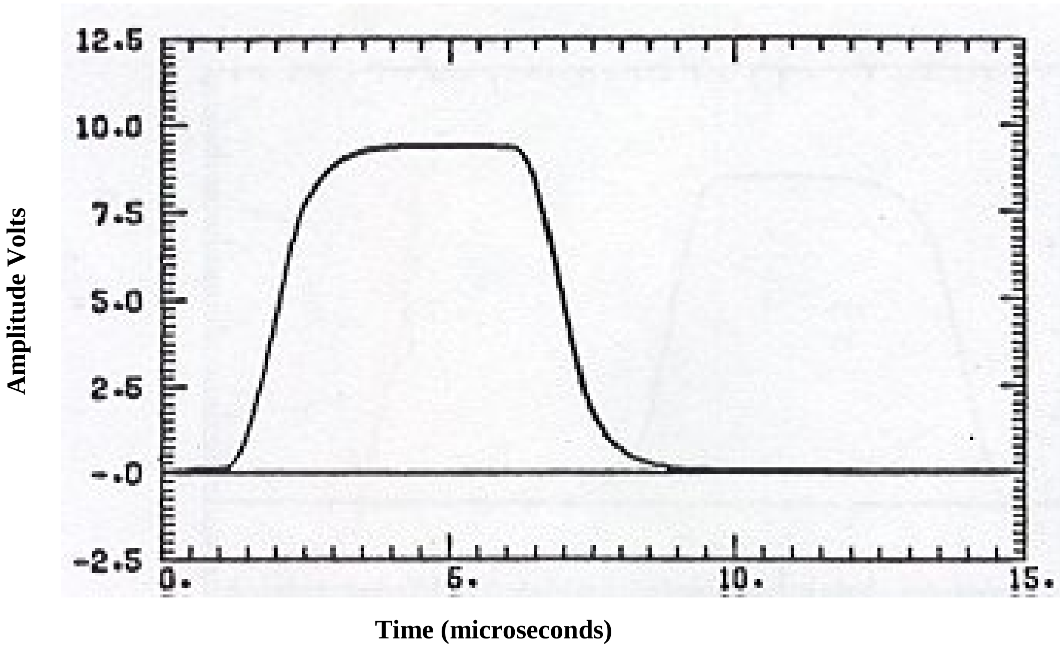
VOLTAGE AT RECEIVER ONE



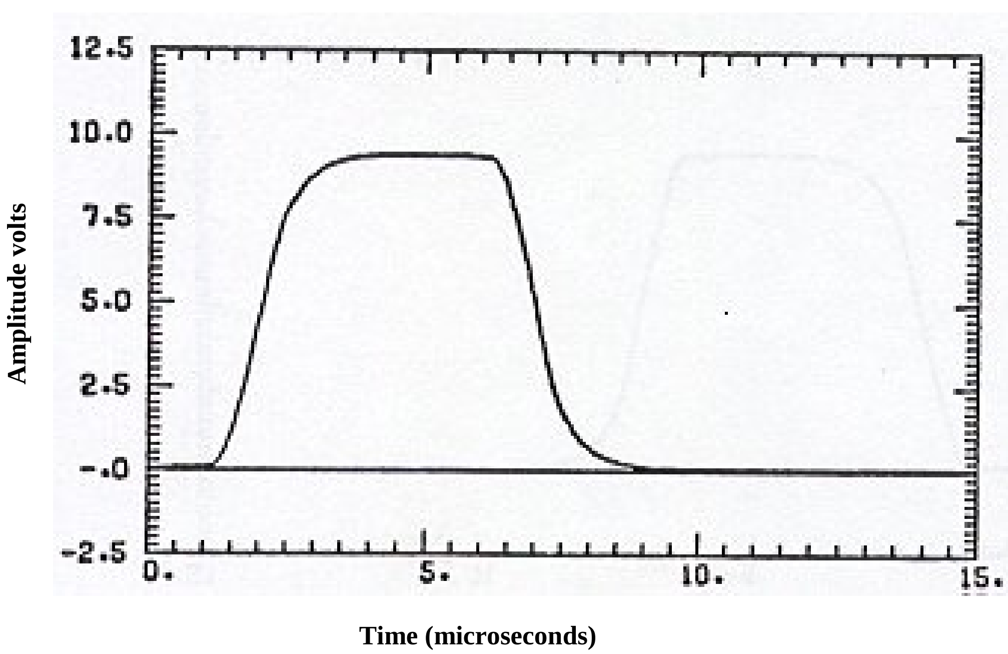
VOLTAGE AT RECEIVER TWO

APPENDIX A
LABORATORY VERIFICATION OF ARINC 429 ELECTRICAL CHARACTERISTICS

FIGURE a-(xxv)



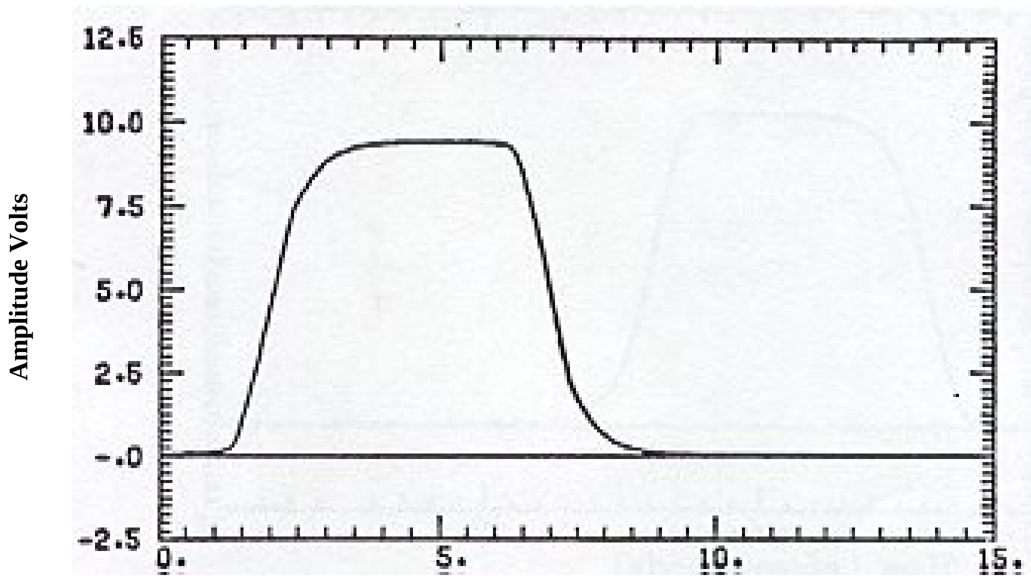
VOLTAGE AT SECOND NODE



VOLTAGE AT RECEIVER THREE

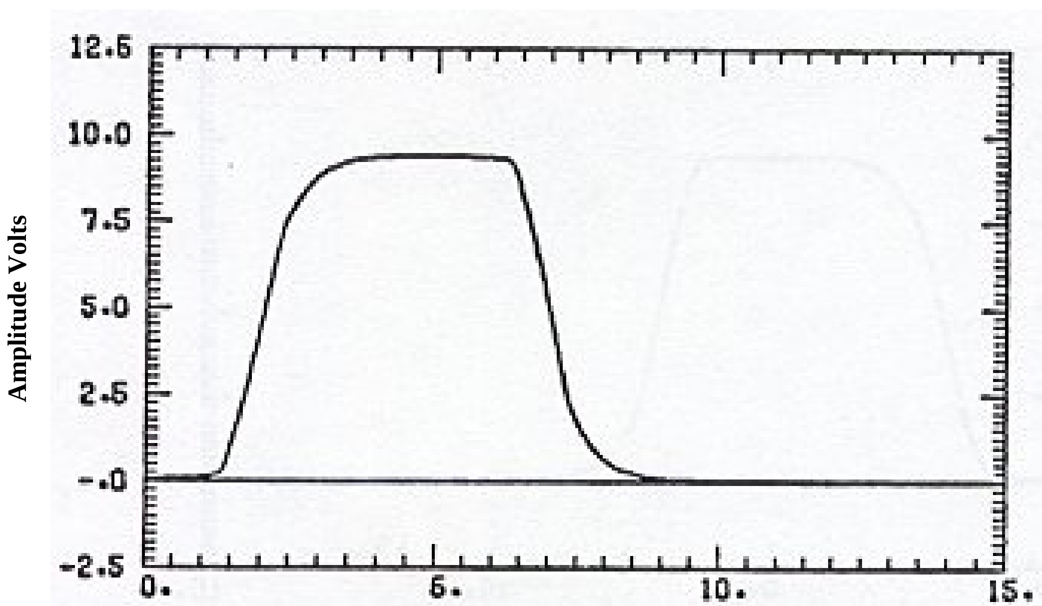
APPENDIX A
LABORATORY VERIFICATION OF ARINC 429 ELECTRICAL CHARACTERISTICS

FIGURE a(xxvi)



Time (microseconds)

VOLTAGE AT NODE THREE

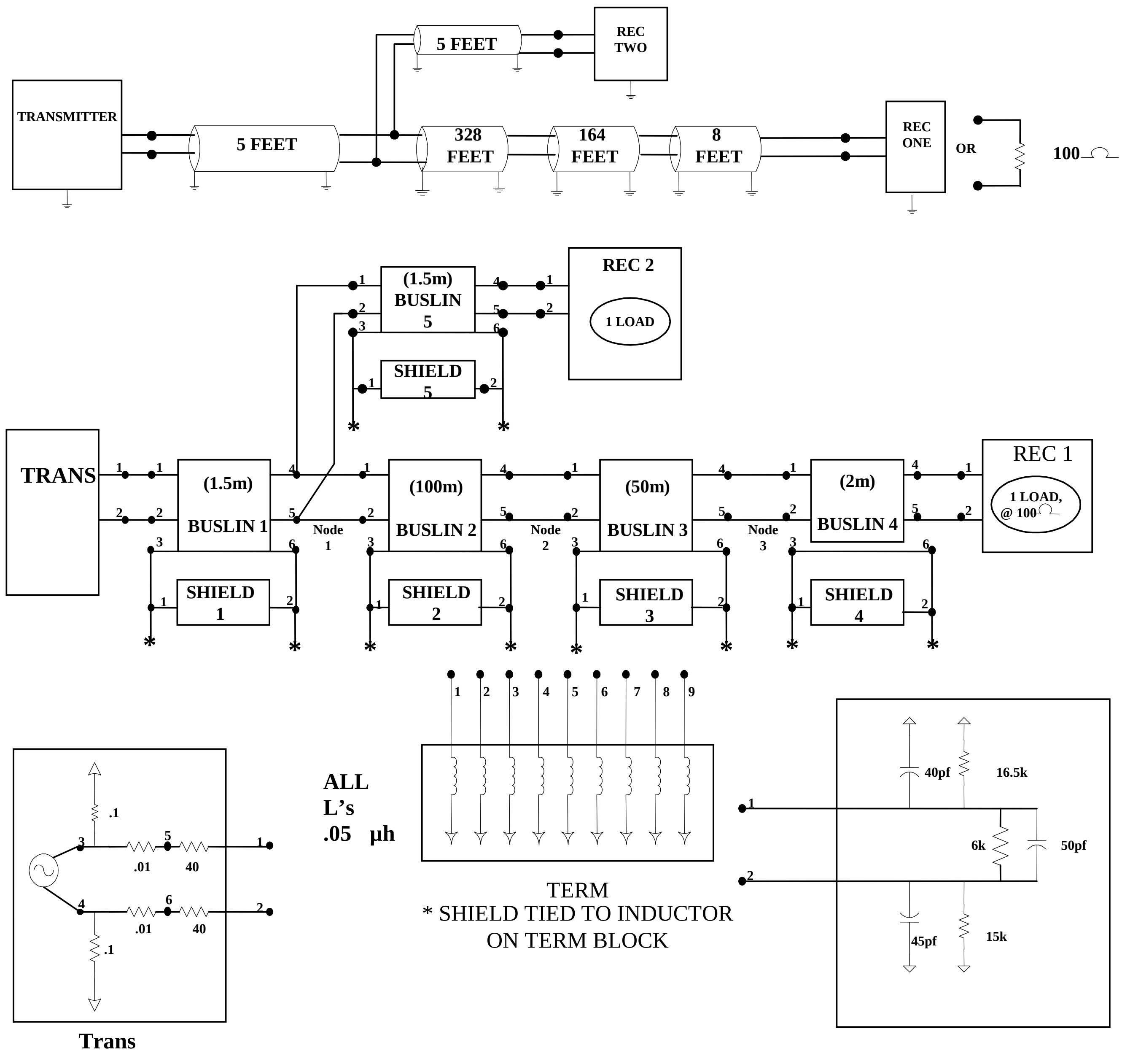


Time (microseconds)

VOLTAGE AT RECEIVER FOUR

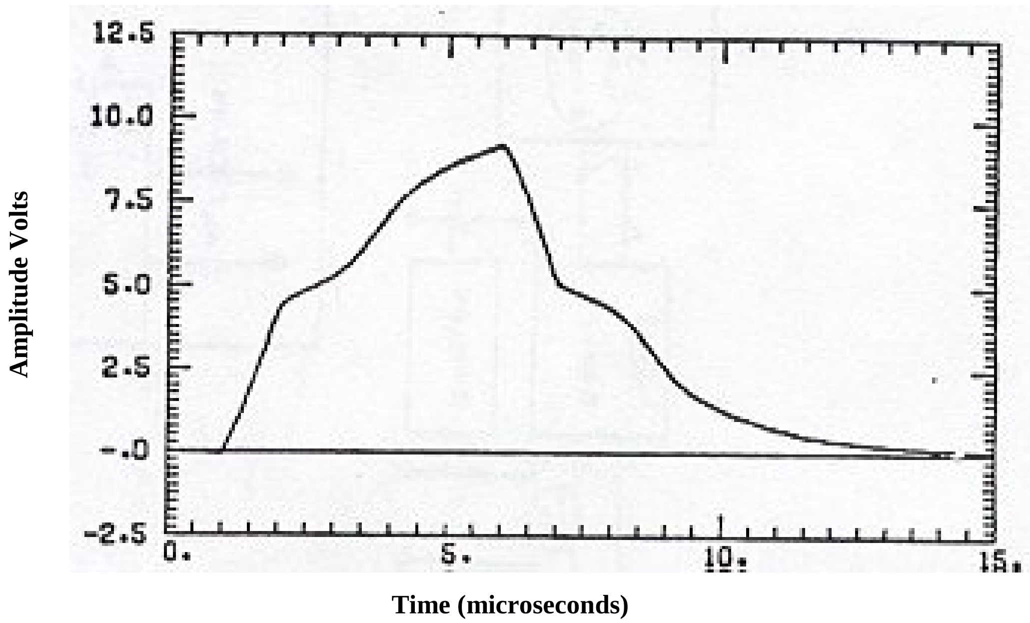
APPENDIX A
LABORATORY VERIFICATION OF ARINC 429 ELECTRICAL CHARACTERISTICS

FIGURE a-(xxvii)

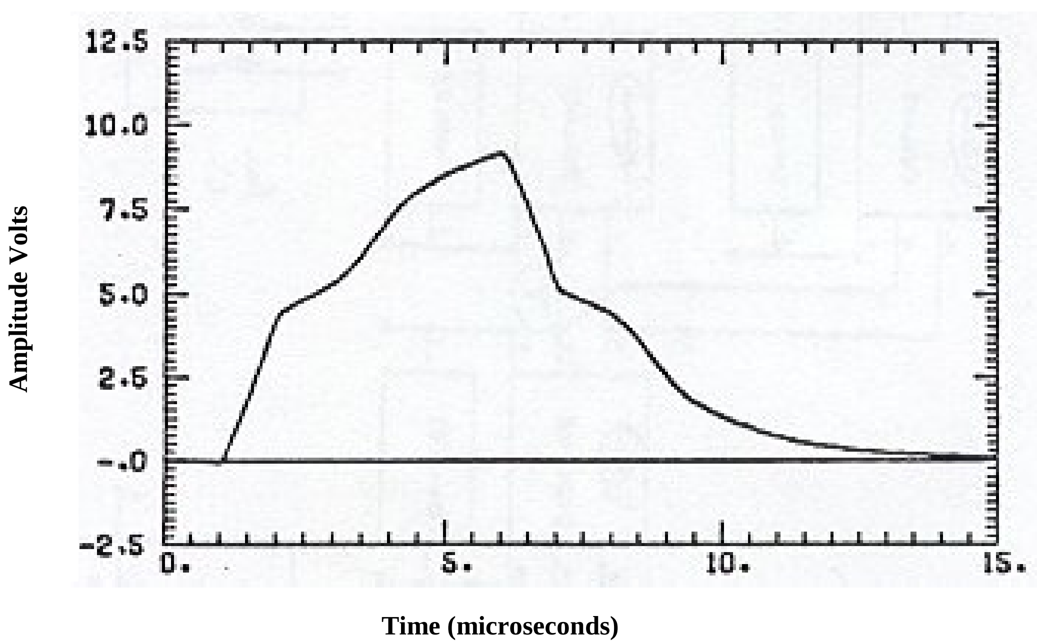


APPENDIX A
LABORATORY VERIFICATION OF ARINC 429 ELECTRICAL CHARACTERISTICS

FIGURE a-(xxviii)



TRANSMITTER OUTPUT VOLTAGE

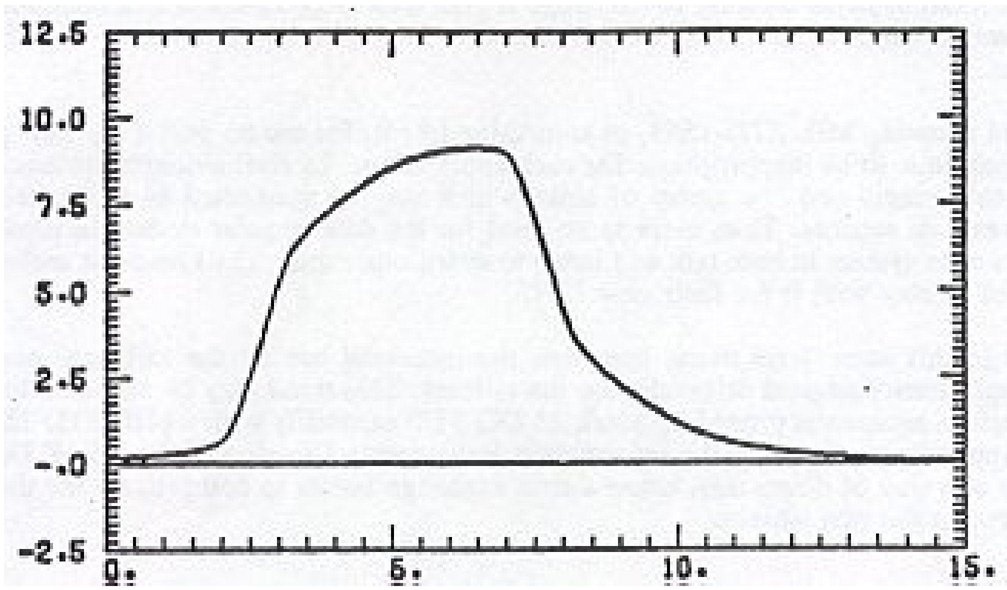


VOLTAGE AT FIRST NODE

APPENDIX A
LABORATORY VERIFICATION OF ARINC 429 ELECTRICAL CHARACTERISTICS

FIGURE a-(xxix)

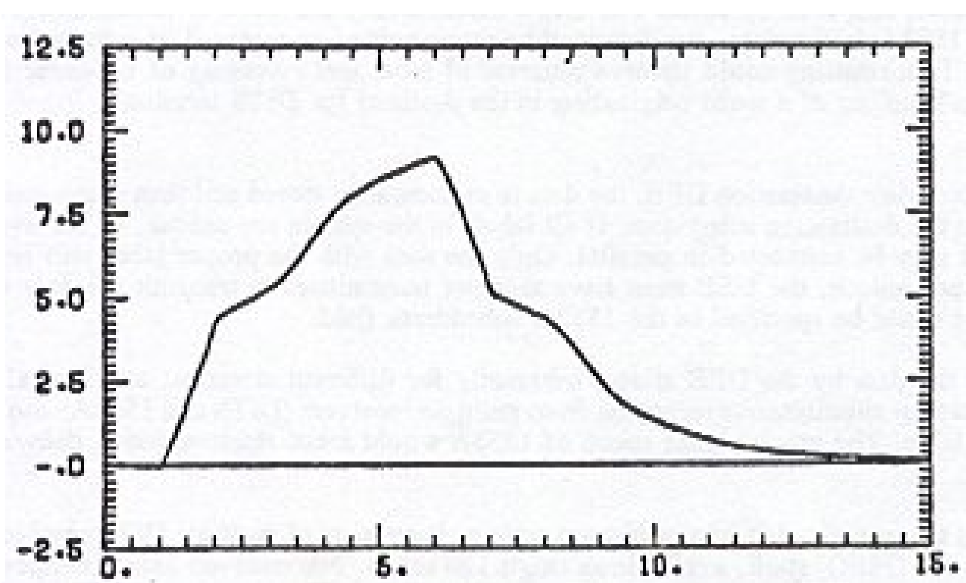
Amplitude volts



Time (microseconds)

VOLTAGE AT RECEIVER ONE

Amplitude Volts



Time (microseconds)

VOLTAGE AT RECEIVER TWO

APPENDIX B
AN APPROACH TO A HYBRID BROADCAST-COMMAND/RESPONSE DATA BUS ARCHITECTURE

A2-1.0 Introduction

During the time that the broadcast approach to digital information transfer became established in the air transport industry, the military aviation community adopted a command/response time division multiplex technique as its standard. In this approach, all aircraft systems needing to exchange digital data are connected to a common bus and a dedicated “bus controller” determines which of them may output data on to the bus at any given time. MIL STD 1553 was written to describe this system.

The airlines considered adopting MIL STD 1553, or something like it, for use on post-1980 new civil aircraft types but found the multiplex technique to be inappropriate for such applications. In civil avionics systems, data typically flows from a given source to a single sink, or group of sinks which may be connected in a parallel, and these sinks are typically not themselves data sources. Thus there is no need for the data transfer system to provide the capability for every unit of every avionics system to both talk and listen to every other unit. The broadcast technique is adequate, and thus the airlines elected to stay with it for their new ARINC 429.

Another development in this same time frame has been the increased use by the military, particularly in transport aircraft, of avionics equipment designed originally for the airlines. This trend may be expected to continue and so give rise to the need to interface equipment providing ARINC 429 I/0 capability with a MIL STD 1553A data bus system. The material in this Appendix prepared by the Information Engineering Division of the USAF Directorate of Avionics Engineering describes one way of doing this, using a data exchange buffer to compensate for the electrical, logic and timing differences between the two systems.

A2-2.0 Suggested ARINC 429/MIL STD 1553A Interface

The following is a proposed method for interfacing an avionic system employing sensors designed for any combination of ARINC 429 and MIL-STD-1553A. This method minimizes message related differences and compensates for electrical, logic and timing differences in a Data Exchange Buffer (DEB).

In a hybrid system such as shown in Figure b-(i), a signal may originate in either an ARINC 429 type subsystem or a 1553A subsystem and may be destined for either type of terminal. ARINC 429 data received by a DEB is momentarily stored and then retransmitted, complete with label, to the 1553A bus controller. The bus controller determines the intended destinations from the label and look-up table. For ARINC 429 destinations, the word is retransmitted, as received, to the appropriate DEB. For 1553A destinations, the data may be retransmitted as received or reformatted, as required by the destination subsystem. Reformatting could involve removal of label and reversing of bit order (MSB vs LSB first). Figure b-(ii) shows the handling of a word originating in the destined for ARINC 429 terminals.

Upon arrival at the appropriate destination DEB, the data is momentarily stored and then retransmitted in ARINC 429 format, complete with label, to the destination subsystem. If all labels in the system are unique, all receivers in all subsystems associated with a DEB may be connected in parallel. Only the data with the proper label will be recognized by each receiver. If labels are not unique, the DEB must have separate transmitters to transmit the data with identical labels. The desired transmitter could be specified in the 1553A subaddress field.

The retransmission of the data by the DEB allows inherently for different electrical and logical characteristics. The storage of the data allows for simultaneous reception from multiple receivers (ARINC 429 and 1553A) and retransmission when the desired bus is available. The much higher speed of 1553A would make retransmission delays small.

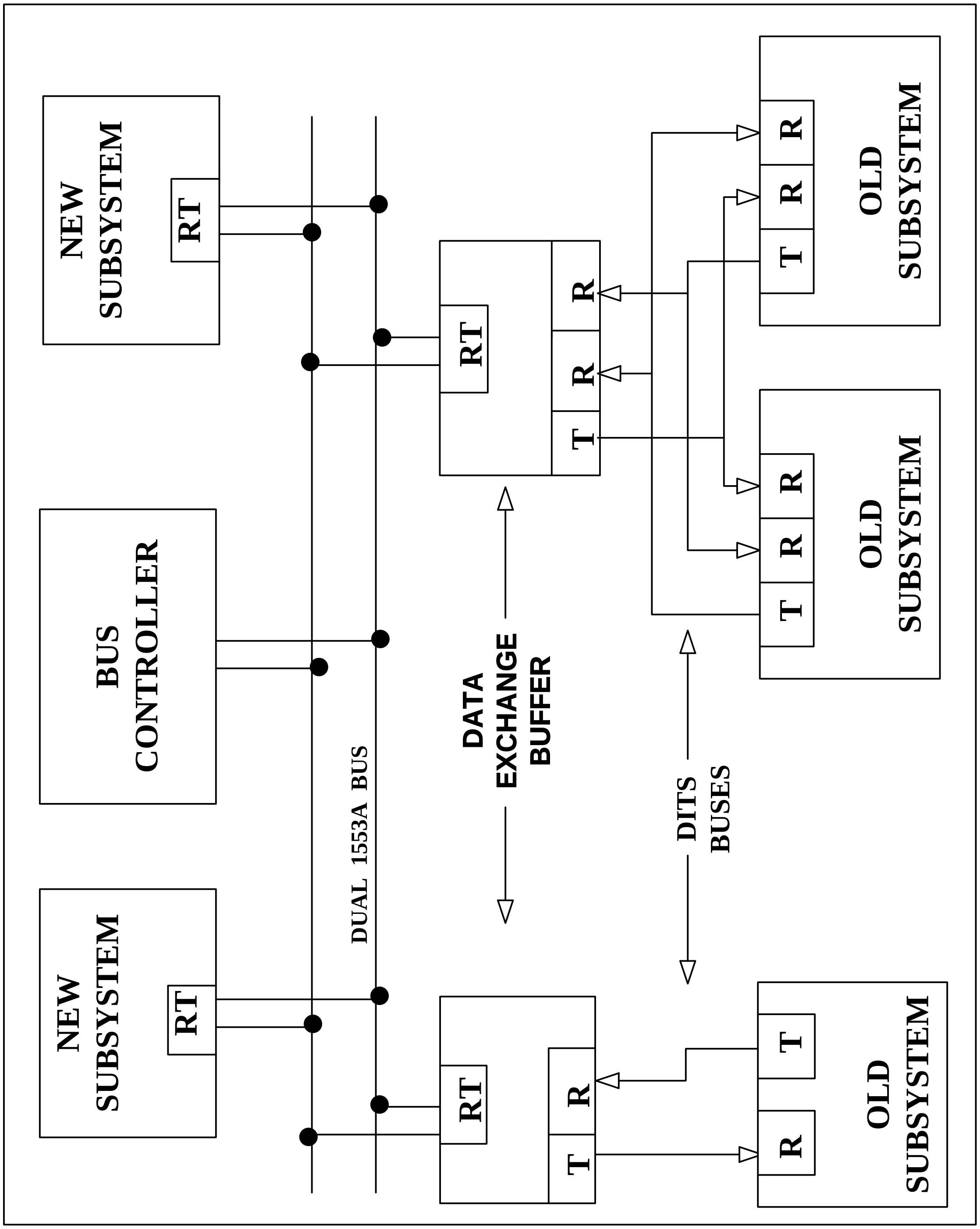
Figure b-(iii) illustrates the organization of a minimum system. It consists of multiple ARINC 429 receivers dumping received data into a first-in first-out (FIFO) stack, available as single LSI chips. The received data is temporarily stored and then retransmitted by the 1553A terminal. Data received via 1553A is dumped into another FIFO for retransmission by an ARINC 429 transmitter. The hardware consists only of ARINC 429 receivers, the 1553A terminal, the ARINC 429 transmitter, and as many FIFOs as are required. Hand-shaking signals available on the FIFOs eliminate almost all supporting SSI chips. This entire system would probably fit on one full ATR card or less.

Figure b-(iv) illustrates possible organization for a more sophisticated DEB. It consists of an many ARINC 429 transmitters and receivers as necessary, a single (internally redundant) 1553A remote terminal, a buffer memory, a controller (microprocessor), and a program for the controller contained in ROM. Whenever a complete, valid word is available at a receiver, the controller is notified. When the parallel data bus becomes available, the word is transferred to memory. When the desired transmitter (ARINC 429 or 1553A) becomes available, the data word is routed from memory to the transmitter. The low rate of ARINC 429 terminals (minimum 320 microsec/word) would result in a very low loading of the parallel bus and controller. The speed of the 1553A terminal might necessitate a direct memory access arrangement. The controller, the program memory, the buffer memory and a dual 1553A remote terminal would probably fit on one one-sided 3/4 ATR card. The required ARINC 429 transmitters and receivers would probably fit on another card.

This method represents one way of constructing a hybrid system. The retransmission of the label with the data greatly reduces the intelligence required by the DEB but increases bus loading. A more intelligent DEB, perhaps located in the bus controller, could achieve much higher efficiencies.

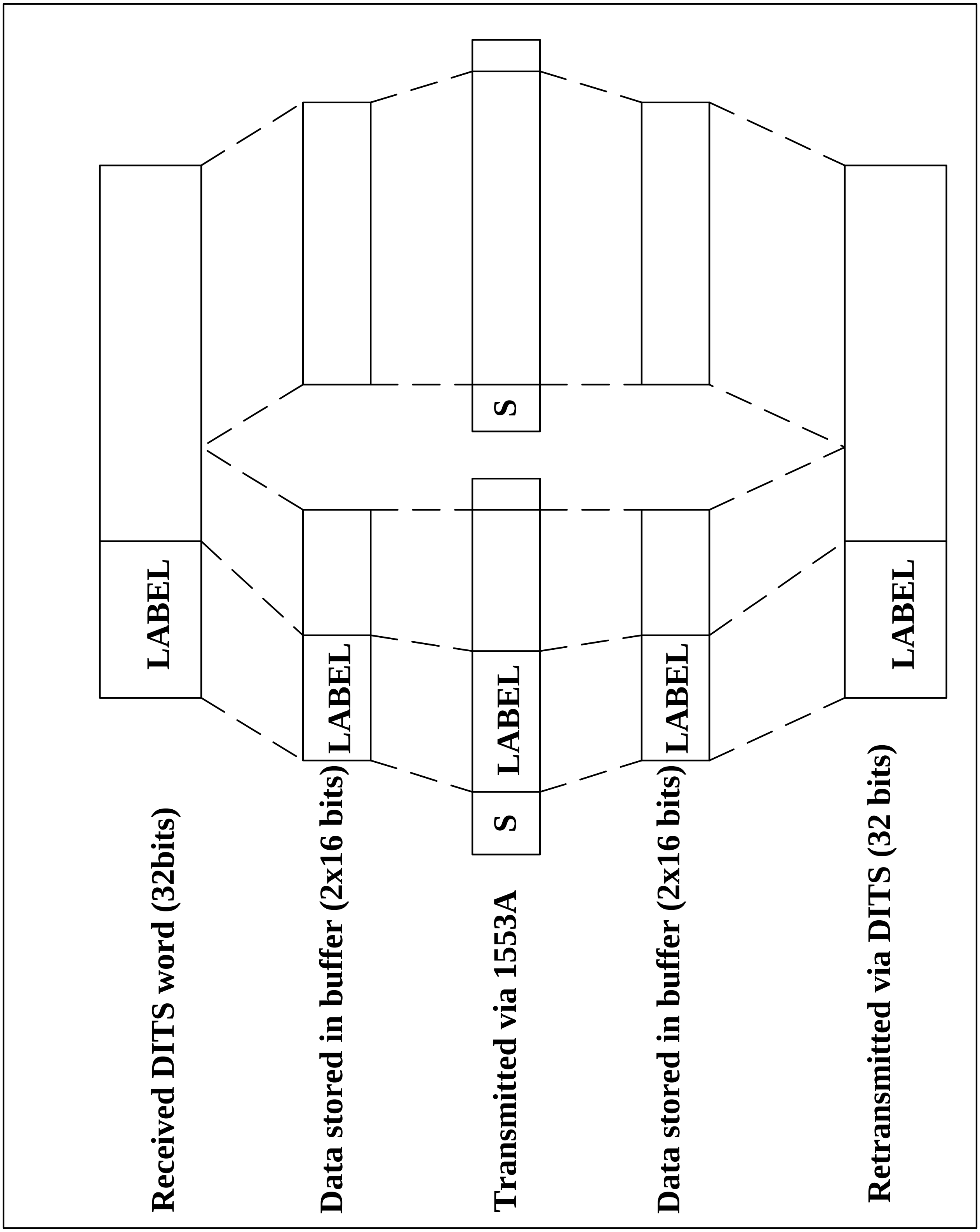
APPENDIX B
AN APPROACH TO A HYBRID BROADCAST-COMMAND/RESPONSE DATA BUS ARCHITECTURE

FIGURE b-(i)
HYBRID BUS ARCHITECTURE



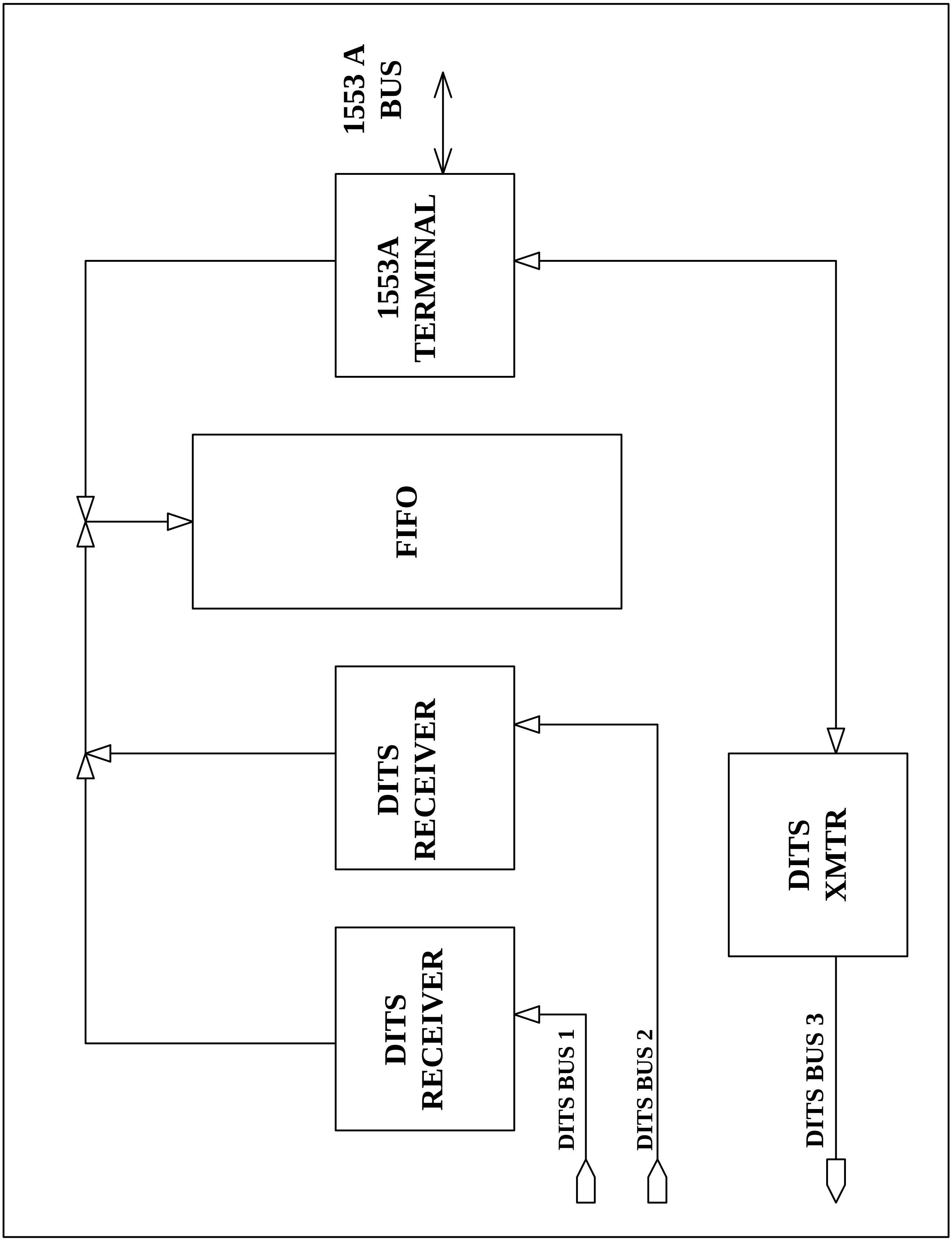
APPENDIX B
AN APPROACH TO A HYBRID BROADCAST-COMMAND/RESPONSE DATA BUS ARCHITECTURE

FIGURE b-(ii)
MESSAGE WORD FORMATTING



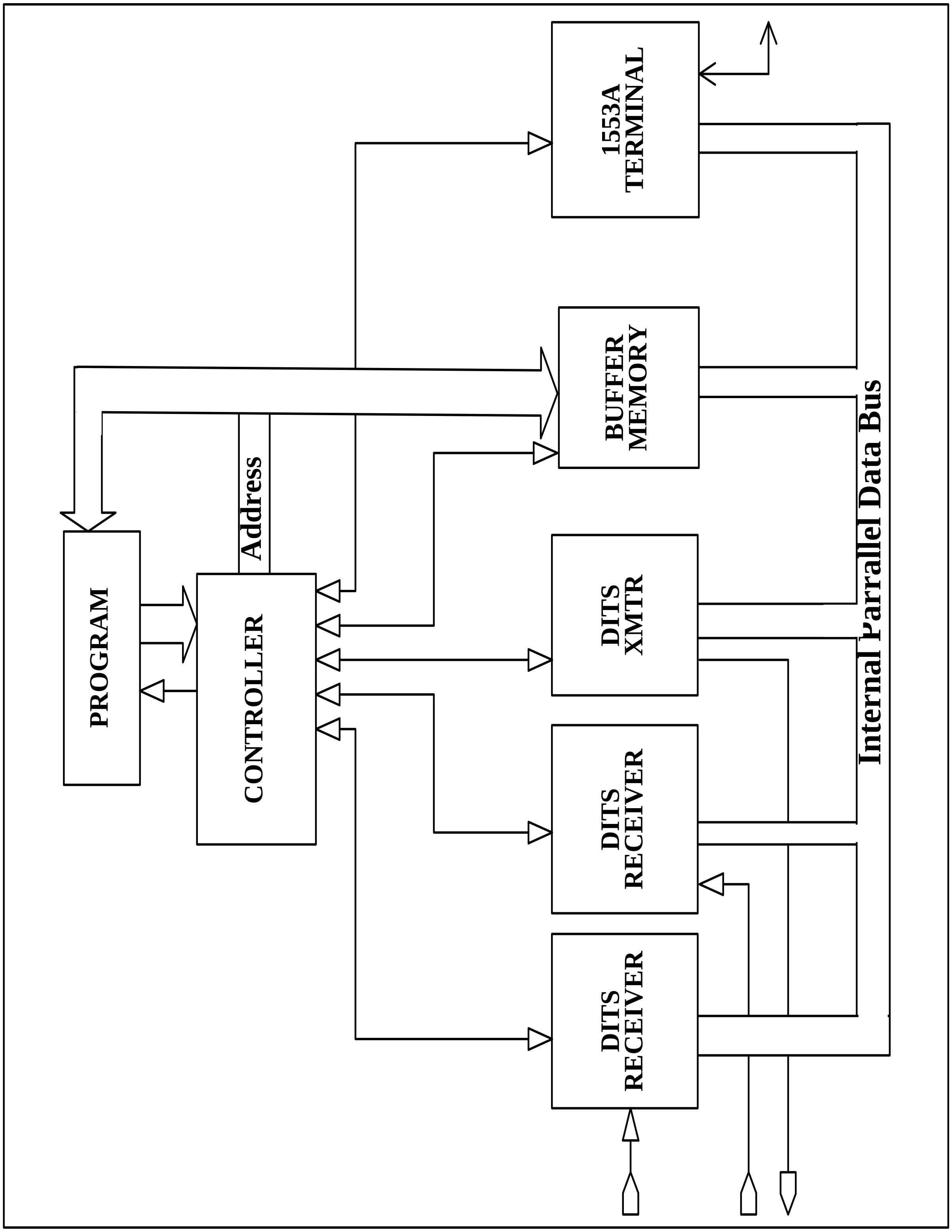
APPENDIX B
AN APPROACH TO A HYBRID BROADCAST-COMMAND/RESPONSE DATA BUS ARCHITECTURE

FIGURE b-(iii)
MINIMUM DATA EXCHANGE BUFFER



APPENDIX B
AN APPROACH TO A HYBRID BROADCAST-COMMAND/RESPONSE DATA BUS ARCHITECTURE

FIGURE b-(iv)
PROGRAMMABLE DATA EXCHANGE BUFFER



APPENDIX C
DIGITAL SYSTEM GUIDANCE (PART 1)

Rockwell
International

4 May 1979

A Control System View of
ARINC 429 Bus Specifications
By
T. G. Sharpe and G. E. Forquer

I. Introduction and Summary

The discussion below summarizes concepts that have grown out of an in-house effort to determine what parameter characteristics Collins feels should be included in the data standards tables of ARINC Bus Specification 429 (DITS). The DITS specification seems to be evolving as more than merely a digital bus description since in many ways it is taking on the characteristics of a system interface specification. This raises philosophical questions concerning those characteristics, which should appear in the individual equipment specifications versus those which should appear in “429”. The authors cannot resolve such partitioning questions. Hopefully we can contribute, as outlined below, to an understanding of what information is required by control systems designers to achieve an acceptable system performance. The detailed discussion in this paper evolves a set of terms (outlined below) which are usable in a specification. Which of these terms appear in the individual equipment specifications and which appear in “429” remains to be determined.

At the present time, it is suggested that control system designers interfacing with digitally bused data should be concerned with three prime areas: stability considerations, signal degradation, and spectral characteristics. Without these elements of information, thorough analysis of system performance will not be possible.

The following eight parameter characteristics should prove adequate for the minimal control of interfacing considerations.

Stability

- Control Band
- Magnitude Limits
- Phase Limits

Signal Degradation

- Modification Signal to Noise Ratio (MSN)
- Static Accuracy

Spectral Characteristics

- Update Interval
- Transmit Interval
- Pre-sampling Bandwidth Limit

The following discussion of these characteristics should aid the reader in understanding their purpose and assessing their adequacy. It is recognized that some changes may necessarily take place as the industry completes its digital interfacing standardization task.

II. Stability Consideration

There is nothing uniquely digital in this area. Here our concern is with those characteristics that are most often used in linear system stability analysis – namely gain and phase characteristics. We recognize at the outset that all sensor systems are not 100% linear but this does not prevent us from defining a linear model of sufficient quality to support stability analyses. It is useful to consider here that generally the sensor will be wideband relative to the band of

APPENDIX C
DIGITAL SYSTEM GUIDANCE (PART 1)

frequencies of interest to the control system. This is necessary from a stability point of view since the converse (that is, signals narrowband relative to the control band) would introduce excessive phase lag in the control band. Thus far we have implicitly considered both bandpass and lowpass centered at zero frequency. For simplicity, however, the discussion below will assume low pass sensor characteristics but the ideas apply generally. Figure 1 illustrates an assumed sensor characteristic.

Gain and Phase Constraints

Note that prime concerns are that the gain remain essentially constant through the control band and that the phase be bounded by a linear characteristic through the control band. From a control law stability point of view, we are not concerned with what happens at frequencies above the control band because these are beyond the range where the data is being used by the control system. If we consider open loop Bode plots broken at the sensor output, the control band as used above should be wide enough to include the phase crossover as well as the gain crossover. The phase and gain characteristics provide information about phase and gain margin degradation. For most sensors the gain crossover in typical control laws is known approximately. Phase crossover is not as easily determined. A reasonable first cut would be to define the control band as approximately ten times the open loop crossover frequency with the expectation
that beyond this range control law gain is low enough to prevent gain margin problems. However, some sensors may have trouble holding a tight gain (and phase) spec over this wide a bandwidth. Possibly in these cases a loosening of the spec between open loop crossover and ten times open loop crossover may be required. With this kind of specification a simple transport delay in combination with a gain change can be used for stability analysis or, for slightly more complex cases, simple transfer functions can be used to approximately fit the spec. The important point here is not to constrain the sensor designer to a first order or second order or any specific implementation, but to rather bound in a simple yet usable sense the stability degradation the sensor can introduce. The important stability characteristics are defined concisely below.

- Control Band – That band of frequencies over which magnitude and phase characteristics of the sensor are important to the control system stability.
- Magnitude Constraint – The bounds (envelope) on the permissible gain variation in a linear frequency response sense that are permissible over the control band.
- Phase Constraint – The bounds (envelope) on the permissible phase variation in a linear frequency response sense that are permissible over the control band.

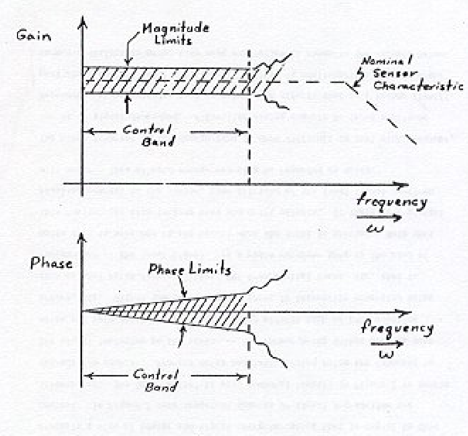


Figure 1. Gain and Phase Limits of Interest to Control System Designer

APPENDIX C
DIGITAL SYSTEM GUIDANCE (PART 1)

Potential Measurement Technique

These quantities could be measured by providing a sinusoidal input stimuli at selected frequencies in the control band using a mid-range amplitude. At each frequency the output component of interest (assuming some distortion) will be the output component whose frequency corresponds to the input frequency. The phase and amplitude of this component of this component relative to the forcing function will provide the magnitude and phase information. In the terminology of nonlinear system analysis, this procedure yields and empirically derived describing function for the sensor over the control band. If amplitude dependent nonlinearities are severe, more than one amplitude of forcing function may have to be used with the procedure repeated at each amplitude.

III. Signal Degradation

In this area we are concerned with what the sensor may have done to degrade the signal. The thrust here is not stability but performance. Figure 2 presents a view of sensor and signal characteristics that is useful in this context. In Figure 2 some important sources of signal degradation are illustrated. The term "noise" is used somewhat loosely in Figure 2 to denote degradation sources. Process noise and installation noise are inherent in the signal impinging on the sensor – the former being things such as gust noise and beam noise and the latter being effects such as EMI, mounting errors, etc. Within the sensor itself there is internally generated noise such as shot noise from resistors, EMI from digital buses, etc. that is independent of the input signal. In a radio receiver this is the kind of noise that is measured at the output when the input is shorted. Note that this "noise" can also include bias and drift effects. If there is a digital sampling process in the sensor, some aliasing of the input signal spectrum will occur. This aliased energy may also be regarded as noise.

The other inherent sensor degradation is more difficult to deal with, however, for it is signal dependent. A familiar analog example is input amplitude dependent characteristics such as saturation effects that only become significant above certain input amplitudes. Another is nonlinearities that produce harmonic distortion under sine wave excitation as shown in the example below.

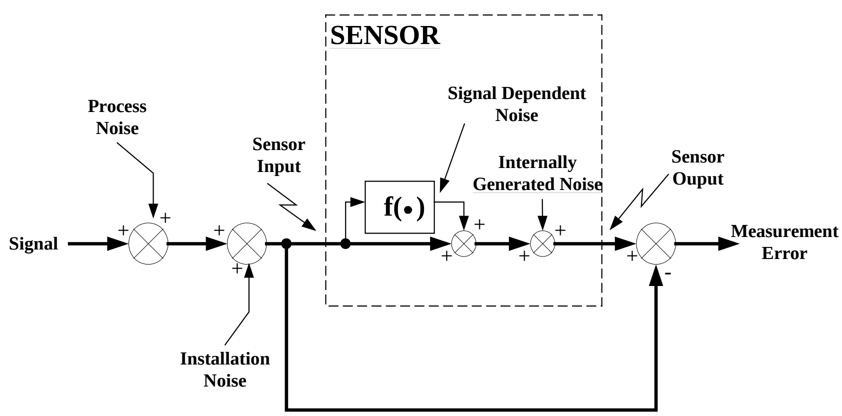


Figure 2. Sensor and Signal Characteristic and Measurement Noise

APPENDIX C
DIGITAL SYSTEM GUIDANCE (PART 1)

Harmonic Distortion

Consider square law distortion in an otherwise linear sensor. Let the sensor output be:

$$y(t) = x(t) + kx(t)^2$$

Where x(t) is the sensor input and let x(t) = sinwt. Then

$$y(t) = \sin wt + k\sin^2 wt$$

$$y(t) = \sin wt \pm \frac{k}{2} \mp \frac{k}{2} \cos 2wt$$

Note that d.c. and second harmonic components as well as the forcing frequency appear at the output. In digital systems a similar effect occurs when multiple rates are introduced, such as signals being received at one rate from a digital bus and being used at a different rate by a software program. If the analog signals originally sampled and put on the bus were sinusoidal at one frequency then, in general, frequency components less than and greater than the input frequency (as well as the input frequency) appear after the second sampler. The amplitude and number of these spurious outputs is a function of the two sampling rates as well as the input frequency. The net effect of all such internal sensor effects is observable by subtracting sensor input from sensor output to yield measurement error as shown in Figure 2.

Measurement Error

The involved nature of what can happen to the signal within the sensor as shown in Figure 2 is the source of ambiguity in conventional “accuracy” specs. Since measurement noise can be dependent on input amplitude as well as spectral characteristics, it is not possible to specify it with a single and simple metric. It should also be apparent that measurement error must be addressed statistically since a significant portion of the input, process noise, is only describable as a random process.[1] Technically the input signal is also in general a random processes influenced by such things as the gust striking the aircraft. Gusts also can only be described as random processes.

To evaluate the spectral characteristics of measurement error will require tests which force the system with noise type inputs. Exponentially correlated noise of specified variance and correlation time (or bandwidth) should be sufficient in most cases. If a sensor is known to be susceptible to a specific type of noise, however, that noise should be included in the test. Often it will be useful to separate out the low frequency or d-c components of measurement error since these may be more tolerable in some applications than dynamic errors. A set of tests that will measure these characteristics is described below.

Modified Signal to Noise Ratio (MSN)

Force the sensor with random noise of specified rms value (σ) and correlation time (τ). Determine the power spectral density (PSD) of the input signal to the sensor. Determine the PSD of the measurement error. Plot the two PSD’s on a common plot as shown in Figure 3. Define a modified signal to noise ratio (which will be a function of frequency) as the square root of noise ratio at each frequency of signal PSD amplitude to measurement error PSD. Note in the example shown in Figure 3 there is a bulge in the measurement error around zero frequency. This effect would indicate d-c bias and possibly low frequency bias drift from the sensor. This effect may or may not be important depending on whether the application permits washing out low frequency components, e.g. in a complementary filter. In the range of frequencies where accurate sensor response is required, it is suggested that appropriate values for the modified signal to noise (MSN) will be 100 to 1000. Roughly, these numbers correspond

[1] Recognizing that a complete description of a random process includes not only probability distributions but also spectral characteristics.

APPENDIX C
DIGITAL SYSTEM GUIDANCE (PART 1)

to noise power being 1% to .1% of signal power at each frequency or noise being 40 to 60 db down from signal. The relationship between MSD and ordinary signal to noise can be understood by assuming both signal and noise PSD's are flat over a band of frequencies Δw as shown in Figure 3. Let the value of the signal PSD in this band be S_o, then rms signal power in the band Δw is given by $\sqrt{S_o * w}$. Similarly, rms error power is given by $\sqrt{P_o * w}$. Therefore conventional signal to noise over the band w is given by $\sqrt{\frac{S_o}{P_o}}$. Requiring that this signal to noise be 100 is equivalent to requiring that noise power be 1% of signal power over this band. Carrying this back to the MSN implies that MSN (w) $= \sqrt{\frac{S_o}{P_o}} = 100$ over the band Δw. The above also represents the motivation for considering square root of the ratio than the ratio directly.

Amplitude Dependent Nonlinearities

The approach described above tests for input frequency dependent degradations by providing a realistic input spectrum. It should be realized that if there are amplitude dependent degradations, the MSN analysis will yield different answers depending on the rms value of the input noise. It is suggested that the MSN measurement be done with worst case input noise, i.e., largest rms and bandwidth that will be encountered. In some cases alternate MSN specs for different flight regimes may be appropriate.

In many cases a more explicit presentation of the amplitude dependent non-linearities may be desirable. A good example here is localizer receiver linearity, specified as being linear within a given percentage up to .155 DDM, a larger percentage from .155 to .310 DDM and not decreasing between .310 and .400 DDM. Such a specification is important in defining localizer capture laws, where one can begin "using" the signal crudely before it is linear or precisely accurate. It should be noted that this is a slightly different use of sensor data than for precise state control, i.e. the control is carrying the system to a prescribed state rather than maintaining it at a prescribed state in the presence of noise. Normally the latter operation will require more accurate information from the sensor. The amplitude dependent degradations should be measured statically -- that is, one should provide a test input at specified amplitude, allow transients to settle, and measure the output value.

The important signal degradation terms are defined concisely below. Only the last two are proposed as parameter characteristics--the first three being definitions to clarify the last two.

- Measurement Error – The difference between the signal impinging on the sensor and the output representation of that signal by the sensor expressed in consistent units.

- Signal PSD (SPSD) – The power spectral density of the signal impinging on the sensor.

- Measurement Error PSD (MEPSD) – The power spectral density of measurement error introduced by the sensor.

- Modified Signal to Noise Ratio – A measure primarily of the spectral characteristics of sensor errors defined as the square root of the ratio of SPSD and MEPSD at each frequency in the control band.

$$\text{i.e., } MSN(w) = \sqrt{\frac{SPSD\ (w)}{MEPSD\ (w)}}$$

- Static Accuracy – A measure of the amplitude dependent characteristics of sensor errors defined as the difference between input and output signals after all transients have settled.

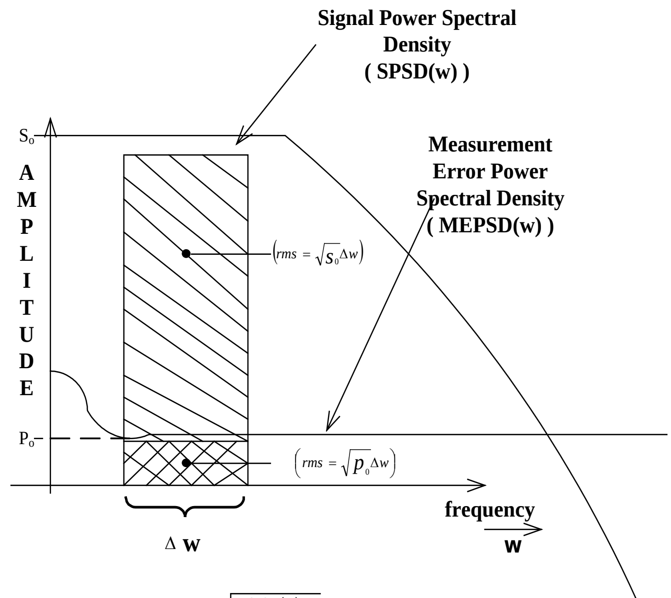
Potential Measurement Technique

Modified Signal to Noise (MSN) determination requires assuming a random process model for the signal impinging on the sensor. Normally an exponentially correlated signal with specified variance will be sufficient. Empirically determined power spectral densities (using discrete Fourier Transform techniques) will need to be measured for input signal as well as measurement error. Static accuracy measurement was described above.

APPENDIX C
DIGITAL SYSTEM GUIDANCE (PART 1)

IV. Spectral Characteristics

In this area the digital nature of the system interface must be faced squarely. The control system designer cannot alter the signal degradation introduced by the sensor whether it be due to nonlinearities, aliasing, noise, etc. He has great potential, however, for making matters worse if he is not alert to potential aliasing problems that he may introduce. To analyze aliasing precisely he would need a precise definition of the spectrum of each signal being received on the digital bus including the update interval for each signal. A more practical approach is to place an upper bound on the received signal spectrum and then ensure downstream performance is adequate using this bound as the signal spectrum. These ideas are made more precise below.



$$\text{MSN (w)} = \sqrt{\frac{\text{SPSD (w)}}{\text{MEPSD (w)}}}$$

MSN $\triangleq$ Modified Signal to Noise Ratio

Figure 3. Modified Signal to Noise Ratio

Multirate Sampling

A simple model for signals received from a bus and used in a digital processor is shown in Figure 4. We note that the spectrum of the signal on the bus, F_1 (s), is an infinitely replicated version of the analog input spectrum with replicas spaced by the input sampling frequency F1. We cannot, therefore, speak of the bandwidth of F_1 (s) strictly. What we mean here is that a bound is required on each copy in F_1 (s). Deriving the spectrum of the signal F_2 (s) is beyond the scope of this discussion but a technique has been developed that will yield this spectrum, F_2 (s), given the quantities F_1, F_2, and the shape of the repeated spectrum of F (s) in F_1 (s). There is considerable spreading of signal energy in this process with considerable "aliasing" potential even if the quantity f_c in Figure 4 is much less than the Nyquist frequency $\left(\frac{f1}{2}, \frac{f2}{2}\right)$ for both F_1 and F_2. The "aliasing" in the spectrum F_2 (s) occurs because the second sampler is not operating on a properly band limited function (see Figure 4) due to the "infinite replica" nature of the spectrum F_2 (s).

Deterministic Versus Random Signals

The discussion above did not specify whether the original analog quantity was a deterministic signal or a random process. For deterministic cases we deal with the Fourier transforms of the signals involved. However, as pointed out in Section III the signals of interest are really describable only in terms of random processes. For this case the development must proceed in terms of power spectral density of the signals involved. Figure 5 then illustrates the bound on bused signal PSD that is envisioned. Recall that white noise through a lowpass filter yields a PSD that rolls off at 40 db/decade as shown below.

APPENDIX C
DIGITAL SYSTEM GUIDANCE (PART 1)

White Noise Input PSD: $U(S) = A \; -\infty < w < +\infty$

Filter Transfer Function: $T(jw) = \dfrac{1}{J\tau w+1}$

Output PSD: $Y(S) = T(S)T^*(S)U(S)$

$$Y(w) = \frac{A}{\tau^2 w^2+1}$$

Adequate roll off chracteristic of the digitally bused data reduces the aliasing problem of the second sampler if the second sampling is properly performed. However, not only this spectrum but also the frequency F_1 enters into the aliasing in F_2 (s), therefore, it is desirable also to carefully specify F_1. This will be accomplished through the update interval. Assuming F_2 is somewhat fixed by computer speed and loading considerations, aliasing can be minimized <u>for a given input spectrum</u> by making F_1 as high relative to F_2 as possible.

The important spectral characteristic terms are defined concisely below.

- Update Interval – The cyclic time interval, as measured at the DITS bus interface, between transmissions of new freshly sensed and converted/derived values of the parameter.

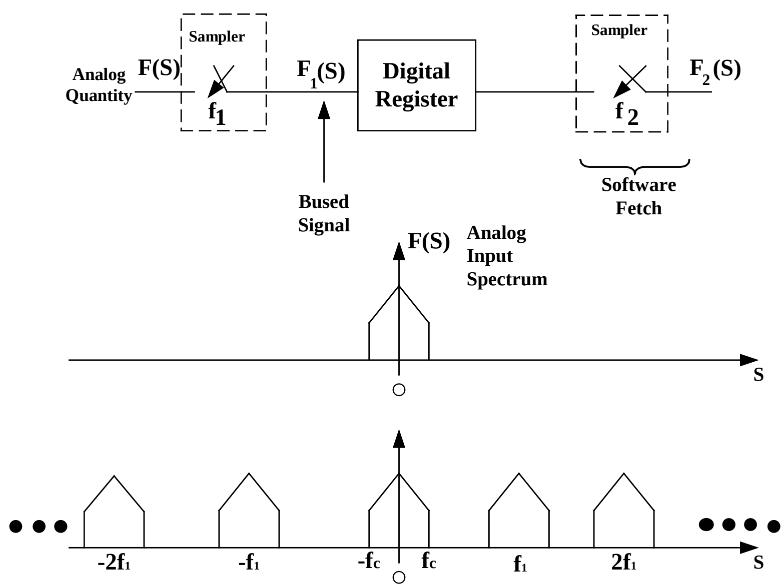
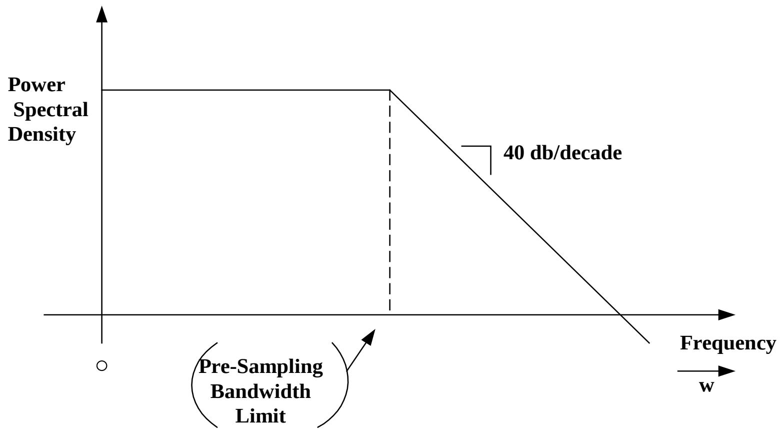


Figure 4 Analysis of Multirate Sampling

- Transmit Interval – The cyclic time interval, as measured at the DITS bus interface, between transmissions of the parameter. Transmit Interval ≤ Update Interval.

APPENDIX C
DIGITAL SYSTEM GUIDANCE (PART 1)

- Pre-sampling Bandwidth Limit – That bandwidth for a first order lag that will upper bound the spectral characteristics of the signal of the signal on the bus.



Note: Periodic Function - Only Positive Half of Zero Centered Component Shown (see Figure 4)

Figure 5 PSD Bound on Bused Signal

APPENDIX D
DIGITAL SYSTEM GUIDANCE (PART 2)

BOEING COMMERCIAL AIRPLANE COMPANY P.O. Box 3707
Seattle, Washington 98124
M/S 47-09
A Division of The Boeing Company

May 11, 1979
SYST-B8713-79-209

Mr. B. R. Climie, Chairman
Airlines Electronic Engineering Committee
Aeronautical Radio, Inc.
2551 Riva Road
Annapolis, Maryland 21401

Dear Rick:

The enclosed paper is a revised version of "Design Parameters for Digital Avionic Systems," which was originally circulated with AEEC letter 79-022/SAI-99. The revision addresses the topic of aliasing which could occur when reducing the sampling rate of a digitally encoded signal. This topic was discussed at the DITS working group meeting held on April 18 and 19.

Sincerely

AIR TRAFFIC CONTROL
AND ELECTRONIC SYSTEMS

A. F. Norwood, Chief

AFN:
Enclosure

BOEING

APPENDIX D
DIGITAL SYSTEM GUIDANCE (PART 2)

Attachment to
SYST-B-8764-20-075

DESIGN PARAMETERS FOR DIGITAL AVIONIC SYSTEMS
Prepared by
Boeing Commercial Airplane Company
REVISION A

Summary

This paper explains the necessity for defining presampling filter characteristics, transport delays and minimum update rates for digital and noise characteristics are discussed. A design procedure for selecting the required filter characteristic and update rate is presented.

Introduction

The new generation of commercial aircraft will use digital technology to implement many functions, which were traditionally performed with analog hardware. These functions include inner and outer servo loops for aircraft control and guidance, processing and filtering signals from navigation and other sensors, and filtering of data prior to its display on cockpit instruments. Digital technology will also replace the majority of the formerly analog communication paths between systems, sensors, instruments and actuators.

A basic property of these and other digital systems is that they only process or transfer values of data from discrete points in time. The contrast between the discrete time nature of a digital system and the continuous time nature of an analog system is shown in Figure 1. Analog systems are said to operate in the continuous time domain while digital systems are said to operate in the discrete time domain.

In order for discrete time digital systems to be used to process or transfer the inherently continuous time data from real world physical systems, samples of the continuous data must be taken at periodic intervals. These samples from discrete points in time can then be used as the input to the discrete time digital system. It is intuitively obvious that the interval between samples affects the accuracy with which the continuous time data is represented by the discrete samples. It is also obvious that rapidly varying signals should be sampled more often than slowly varying signals in order to maintain an adequate representation of the continuous analog data. Selection of a proper sampling rate for each signal is a design task unique to digital systems. An understanding of the Sampling Theorem is necessary in order to make the proper trade offs between sampling rate, signal-to-noise ratio, signal delay, and system complexity.

The Sampling Theorem

The Sampling Theorem states that a signal which contains no frequency components higher than f_o Hertz can be exactly recovered from a set of its samples if the samples are spaced no further apart than ½ f_o seconds. This is equivalent to requiring that the sampling frequency be greater than twice the highest frequency component of the signal.

The reason for this requirement can be shown by examing the frequency spectrum of the sampler output. Modeling the sampling operation as the multiplication of the input signal by an impulse train as shown in Figure 2 allows the sampler output spectrum to be computed from a Fourier Transform identity. The required identity states that time domain multiplication is equivalent to frequency domain convolution. Therefore, the output spectrum is found by convolving the input spectrum with the spectrum of the impulse train. This relationship is shown in Figure 3. The convolution operation has the effect of reproducing the spectrum of the input signal about zero frequency and at all harmonics of the sampling frequency. If the sampling frequency, $1/T_s$, is greater than twice f_o the spectral components centered about the sampling frequency and its harmonics will not overlap the spectral component centered about zero frequency. Therefore, the spectral component centered about zero, which is identical to the input spectrum, can be obtained by passing the sampled output through a low pass filter with a bandwidth of f_o Hz.

Application of the Sampling Theorem to Digital Avionics Systems

The discussion of the Sampling Theorem in the preceding section has shown that a signal which contains no frequency components higher than f_o Hz. can be exactly represented by a series of samples spaced no further apart than ½ f_o seconds. However, signals, which represent physical quantities, such as those processed by avionic systems never satisfy the strict bandwidth limitation requirement stated above. Therefore exact reproduction of the original signal from its samples is not possible. The effect of the non-bandlimited nature of signals is to distort the replica reconstructed from the samples. The shaded area shown in Figure 4 represents typical high frequency signal energy

APPENDIX D
DIGITAL SYSTEM GUIDANCE (PART 2)

which distorts the low frequency portion of the signal spectrum. The high frequency portion of the signal takes on the identity of the lower frequencies, hence the name "aliasing" for this phenomenon.

Aliasing becomes a greater problem when the signal is corrupted by noise, which has a wider bandwidth than the signal. When this occurs both signal energy and noise energy which is beyond one half of the sampling frequency is aliased into the low frequency portion of the recovered signal. This effect is shown in Figure 5. The signal-to-noise ratio is degraded by both noise and signal components which are aliased into the low frequency portion of the signal spectrum. The effect of aliasing can be decreased by sampling the incoming signal at a higher rate and/or using a presampling filter to reduce the bandwidth of the signal prior to sampling. Neither of these approaches can ever completely eliminate the effect of aliasing and they each result in some negative impact on the overall system.

An increase in the sampling rate requires more computations to be done in a given period of time. This requires more computational resources, which increases the weight, complexity, and power requirements of the computer subsystems. The use of a presampling filter to limit the bandwidth prior to sampling distorts the signal. It also increases the delay experienced by signals as they propagate through the system. The increase in delay reduces phase margin if the signal is used in a closed loop control system. Therefore, more stringent delay requirements must be placed on other components in the loop if the system phase margin is to remain constant.

<u>Design Tradeoffs for Digital Avionics Systems</u>

The final choices of sample rate and presampling filter depend upon the input signal and noise spectra, maximum allowable signal-to-noise ratio degradation due to aliasing, maximum allowable transport delay, available computational resources, and the bandwidth of the system which uses the data. A practical way to make these choices is to analyze the system for various sample rates and filters. This can best be done with the aid of a computer program which computers the effect of each combination of sample rate and filter characteristic on the output signal-to-noise ratio for the defined input signal and noise spectra.

The initial computation is to determine the effect of the prefilter on the in-band signal-to-noise ratio without regard to aliasing effects. A typical plot of signal-to-noise ratio versus presampling filter bandwidth is shown in the top curve of Figure 6. This curve forms a baseline against which signal-to-noise ratio degradation caused by aliasing can be compared. The signal-to-noise ratio is determined by computing the input signal power and input noise power, which is passed by the selected prefilter. This parameter will generally exhibit a peak value at a specific bandwidth. The signal-to-noise ratio will decrease with increasing bandwidth as more noise is admitted and decrease with decreasing bandwidth as signal energy is eliminated.

The filter order is an important design parameter because higher order filters roll off more rapidly near the cutoff frequency. Therefore higher order filters admit less noise and signal from beyond the cutoff frequency than low order filters. Because of this characteristic, high order filters alias no more noise into the signal than slightly narrower bandwidth low order filters. However, high order filters delay the signal more than low order filters.

The ultimate objective of the design task discussed in this paper is to achieve acceptable system performance with the minimum possible sampling rate. System performance is adversely affected by large propagation delays and high in-band noise levels.

If the maximum allowable propagation delay is given, the minimum usable filter bandwidth can be found standard plots of group delay versus frequency for the type and order of filter considered. (See for example Reference 1, page 112.) This minimum bandwidth is plotted on Figure 6 as a vertical line. The maximum achievable signal-to-noise ratio is constrained by the requirement for a presampling filter wide enough to limit delay to the given value. The intersection of the minimum bandwidth line with the top curve of Figure 6 gives the maximum achievable signal-to-noise ratio i.e., the signal-to-noise ratio which would be achieved by an unsampled system.

Sampling rate is chosen by comparing the maximum acceptable degradation in signal-to-noise ratio to the actual aliasing degradation due to sampling at the candidate rates. For the example shown in Figure 6, a sampling rate of 50Hz would be chosen.

A system interface which meets prescribed limits on signal delay and maximum noise due to aliasing can be designed using the procedures outlined above. Some systems which use sampled data, such as closed loop control systems, have a bandwidth which is much smaller than that of the sampling filter. For this reason it is important to verify that the signal and noise power which is aliased into the frequency band of interest is well below the inherent noise in that band.

This can be accomplished by constructing a signal and noise power spectral density plot for the filter and sampling rate chosen. The power spectral density plot is most easily obtained with the aid of a computer program. A typical plot of this type is shown in Figure 7. The example power spectral densities in Figure 7 show that the aliased signal and noise

APPENDIX D
DIGITAL SYSTEM GUIDANCE (PART 2)

is much lower than the inherent noise level in the frequency range of interest. If this constraint is not met a different combination of filter and sampling frequency must be chosen.

In some situations it may be desired to reduce the sampling rate of a digitally encoded signal. This may be done where wideband digital data is used to drive an instrument or subsystem which responds only to narrower bandwidth data. Simple deletion of unwanted samples to reduce the sampling rate can cause aliasing problems similar to those encountered when sampling an analog signal at an insufficient rate. The aliasing can be elimination of the unwanted samples. Design of the digital filter is subject to the same set of delay versus aliasing noise tradeoffs as the design of an analog presampling filter.

Conclusion

The procedures outlined in this paper can be used to choose the presampling filter and sampling rate required for interfaces to a digital signal processing or control system. The values are chosen to meet the constraints of maximum allowable delay and maximum allowable noise due to aliasing. Signal and noise spectra of the signal to be sampled must be supplied as an input to the design procedure.

Reference: Herman J. Blinchikoff and Anatol I. Zverev, Filtering in the Time and Frequency Domains, John Wiley and Sons, New York.

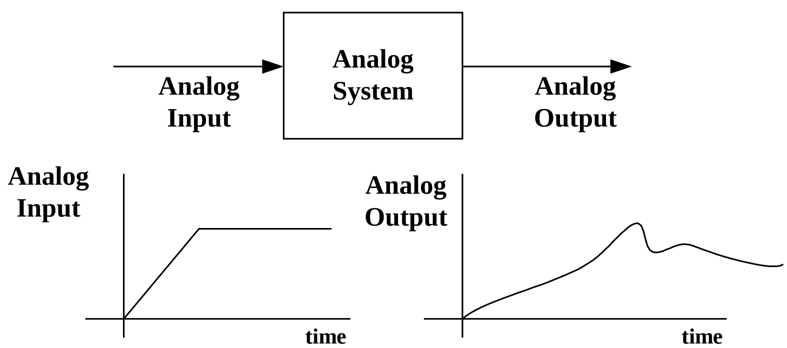


Figure 1(a) Typical Input and Output of Analog System

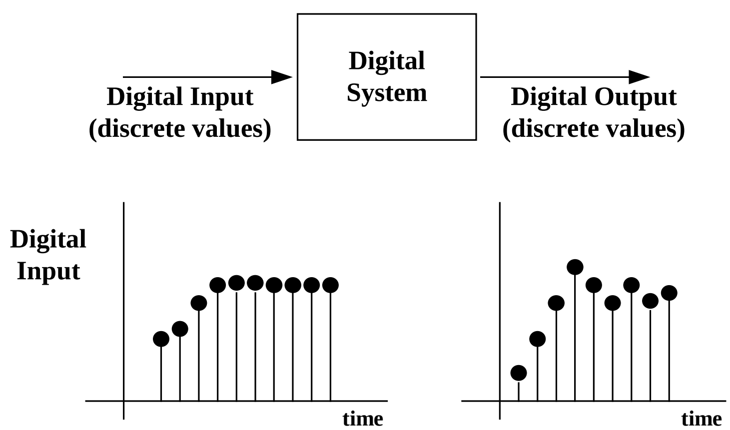


Figure 1(b) Typical Input and Output of Digital System

APPENDIX D
DIGITAL SYSTEM GUIDANCE (PART 2)

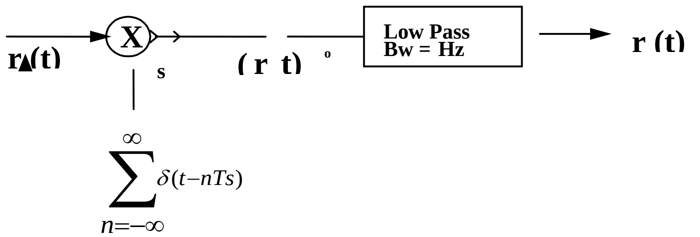


Figure 2 Mathmatical Model of Sampling Process

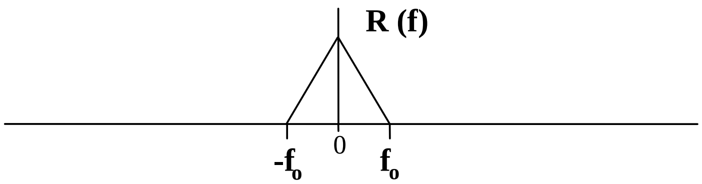


Figure 3(b) Spectrum of f(t) Bandlimited to f_o Hz

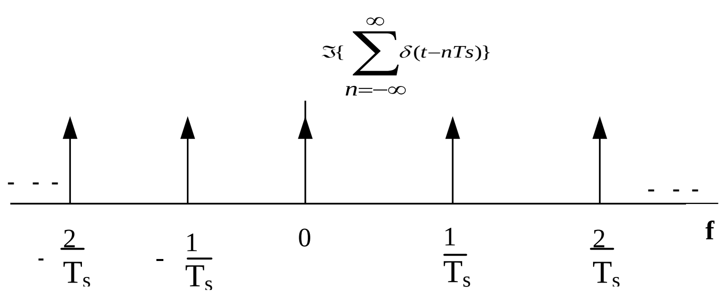


Figure 3(b) Spectrum of Input Train, $\sum_{n=-\infty}^{\infty} \delta(t-nTs)$

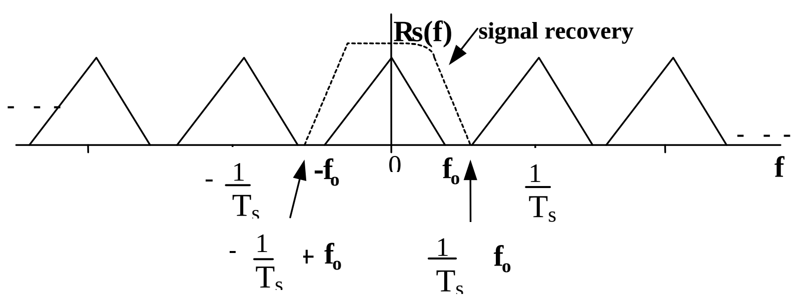


Figure 3(c) Spectrum of Sampling Output

APPENDIX D
DIGITAL SYSTEM GUIDANCE (PART 2)

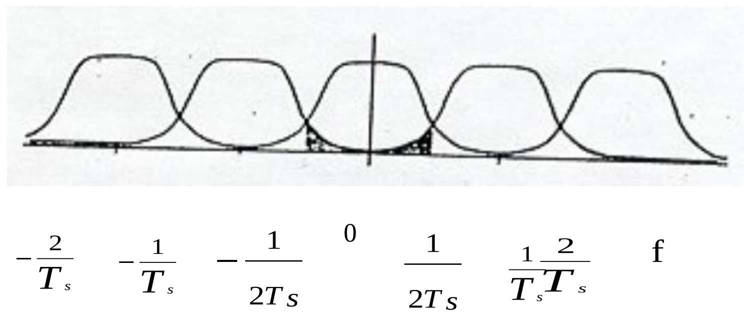


Figure 4 Sampler Output Spectrum When Input Signal Bandwidthis not Limited to One-Half of the Sampling Frequency

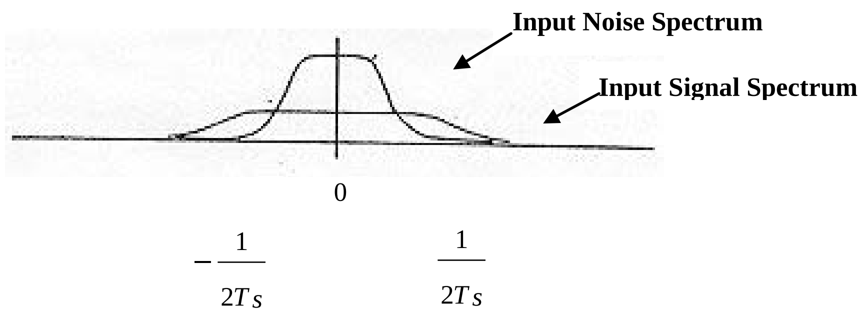


Figure 5(a) Input Signal and Noise Spectra

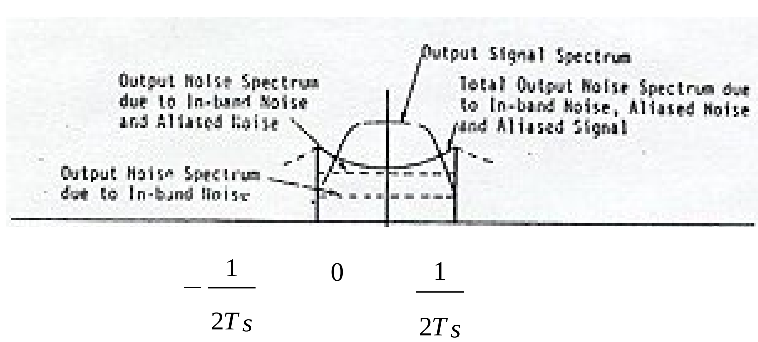


Figure 5(b) Output Signal and Noise Spectra Showing Signal-to-Noise Ratio Degradation Due to Aliasing of Signal and Noise

APPENDIX D
DIGITAL SYSTEM GUIDANCE (PART 2)

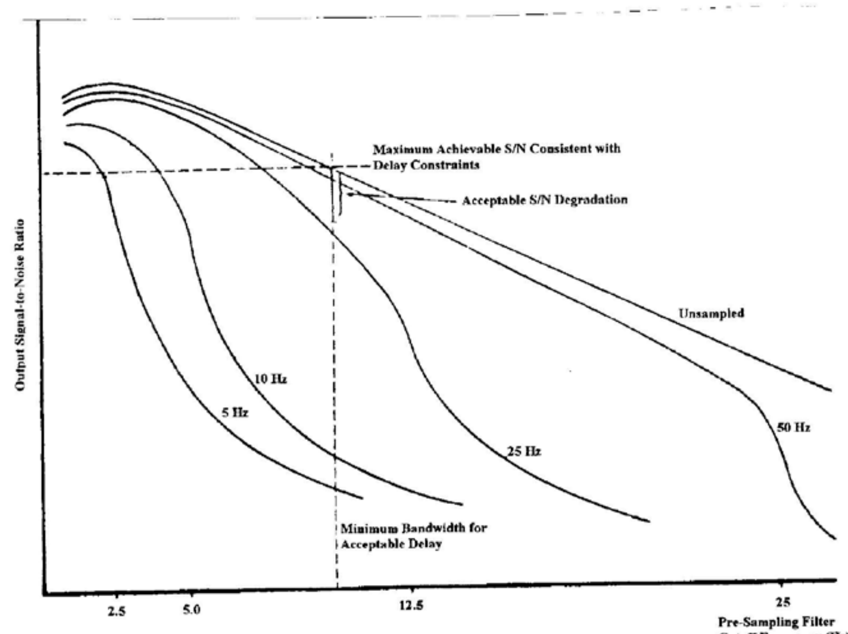


Figure 6 Effect of Sampling Rate and Filter Cutoff Frequency on Output Signal-to-Noise Ratio

APPENDIX D
DIGITAL SYSTEM GUIDANCE (PART 2)

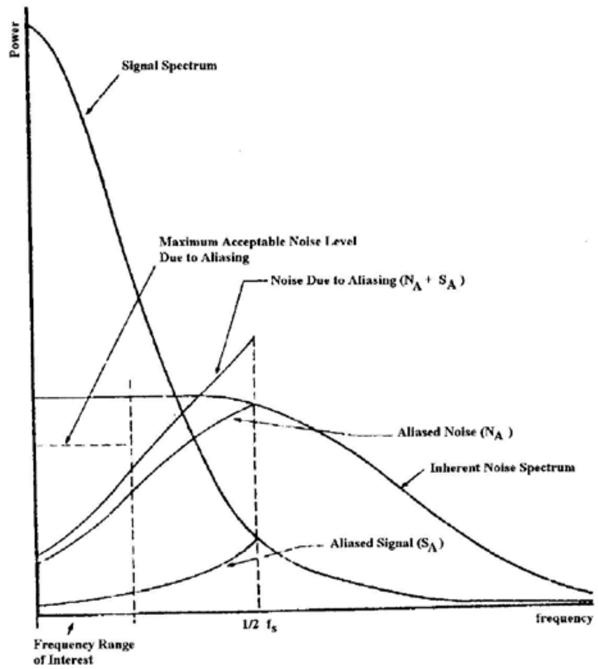


FIGURE 7 Sample Plot of Signal and Noise Power Spectral Densities

APPENDIX E
GUIDELINES FOR LABEL ASSIGNMENTS

The ARINC 429 data bus was developed to provide a standardized means of digital information transfer between the "ARINC 700" series of avionics units. ARINC 429 has proven to be a very flexible standard and its usage has extended to provide data transfer between Line Replaceable Units (LRU) which are not otherwise covered by ARINC Characteristics. It is important that each new usage of ARINC 429 be coordinated and indexed by ARINC such that the information on usage (label allocation, data format, etc.) is available industry-wide. The use of the same label for two different functions on a particular LRU type built by different manufacturers can create serious problems.

To facilitate the coordination of ARINC 429 label usage between the industry and the ARINC staff, a set of guidelines is provided.

1. New labels should be selected from the five character field as defined in Section 2.3 (three octal and three hexadecimal).

2. The following labels have special significance and should not be used: label 000 (not used) and label 377 (equipment identification). The preferred SSM encoding for method for the Equipment Identification Word (label 377) is according to the Discrete word guidelines. When this label was originally assigned, it was recognized as a non-BNR word. The SSM encoding was according to the BCD and DISC guidelines that were identical at that time. During development of Supplement 4, the SSM for DISC was revised to it current form to provide enhanced failure warning. When the SSM encoding was changed, some systems retained the BCD encoding for the Equipment Identification word and others changed to DISC encoding.

3. The following labels are presently "spare" and should only be used for new parameters which may have very widespread usage throughout the airplane architecture.

005	040	050	054	107	163	227	371
006	046	051	055	113	167	240	
007	047	052	057	124	226	243	

4. Where possible, similar word usage should be "grouped"; for example, if Engine N 1 is to be provided from a new unit (PMUX) it should utilize label 246 which is presently N 1 (engine direct).

5. Where possible, grouped usage should have identical data specification (units, range, significant digits/bits, positive sense, resolution, min--max transmit interval). To facilitate this commonality it is permissible for a particular LRU to output a lower resolution signal (fewer significant digits/bits) if the least significant remainder of the data field is set to zeros.

6. Where word grouping is not possible, the labels should be selected from the following subgroups:

   Binary coded decimal (BCD) sub-group 001 to 067, 125, 165, 170, 200, 201,230 to 237.

   Binary (BNR) subgroup 070 to 124, 126 to 144, 150 to 154, 162 to 164, 166, 167, 171 to 177, 202 to 227, 240 to 257, 262 to 265, 267, 310 to 347, 360 to 376.

   Mixed BCD and BNR subgroup 260, 261

   Discretes subgroup 145 to 147, 270 to 276

   Maintenance and discrete data subgroup 155, 156

   Maintenance data subgroup 157 to 161, 350 to 354

   Test word subgroup 266, 277

   Application dependent subgroups 300 to 307

   Acknowledgement subgroup 355

   Maintenance ISO #5 subgroup 356

   ISO #5 message subgroup 357

   A schematic of these subgroups is attached.

APPENDIX E
GUIDELINES FOR LABEL ASSIGNMENTS

7. Allocation of bits within words, as defined in the appropriate sections.

   BCD
   BNR
   Discretes
   Maintenance data
   Test
   Application dependent
   Acknowledgement
   Maintenance ISO #5
   ISO #5 message

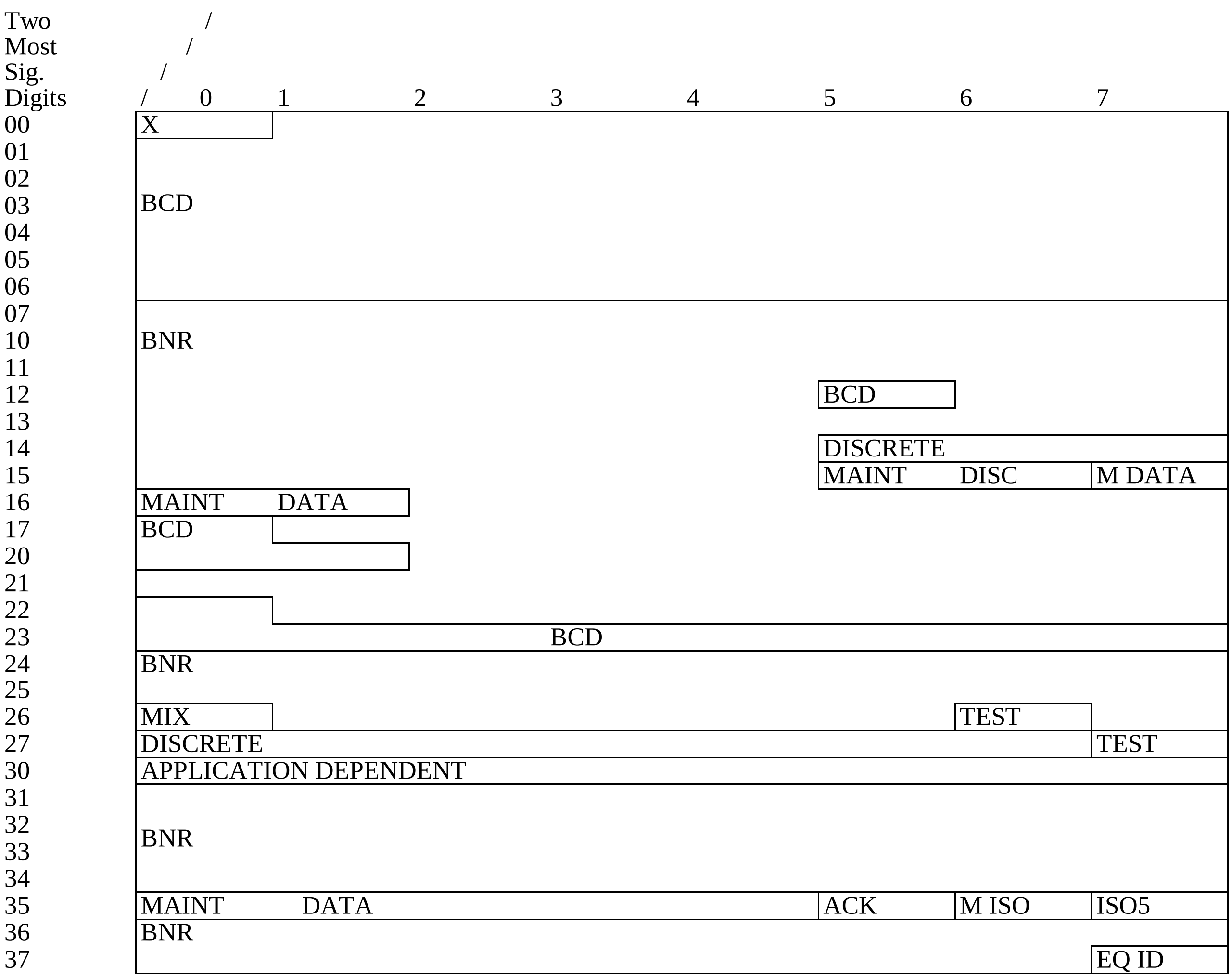
8. The data should be fully defined by Equipment ID and the label and the Source Destination Indicator (SDI). It should not be necessary to decode additional bits in the word to correctly interpret the data field.

9. The equipment ID should be allocated as the two least significant digits of the 7XX ARINC equipment specification, if one exists. For equipment not otherwise covered by an ARINC Specification, an equipment ID should be allocated with a non-numeric value of the hexadecimal character set as the least significant digit.

10. Equipment ID of 000 (HEX) should not be used.

11. The SDI code should indicate the aircraft installation number of the source equipment, in a multi-system installation, as described in 2.1.4.

Least Significant Digit



AERONAUTICAL RADIO, INC.
2551 Riva Road
Annapolis, Maryland 24101-7435

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
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 (B-767)
346	Integrated Air System Controller
347	Landing Gear Control & Interface Unit (LGCIU) (Airbus)

APPENDIX X – CHRONOLOGY AND BIBLIOGRAPHY

This appendix deleted by Supplement 18.

ARINC Standard – Errata Report

1. Document Title

(Insert the number, supplement level, date of publication, and title of the document with the error)

2. Reference

Page Number: ______ Section Number: ______________ Date of Submission: ______________

3. Error

(Reproduce the material in error, as it appears in the standard.)

4. Recommended Correction

(Reproduce the correction as it would appear in the corrected version of the material.)

5. Reason for Correction *(Optional)*

(State why the correction is necessary.)

6. Submitter (Optional)

(Name, organization, contact information, e.g., phone, email address.)

Please return comments to fax +1 410-266-2047 or standards@arinc.com

Note: Items 2-5 may be repeated for additional errata. All recommendations will be evaluated by the staff. Any substantive changes will require submission to the relevant subcommittee for incorporation into a subsequent Supplement.

[To be completed by IA Staff]

Errata Report Identifier: ______________ **Engineer Assigned:** __________________________

Review Status: ____

ARINC Project Initiation/Modification (APIM)

1.0 Name of Proposed Project **APIM #:** ____________

(Insert name of proposed project.)

1.1 Name of Originator and/or Organization

(Insert name of individual and/or the organization that initiated the APIM)

2.0 Subcommittee Assignment and Project Support

2.1 Suggested AEEC Group and Chairman

(Identify an existing or new AEEC group.)

2.2 Support for the activity (as verified)

Airlines: (Identify each company by name.)
Airframe Manufacturers:
Suppliers:
Others:

2.3 Commitment for Drafting and Meeting Participation (as verified)

Airlines:
Airframe Manufacturers:
Suppliers:
Others:

2.4 Recommended Coordination with other groups

(List other AEEC subcommittees or other groups.)

3.0 Project Scope (why and when standard is needed)

3.1 Description

(Insert description of the scope of the project.)

3.2 Planned usage of the envisioned specification

Note: New airplane programs must be confirmed by manufacturer prior to completing this section.

New aircraft developments planned to use this specification yes ☐ no ☐

Airbus: (aircraft & date)
Boeing: (aircraft & date)
Other: (manufacturer, aircraft & date)

Modification/retrofit requirement yes ☐ no ☐

Specify: (aircraft & date)

Needed for airframe manufacturer or airline project yes ☐ no ☐

Specify: (aircraft & date)

Mandate/regulatory requirement yes ☐ no ☐

Program and date: (program & date)

Is the activity defining/changing an infrastructure standard? yes ☐ no ☐

Specify (e.g., ARINC 429)

When is the ARINC standard required?

______(month/year)__________

What is driving this date? _______(state reason)_____________________

Are 18 months (min) available for standardization work? yes ☐ no ☐

If NO please specify solution: _________________

Are Patent(s) involved? yes ☐ no ☐

If YES please describe, identify patent holder: _________________

3.3 Issues to be worked

(Describe the major issues to be addressed.)

4.0 Benefits

4.1 Basic benefits

Operational enhancements yes ☐ no ☐

For equipment standards:

(a) Is this a hardware characteristic? yes ☐ no ☐

(b) Is this a software characteristic? yes ☐ no ☐

(c) Interchangeable interface definition? yes ☐ no ☐

(d) Interchangeable function definition? yes ☐ no ☐

If not fully interchangeable, please explain: _________________

Is this a software interface and protocol standard? yes ☐ no ☐

Specify: _________________

Product offered by more than one supplier yes ☐ no ☐

Identify: (company name)

4.2 Specific project benefits (Describe overall project benefits.)

4.2.1 Benefits for Airlines

(Describe any benefits unique to the airline point of view.)

4.2.2 Benefits for Airframe Manufacturers

(Describe any benefits unique to the airframe manufacturer’s point of view.)

4.2.3 Benefits for Avionics Equipment Suppliers

(Describe any benefits unique to the equipment supplier’s point of view.)

5.0 Documents to be Produced and Date of Expected Result

Identify Project Papers expected to be completed per the table in the following section.

5.1 Meetings and Expected Document Completion

The following table identifies the number of meetings and proposed meeting days needed to produce the documents described above.

Activity	Mtgs	Mtg-Days (Total)	Expected Start Date	Expected Completion Date
Document a	*# of mtgs*	*# of mtg days*	*mm/yyyy*	*mm/yyyy*
Document b	*# of mtgs*	*# of mtg days*	*mm/yyyy*	*mm/yyyy*

Please note the number of meetings, the number of meeting days, and the frequency of web conferences to be supported by the IA Staff.

6.0 Comments

(Insert any other information deemed useful to the committee for managing this work.)

6.1 Expiration Date for the APIM

April/October 20XX

For IA staff use only

Date Received: : Click here to enter a date. IA staff : ____________

Potential impact: ______

*(**A**. Safety **B**. Regulatory **C**. New aircraft/system **D**. Other)*

Resolution: _______

Authorized, Deferred, Withdrawn, More Detail Needed, Rejected)

Assigned to SC/WG:________________

Completed forms should be submitted to the AEEC Executive Secretary.