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AEROFLEX

OPERATION MANUAL

429EX

429 ARINC TX/RX

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REVISION HISTORY BY DRAWING NUMBER

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Section I	0		
Section II	0		
Section III	0		
Section IV	0		
Section V	0		
Appendix A	0		

ELECTROSTATIC DISCHARGE GENERAL WARNINGS FOR ALL EQUIPMENT

CAUTION: THIS EQUIPMENT MAY CONTAIN ELECTROSTATIC DISCHARGE (ESD) SENSITIVE COMPONENTS. TO PREVENT ESD SENSITIVE EQUIPMENT FROM POSSIBLE DAMAGE, OBSERVE THE FOLLOWING PRECAUTIONS WHEN HANDLING ANY ESD SENSITIVE COMPONENTS, OR UNITS CONTAINING ESD SENSITIVE COMPONENTS:

a. Maintenance or service personnel must be grounded though a conductive wrist strap, or a similar grounding device, using a 1 MΩ series resistor for equipment protection against static discharge, and personal protection against electrical shock.

b. All tools must be grounded (including soldering tools) that may come into contact with the equipment. Hand contact will provide sufficient grounding for tools that are not otherwise grounded, provided the operator is grounded through an acceptable grounding device such as a wrist strap.

c. Maintenance or service of the unit must be done at a grounded, ESD workstation.

d. Before maintenance or service of the equipment, disconnect all power sources, signal sources, and loads connected to the unit.

e. If maintenance or service must be performed with power applied, take precautions against accidental disconnection of equipment components. Specifically, do not remove integrated circuits or printed circuit boards from equipment while the equipment has power applied.

f. All ESD sensitive components are shipped in protective tubes or electrically conductive foam. The components should be stored using the original container/package when not being used or tested. If the original storage material is not available, use similar or equivalent protective storage material.

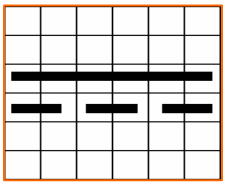
g. When ESD sensitive components are removed from a unit, the components must be placed on a conductive surface, or in an electrically conductive container.

h. When in storage or not being repaired, all printed circuits boards must be kept in electrically conductive bags, or other electrically conductive containers.

i. Do not unnecessarily pick up, hold, or directly carry ESD sensitive devices.

Failure to comply with these precautions may cause permanent damage to ESD sensitive devices. This damage can cause devices to fail immediately, or at a later time without apparent cause.

WARNING AND CAUTION SYMBOLS USED IN THIS MANUAL



Direct Current

This symbol indicates that the equipment requires direct current input.



Caution (refer to accompanying documents)

Attention – refer to the manual. This symbol indicates that information about usage of a feature is contained in the manual.

CAUTION

The **CAUTION** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like, which, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a **CAUTION** notice until the indicated conditions are fully understood and met.

GENERAL WARNINGS AND CAUTIONS APPLICABLE TO THIS EQUIPMENT

BATTERY CHARGING WARNING

This equipment has a recharging circuit for rechargeable cells. Use only NiCad size “AA” cells.

WARNING

Do not use the equipment in a manner not specified in this manual!

CLEANING WARNING

Keep the equipment dry to avoid electrical shock to personnel or damage to the equipment. To prevent damage, never apply solvents to the equipment housing. For cleaning, wipe the equipment with a cloth that is lightly dampened with water, mild detergent, or alcohol. Do not use aromatic hydrocarbons, chlorinated solvents, or methanol-based fluids.

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Declaration of Conformity

DECLARATION OF CONFORMITY

Manufacturer's Name:	BFGoodrich Aerospace, JcAIR Test Systems Division
Manufacturer's Address:	400 New Century Parkway New Century, KS 66031-0009 USA

Declares that the products

Product Name:	429EX -- ARINC 429 TX/RX
Model Number(s):	01-1001-05
Product Options:	All options associated with listed models are covered.

Conform to the following product specifications and carry the CE-marking accordingly.

Low Voltage Directive 73/23/EEC:	IEC 61010-1:1990 / EN 61010-1:1993
EMC Directive 89/336/EEC:	EN 61326:1998 IEC 61326:1997

Date: 2000-08-22

Chuck Nehring, Director
Quality Assurance/Customer Support

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SECTION I - GENERAL INFORMATION

1.1 INTRODUCTION

This manual provides operational information for the Aeroflex JcAIR Test Systems Model 429EX ARINC 429 Transmitter/Receiver.

1.2 EQUIPMENT DESCRIPTION

The 429EX provides avionics technicians and line maintenance personnel with a convenient, easy to use tool for testing and troubleshooting ARINC 429 avionics systems.

Transmitter features:

- Data entry in Hexadecimal or Engineering Units
- Can transmit up to 10 labels simultaneously
- Selectable (Lo or Hi speed) bit rate
- Selectable (Odd or Even) word parity
- Selectable (4 to 59995 ms) word rate
- Selectable Hex I.D. for display of data per ARINC 429-11 (Attach. 2)
- Non-volatile memory storage
- Data slewing of non-RF labels
- On/Off toggling of individual data bits 11 through 29
- LED display of transmitted word parity

Receiver features:

- Data display in Hexadecimal or Engineering Units
- Trapping and storing of up to 255 words (511 in Data Only mode)
- Allows trapping of block data protocols or alphanumeric data strings
- Non-volatile memory of trapped data
- Automatic scrolling of trapped data
- Individual display of bits 11 through 29
- Selectable Hex I.D. for display of data per ARINC 429-11 (Attach. 2)
- Selectable (Lo or Hi speed) bit rate
- LED display of received word parity

Other features:

- Liquid crystal display
- Portability
- Self-contained, rechargeable NiCad batteries
- Available with either 110 V ac or 220 V ac battery charger
- Rugged, compact case
- Optional carrying case

1.3 TECHNICAL CHARACTERISTICS

Specification		Characteristic
MASS:		(1.36 kg) 3 lbs.
DIMENSIONS:		
Height:		(18.42 cm) 7.25 in.
Width:		(11.43 cm) 4.5 in.
Depth:		(6.35 cm) 2.5 in.
POWER REQUIREMENTS:		
INPUT:		110 V ac/60 Hz/500 mA OR 230 V ac/50 Hz/300 mA OR Six (6) internally mounted AA size rechargeable NiCad batteries.
ENVIRONMENTAL CONDITIONS		
OPERATING TEMPERATURE:		5 °C to 40 °C
ENVIRONMENT:		For indoor use only
ALTITUDE:		Not for use over 2000 ms
RELATIVE HUMIDITY:		30% to 80% relative humidity
Pollution Degree		1
Overvoltage Category		II
ARINC 429 TRANSMITTER		
Pulse Rise/Fall Times:	Low Speed	10.0 ±5.0 μs
	High Speed	1.5 ±0.5 μs
Voltage Levels (Line A to B):	HI	+10.0 ±1.0 V dc
	NULL	0.0 ±0.5 V dc
	LO	-10.0 ±1.0 V dc
Output Impedance:		75 ±5 Ω (Line A to B)
Bit Rate:	Low Speed	12.5 kbps ±0.5%
	High Speed	100.0 kbps ±0.5%
Word Rate:		4 to 59 998 ms
Parity:		ODD or EVEN
ARINC 429 RECEIVER		
Voltage Levels (Line A to B):	HI	+6.5 to +13.0 V dc
	NULL	+2.5 to - 2.5 V dc
	LO	-6.5 to -13.0 V dc
Bit Rate:	Low Speed	8 to 20 kbps
	High Speed	80 to 125 kbps
Word Rate:		±2 ms average
Input Impedance:		12 k Ω minimum (balanced)

1.4 UNITS AND ACCESSORIES SUPPLIED

The Aeroflex JcAIR Test Systems Model 429EX, JPN: 01-1001-05, is supplied with either a 110 V ac battery charger or a 230 V ac battery charger. Two 3-conductor 1/4" phone plugs are included for fabrication of cables to connect to the transmit and receive jacks of the unit. (See Section 2.3.3 for fabrication instructions.) The accessories provided are as follows:

JcAIR P/N	DESCRIPTION
15-0009-00	Battery Charger 110 V ac to 9 V dc 500 mA
15-0009-01	Battery Charger 230 V ac to 9 V dc 500 mA
33-1032-00	3-Conductor 1/4" Phone Plugs
06-1001-05	429EX Maintenance Manual

SECTION II - INSTALLATION

2.1 GENERAL INFORMATION

This section contains information relating to the unpacking and inspection of the unit. Also included is information concerning charging of the internal batteries and an explanation of the unit's self test routine.

2.2 UNPACKING AND INSPECTING EQUIPMENT

Carefully remove the Aeroflex JcAIR Test Systems 429EX and battery charger from the packing box. Visually inspect the units for any damage incurred during shipment. Should there be damage, save the packing box to show the shipping company when submitting your claim. It is generally a good idea to save the packing box should it become necessary to store or ship the unit.

2.3 EQUIPMENT INSTALLATION

2.3.1 BATTERY CHARGING

The batteries were fully charged when the unit was shipped from the factory. However, if the unit has been stored for an extended period of time, the batteries may have become discharged. Plug the charger into an appropriate voltage outlet (U.S. as well as international voltage chargers are available). A 4 to 5 hour charge should refresh the batteries. The 429EX may be operated while charging or with the charger disconnected. With fully charged batteries, the unit will operate for approximately 3 to 6 hours.

CAUTION

To avoid possible damage to the battery charger, it is recommended that you do NOT have the charger connected to the wall outlet when connecting or disconnecting the charging plug to the 429EX.

2.3.2 CONNECTION TO USER EQUIPMENT

Connect the Aeroflex JcAIR Test Systems 429EX TX output jack to the input of the UUT and the 429EX RX input jack to the output of the UUT using 3-conductor 1/4 inch phone plugs (see paragraph 1.4).

2.3.3 JUMPER PLUG FABRICATION

Jumper plugs should be fabricated using 2-conductor braided shield cable. The shield should be folded back onto the insulation and the clamp on the connector should be crimped around the shielding. Also, once the shield is clamped, solder should be added to ensure a stable connection is made between the clamp and wire shield. Refer to figures 2-1 and 2-2.

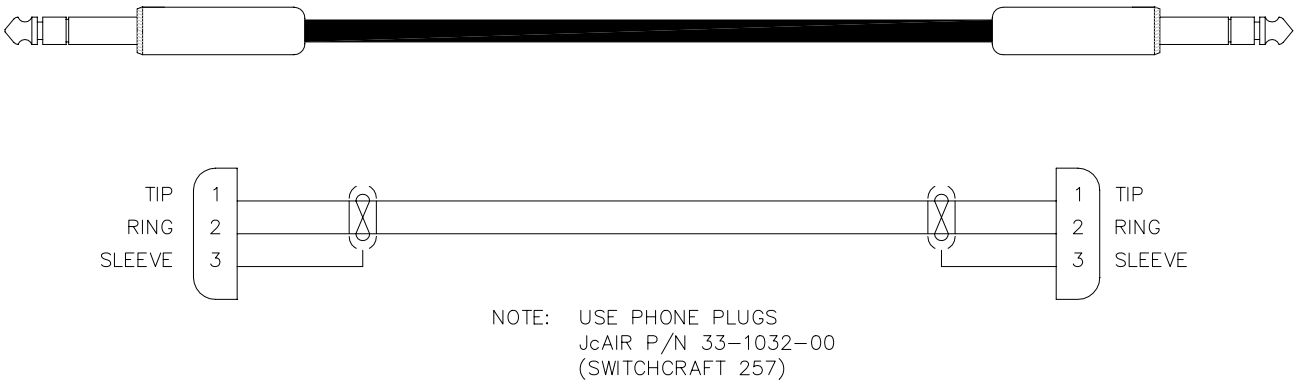


Figure 2-1. Phone Jack Jumper Plug

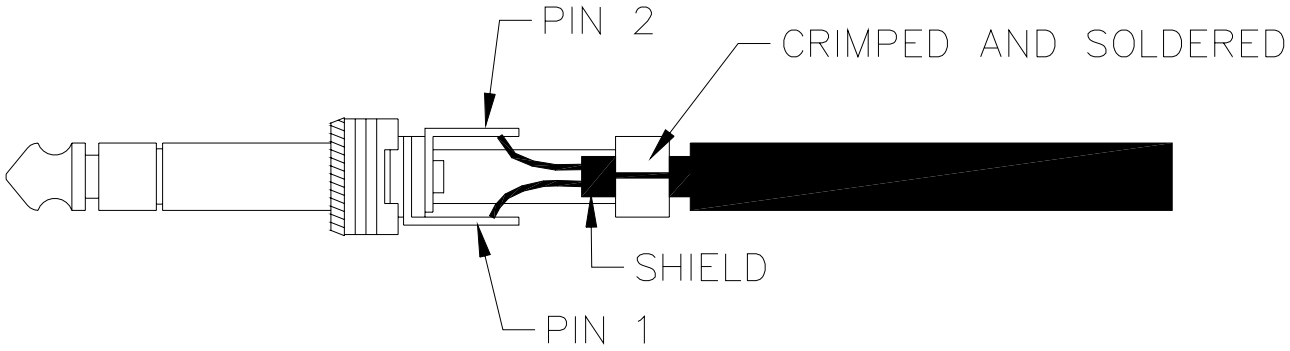


Figure 2-2. Phone Plug Termination

2.4 POST INSTALLATION CHECK

2.4.1 UNIT SELF TEST

The 429EX performs a self test routine on initial power up. The following tests are performed:

1. The message EX VERSION *.* is displayed. (*.* = firmware revision). Red LED's on the front of the unit will be lit for approximately 0.5 seconds each in the following order; EVEN and ODD Parity, TX and RX. For the remainder of the test, unless an error condition exists, the LED's are extinguished. If one of the LED's fails to light, the unit should still function properly, but the LED should be replaced at the earliest opportunity. If all LED's fail to illuminate and the display is blank or displays random data, then a catastrophic unit failure has occurred or the batteries are completely discharged.

2. The EPROM is checked by summing all memory locations and comparing the result to the known checksum. If the checksums don't match, the unit will signal a checksum error by flashing the RX LED and will attempt to write CHECKSUM ERROR to the display. If the entire EPROM has failed, however, or if one of the locations in the checksum sub-routine is bad, the program will not be able to execute properly.

3. The 429EX has RAM in two independent IC's. The unit tests each RAM section separately for data retention and address integrity. It begins by writing the lower 8 bits of the location address to the location. After writing to all locations of the section. It then reads each location and check its value. If all is correct, it will repeat this sequence with the exception that it will write the complement of the lower 8 bits of the location address to the location. It performs this sequence for each RAM section.

If the first IC fails this test, the unit will flash the EVEN parity LED and attempt to write NSC RAM ERR to the display. This indicates that U5 has failed its test. If the second IC fails this test, the unit will flash the ODD parity LED and will attempt to write 6116 RAM ERR to the display. This indicates that U3 has failed its test. The PROGRAM will then loop indefinitely reading from the failed location.

4. The 429EX has a loop back feature on the digital board to completely test the digital portion of the transmit and receive circuitry. The unit will turn on the loopback circuitry and transmit a word with a label of 0 and a data pattern of AA55AA (hex). After a brief pause, the unit will read its receive buffer and check the data against the transmitted data. If the data is not what is expected, the unit will flash the TX LED and attempt to write LOOP BACK FAILED to the display. No further operations will be possible until the cause of the failure is corrected.

The Loop test and Ram tests are not performed if the unit Trap mode is active.

If all tests have been successfully completed, the unit will display SELF TEST OK for approximately 2 seconds and will then enter the operational transmit mode and display the number of different labels currently being transmitted.

SECTION III - OPERATION

3.1 GENERAL OPERATION DESCRIPTION

The Aeroflex JcAIR Test Systems 429EX is a single channel ARINC 429 transmitter and receiver. It can receive and display all ARINC 429 labels (001 - 377). It can simultaneously output up to ten 429 words. Data can be displayed and entered in hexadecimal or engineering formats.

3.1.1 HEX DISPLAY MODE

The **HEX** mode has two types of data entry and display. The first type allows display and entry of bits 32-9 in hexadecimal format. The characters represent bits 32 through 9 (starting with bit 32) of the 32 bit word in six 4-bit nibbles. Each 4-bit nibble is derived from the BCD equivalent of the binary value. For example:

Data field in binary -	1001	0010	1111	0001	1010	0101
Equivalent hex value -	9	2	F	1	A	5

The label will be displayed in octal. The SDI (bits 10-9) is then displayed in binary. Bits 32-9 of the word are then displayed in HEX. On the far right of the display will be the SSM bits (31-30) of the word. The second type in HEX mode allows display and entry of bits 31-9 in binary format. The SDI bits (10-9) and SSM bits (31-30) each have their own screen. The remaining bits (29-11) each have their own individual screen. Word rate for the word is also available on a dedicated screen in the HEX mode.

3.1.2 ENGINEERING DISPLAY MODE

The **ENG** (Engineering) mode allows data entry and display in engineering unit formats (Feet, Knots, MHz, etc.). The label definition will determine the number of screens required for display of the possible fields of the word. Label definition may be changed by entering a new EQID (Equipment Identifier). This is accomplished by pressing the EQID key which will display the current EQID number. To change it, press the EDIT key, enter the desired two digit number and press the ENTER key. If the new EQID is valid (per ARINC 429-11, Attach. 2) for the currently selected label, then the label will be decoded and displayed according to that definition. If the EQID is invalid for the label, or no EQID number is entered, the default definition (EQID 00) will be used (see Appendix A of this manual for the default label definitions). The last EQID entered will remain active until changed or until the unit is turned off (unless in Trap or Protect mode). Some labels have definitions that don't have an assigned EQID and are not the default definition. These have been arbitrarily assigned EQID of FF.

NOTE

BITE Status Word has been assigned the same EQID as the BITE Command Word (7E) and will be displayed in engineering format. However, due to the many variations of data types for the word, it must be entered in HEX format.

3.1.3 RECEIVE AND TRANSMIT MODES

There are two distinct modes of system operation; **RX** (Receiver) mode and **TX** (Transmit) mode. Selection of these modes and all other display operations are accomplished by keypad or slide switch entry.

3.1.3.1 TX Mode

The transmitter is capable of outputting up to ten 32 bit words in ARINC 429 or 419 bipolar RZ (Return-to-Zero) format. The word rate for each of the ten can be set independently. The word rate can be as fast as 4 ms or as slow as 59998 ms. If the word rate is not specified, the unit will set it to the default value as defined as the minimum word rate in the ARINC 429-11 specification. The transmitter automatically insures at least a 4 bit time (Low Speed) separation between adjacent words.

The transmitter section may be placed into a PROTECTED mode of operation if desired. This is accomplished by pressing the TRAP key while the unit is in the transmit mode of operation (TX LED lit). Subsequent presses of the TRAP key will cause the display to toggle between PROTECTED and NOT PROTECTED. If turned on, this feature protects the user entered parameters from changing when the unit is powered off. When power is restored to the unit, it will resume operation where it was at power down. If the PROTECTED mode is turned off, the unit will clear the transmitter section on power up. The unit will stay in the selected mode (PROTECTED or NOT PROTECTED) until changed by the user, even if the unit power is cycled.

The data for most labels with engineering definitions can be SLEWED. This means that the data will dynamically change value according to user defined parameters. There will be 4 slew screens in the data mode for any label with slew capability. The first screen is a SLEW screen that defines the amount of change in data. When this parameter is set to "0" (default), no slewing will occur. The second screen is the MAX screen which defines the upper limit that the data is allowed to slew to. The third screen is the MIN screen which defines the lower limit that the data is allowed to slew to. Either parameter may be positive or negative (dependent on ARINC definition for the label), but the MAX parameter MUST be larger than the MIN parameter. Note that only bits 28 to 17 of the limits will be used in the limit check. All other bits are ignored and will be truncated upon user entry of new limit values. The fourth screen turns the ALT (Alternate) mode on and off. If this mode is on, the data will slew to the limit in the direction it is going. When the limit is reached, the data will reverse direction and then slew to the opposite limit. When this limit is reached, the data will again reverse itself. If ALT is off, the data will slew in the direction entered in the SLEW parameter (positive or negative) to the limit and then reset to the value defined for the opposite limit (data wraps around).

3.1.3.2 RX Mode

The receiver has the capability of receiving and storing up to 255 (511 in DATA ONLY mode) high or low speed 32 bit words in ARINC 429 or 419 RZ format. There are three mutually exclusive receiver modes of operation. Each mode has a screen that shows the count of words received, the label and description, or the data field currently selected.

NORMAL mode (default) is a dynamic mode that displays all unique labels received. In this mode the screen is updated 4 times per second with the latest data received.

FILTER mode is identical to NORMAL mode with the exception that words received may be filtered. Words may be filtered in 1 of 4 combinations; All Labels/All SDI, Specific Label/All SDI, All Labels/Specific SDI, and Specific Label/Specific SDI. Any words that do not meet the filter parameters will be discarded.

TRAP mode is the third and most powerful mode. This is a static mode of operation which captures and stores the data for detailed analysis. Words are received and stored in the trap buffer in their order of occurrence. They will remain in the buffer until the trap mode is turned off, even if the unit power is turned off. In normal TRAP mode, up to 255 unique words may be stored. In this mode, the time that has elapsed since the previous word is stored as the rate. In DATA ONLY TRAP mode, up to 511 words (must be the same label) are stored. The rate is invalid in this mode of operation.

The TRAP has user definable trigger and filter parameters. A trigger may be set up so that trapping will not occur until the trigger specs are met. Triggering specs may be set in 1 of 4 combinations: Don't Care Label/Don't Care Data (No Trigger), Specific Label/Don't Care Data, Don't Care Label/Specific Data Pattern, Specific Label/Specific Data Pattern. Filtering specs may be set to filter the data in 1 of 4 combinations: All Labels/All Data, Specific Label/All Data, All Labels/Specific Data Pattern, and Specific Label/Specific Data pattern. The data pattern for each spec can be from 1 to 24 bits. If a data pattern is entered for either spec, the user will be prompted for a CARES mask. If a bit is set in this mask, the corresponding bit in the received data will be checked against the same bit in the desired data pattern. The user may simply press the enter key if the prompted parameter is a don't care to the user. Data and care patterns must be entered in hexadecimal (up to 6) characters, if used. As an example, if a DATA pattern of 000001 and a CARES pattern of 000003 (default) is used then only the SDI bits (10 - 9) will be checked for an SDI of 01. The status of a bit in the DATA pattern is irrelevant if the corresponding bit in the CARES pattern is not set.

3.1.4 MISCELLANEOUS

3.1.4.1 Speed and Parity Select/Display

The transmitter and receiver can operate at either 12.5 kbps (Lo Speed) or 100 kbps (Hi Speed). Each mode's speed can be set independently of the other. The parity of the words being transmitted can be set for either ODD or EVEN parity. The 429EX will automatically correct the entered data to be transmitted if the data entered by the user is in conflict with the selected TX parity. An LED indicator will show the parity selected for transmitted words if in the TX mode or the parity of the currently displayed word if in the RX mode.

3.1.4.2 Power Saver Mode

To minimize battery drain, the 429EX has the capability to sense there has been no activity (keypad, TX, or RX) for at least 5 minutes. When this happens, the 429EX will shut down some of it's circuitry and go to "sleep". In this state, the 429EX is fully functional, but it is in a low current drain wait state. The LCD screen will be blank, but either the TX or RX LED will be lit. Any keypad or RX activity will reawaken the 429EX to its normal operation mode.

3.2 CONTROL FUNCTIONS

3.2.1 429EX CONTROLS AND INDICATORS (Figure 3-1)

(1) TRAP Mode Key

IN RX MODE. ON/OFF control for the TRAP mode. Pressing the ENT key for any of the prompted parameters will cause a DON'T CARE to be used for that parameter. Data is automatically protected if unit is powered off when TRAP is on.

IN TX MODE. ON/OFF key for the PROTECT mode. If PROTECT is on, the transmit parameters will be protected when the 429EX is powered off.

(2) AUTO Mode Key

IN RX MODE. ON/OFF key for AUTO scrolling mode. Allows the operator to scroll through labels that have been received by TRAP mode. AUTO mode steps automatically through the word buffer and displays the number of trapped words as well as the engineering name of the label, if it is in the LABEL mode. If in the DATA mode, the AUTO mode steps to the same data menu for the next trapped word. Scroll keys allow scanning direction to be selected.

IN EDIT MODE. While in the EDIT mode, this key allows the hexadecimal value C to be entered.

(3) TX Parity Switch	Allows operator to select ODD or EVEN transmit word parity.
(4) TX SPEED Switch	Allows operator to select HI (100 kbps) or LO (12.5 kbps) speed transmit word rate.
(5) TX Output Port	Allows access to transmitter port using standard 3-conductor, 1/4" phone plug.
(6) RX Input Port	Provides input to receiver port using standard 3-conductor, 1/4" phone plug.
(7) ARROW (Scroll) Keys	Allows operator to scroll through display menus (10 transmitter slots, up to 511 receiver slots, or data menus). Allows selection of the scanning direction in AUTO mode. If editing data of an ISO Alpha label (356 or 357), the SCROLL keys will allow selection of the Alpha character to be entered (SCROLL to the desired character and press ENT to select a character).
(8) TX/RX Indicator	LED indicates that the system is in either transmitter (TX) or receiver (RX) mode of operation for display and entry of data.
(9) PARITY Indicator	**IN RX MODE**. LED Indicates parity (ODD or EVEN) of word presently displayed. **IN TX MODE**. LED Indicates selected transmit parity.
(10) HEX/ENG Switch	Allows operator to select hexadecimal or engineering unit display and entry of data.
(11) TX/RX Key	Allows operator to select whether the system is in transmit or receive mode of operation for display and entry of data. After selection of the TX/RX key, initial display indicates the number of labels being transmitted, received, trapped, or filtered. SCROLL keys should then be used for manual stepping through transmitter or receiver slots. TX/RX LED indicators above display will indicate current mode of operation.
(12) RX SPEED Switch	Allows operator to select HI (100 kbps) or LO (12.5 kbps) receiver speed.
(13) DATA ENTRY Keys	Allows operator to enter various data in hexadecimal or engineering formats. Keys 0 to 9 and the "." and "-" keys are valid while in ENG mode. Keys 0 to F are valid while in HEX mode. Hex mode will be forced regardless of switch position if the label is currently undefined by ARINC specs. or is a label not supported in ENG mode (Discrete Data, Maintenance Data, etc.). Keys 0 to 7 are valid for LABEL entry since all labels are entered in octal format. The 0 and 1 keys allow clearing and setting, respectively, bits of discrete bit screens (SDI, SSM, RF management labels, frequency discretes & individual bit screens, etc.) and turning various modes on and off (i.e. slew ALTERNATE).

(14) LAB/DAT Key	Allows operator to select either LABEL mode or DATA mode of display. LABEL mode displays octal number and engineering definition of labels being transmitted or received. DATA mode allows viewing of data of the currently selected label being transmitted or received.
(15) EDIT/DEL Key	Allows operator access to the data entry mode. If in the data entry mode, the DEL keys allows correction of errors during data entry.
(16) ON/OFF Key	Turns unit ON and OFF
(17) ENT Key	This key has several functions, dependent on which mode the unit is in. **DATA ENTRY MODE**. Used to complete an entry sequence. Until the ENT key is pressed, an entry may be edited with the DEL key. If an entry is not allowed for some reason (out of range, illegal key), the old data will be retained. **TX MODE**. Resets the TX timer counters of each active slot to their initial value. This allows the TX labels to be synchronized in their output order if all have the same word rate. They will be sent out in descending TX slot order (10 thru 1). For example, the user wants to simulate a LRU that transmits 6 labels in bursts 100 ms. apart. The user would enter the first label in the group in the TX slot 10 with a word rate of 100. The second label would go in the TX slot 9 with a word rate of 100. This would continue for the remaining labels with the last label of the group being entered in TX slot 5. Once all the data has been entered correctly and the user is ready to synchronize the labels, he(she) should press the ENT key. There will be no visible indication that anything has occurred, but the words have been synchronized and are being transmitted in bursts of 6, 100 ms apart. If any data is changed later, the ENT key should be pressed again to resynchronize the words. **RX MODE**. If in trap mode and the current screen is the word trapped count screen and there are valid words trapped, pressing the ENT key will initiate a printer dump sequence. If a printer is not connected to the 429EX or is off line, the 429EX will indicate this for 2 seconds and abort the print sequence. NOTE: The LED's will blink erratically and the keypad will be disabled during the print dump. This is normal and should be ignored. To abort a print sequence just turn the unit off since the data will still be valid on restoration of power.
(18) Battery Charging Jack	Allows the internal NiCad batteries to be charged by connecting to the battery charger furnished with the 429EX. **CAUTION** To avoid possible damage to the battery charger, it is recommended that you do NOT have the charger connected to the wall outlet when connecting or disconnecting the charging plug to the 429EX.
(19) D/D.O. Key	**EDIT MODE**. While in the EDIT mode, this key allows the hexadecimal value "D" to be entered.

RX MODE. Pressing this key when trap mode is first activated (before entering the Trap Label) will activate the DATA ONLY trap mode. This mode expands the trap capacity to 511 words, however, no label or rate information is stored. This means that the user must enter a trap label when prompted. This mode will be cleared when trap mode is turned off.

(20) E/EQID Key

EDIT MODE. While in the EDIT mode, this key allows the hexadecimal value "E" to be entered.

NON EDIT MODE. While in any mode other than edit mode, pressing this key will display the Equipment Identifier screen. This may than be edited using the normal edit procedure. Up to 2 hex characters may be entered. Pressing this key again or any other mode control key will clear this screen. The Equipment Identifier is used by the 429EX to determine which ARINC definition to use for the received and transmitted labels when displaying and entering data.

(21) F/FILT Key

EDIT MODE. While in the EDIT mode, this key allows the hexadecimal value "F" to be entered.

RX MODE. On/Off control for the FILTER mode. Pressing the ENT key for any of the prompted parameters will cause a don't care to be used for that parameter.

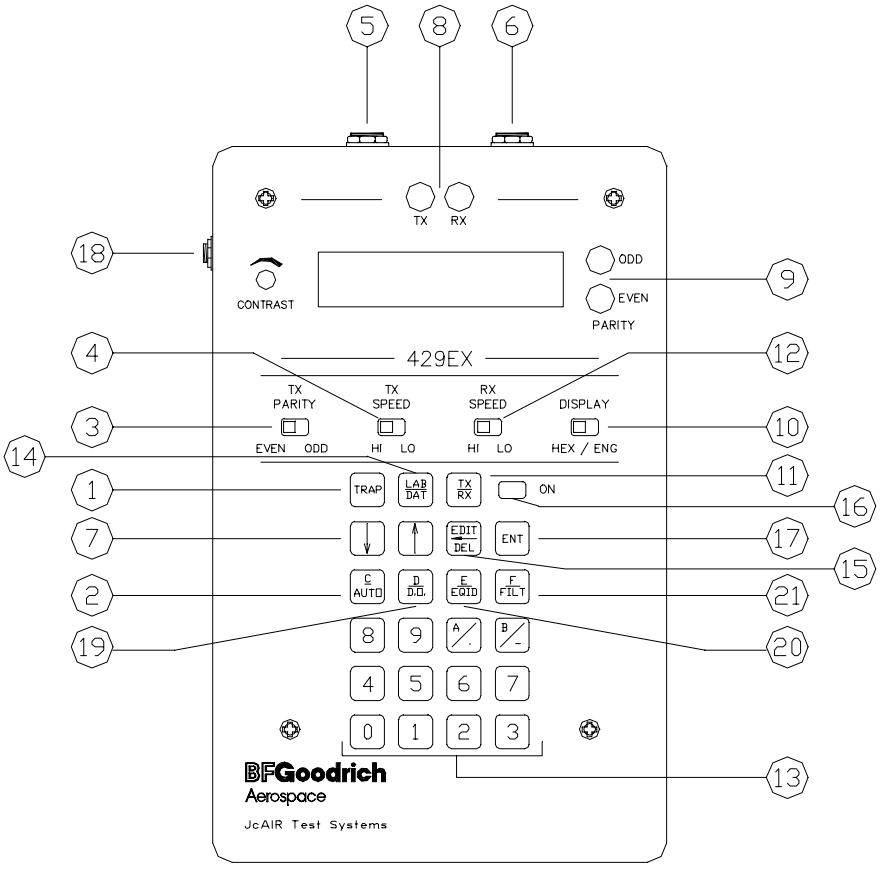


FIG. 3-1: CONTROLS AND INDICATORS

3.3 OPERATING EXAMPLE

The following section is a series of instructions designed to guide the user through some of the features of the 429EX.

NOTE

For consistency sake, these instructions will use four ARINC labels throughout. The user is free to configure additional labels if desired. These labels are as follows:

033 ILS FREQUENCY
034 VOR FREQUENCY
035 DME FREQUENCY
102 SEL ALTITUDE

The 429EX features are designed to allow greater flexibility when working with ARINC 429 data buses. These features are outlined below.

1. Expanded screen displays of data and information.
2. User definable Equipment ID codes.
3. Labels defined to ARINC 429-11 Air Transport specifications.
4. Data slewing or ramping capabilities.
5. Positive or negative slewing.
6. Non-volatile memory that stores previously entered information when protection feature is turned on.
7. Additional, expanded selective trap capabilities.
8. Dynamic display of slewed and ramped data.
9. Individual display and control of bits 11 to 29.
10. Separate screens for SDI and SSM.
11. Non-volatile memory for RX and TRAP mode.

3.3.1 TRANSMITTER FUNCTIONS

3.3.1.1 Entering Transmit Labels and Protecting Data

1. Turn ON the 429EX. The unit will automatically perform a self test and enter the transmit mode if the self test is successful. To clear the transmitter, if it contains any previously stored labels, press the TRAP key until the display indicates NOT PROTECTED. Then turn the unit OFF for 5 seconds and back ON.

2. Press the TRAP key for PROTECTED or NOT PROTECTED data mode. When data is NOT PROTECTED, it will not be retained in the units memory when it is turned off. Set unit to PROTECTED.

3. Press the UP ARROW key (the UP and DN ARROW keys are also referred to as SCROLL keys). TX 1 INACTIVE shall appear on the display. This indicates that transmitter slot #1 is currently inactive.

4. Press the EDIT/DEL key. LABEL ? __ shall appear on the display, which is the prompt to enter a 3-digit octal label. Enter the first label of the example (033) by pressing the appropriate keys and completing the entry by pressing the ENTER key. To correct an error when entering a label, simply press the EDIT/DEL key prior to pressing the ENTER key and re-enter the correct label. 033 ILS FREQ shall now appear on the display. You can view the default data for this label by depressing the LAB/DAT key. This key acts as a toggle to select between either LABEL or DATA information. To scroll through the data, use the UP/DOWN ARROW keys. This step is the same for all future labels to be entered. To clear the transmitter slot, edit the label number and enter 0.

5. Press the LAB/DAT key and return to the label screen (033 ILS FREQ). Press the UP ARROW key to scroll to the TX 2 INACTIVE display. Press the EDIT/DEL key and enter label 034 (034 VOR FREQ) in transmitter slot #2. Repeat this procedure and enter LABEL 035 (035 DME FREQ) in transmitter slot #3.

6. Press the UP ARROW key to scroll to the TX 4 INACTIVE display. Press the EDIT/DEL key and enter label 102 (102 SEL ALTITUDE). The following sequence will slew and ramp the data within a selected non-RF label. For demonstration purposes, we will limit this to label 102.

NOTE

For all data entry that follows it will be necessary for the user to follow the previous sequence of depressing the appropriate keys such as EDIT/DEL and ENT as well as the scroll keys to access all of the data displays for editing.

A) Depress LAB/DAT key. Depress the UP ARROW key as required until SLEW=00000 appears on the display.

B) SLEW defines the value that the data will change by. Enter 100 Ft. (EDIT - 100 - ENT).

C) Scroll to MAX=65520. This is the default limit in the ARINC specification truncated to 12 bits. Enter 10000 Ft. (EDIT - 10000 - ENT).

D) Scroll to MIN=00000 and enter 9000 Ft. (EDIT - 9000 - ENT). The display will now indicate MIN=08992 instead of MIN=9000. This is due to the program using only the first 12 bits of significant data (bits 28 to 17). Other bits are truncated and this results in a resolution of 8 Ft. for limit checking for this label.

E) Scroll to SLEW ALT OFF. To turn this feature on, simply press the EDIT/DEL key and enter 1 (1 turns ALT ON and 0 turns ALT OFF). When SLEW ALTERNATING is on, slewing will continuously occur bi-directionally, reversing itself when upper and lower limits are reached. When this feature is off, slewing will occur in only one direction, up/down, positive/negative.

F) Scroll to the next screen and there will be a dynamic display of the slewing from 9000 Ft. to 10000 Ft. up and down in increments of 100 Ft.

G) Scroll to the rate screen and RATE = 100 MS. Enter 500 (MS) to slow the updating speed for additional visibility.

H) Scroll to the SDI screen which will display SDI = 00. Edit as required.

I) Scroll to the SSM screen which will display SSM = 11 / NORM, which is the ARINC default norm for this label. Edit the SSM to 00 and watch the display change to SSM = 00 / FAIL. Re-edit to 11 and the SSM returns to normal.

J) Scroll once more to return to the SLEW screen. Press LAB/DAT key to return to the label screen.

NOTE

When entering data, it is possible to view and turn on or off individual bits 11 to 29. To access this feature, press the LAB/DAT key to go to the DATA mode and move the display switch from ENG to HEX. Then scroll until the desired bit is reached. Edit each bit individually with 0 for off and 1 for on.

K) Press the TX/RX key to go to the receiver mode.

3.3.2 RECEIVER FUNCTIONS

3.3.2.1 Normal Receiver Mode

The Normal Receiver Mode (default) is the basic receiver mode of operation for the 429EX. It will display all labels and their data dynamically as they are being received.

1. To use the receiver port for this example, it is necessary to loop the unit to itself by connecting the transmitter port to the receiver port. In this manner you will see displayed the four labels entered previously on the transmitter side.

NOTE

If there are any labels trapped in the memory of the 429EX, they will annunciate on the screen. To clear the memory, press the TRAP key if XXX TRAP WORDS appears, or the F/FILT key if XX FILTERED WORDS appears.

2. Once this is accomplished, the display will indicate 4 RX LABELS.

3. To view the labels, press the appropriate ARROW key in the direction you wish to scroll. You will see displayed the four labels entered; 033 ILS FREQ, 034 VOR FREQ, 035 DME FREQ, and 102 SEL ALTITUDE.

4. To view data, depress the LAB/DAT key. For this exercise, we will view label 102.

5. Label 102 will display data that is being slewed at the rate of 100 Ft. every 500 ms as was previously programmed (place the Display switch in the ENG position).

6. Scrolling through the data will sequentially display RATE, SDI and SSM.

7. By switching the unit from the ENG mode to the HEX mode it is possible to scroll through the data mode and individually view bits 11 through 29. These bits can also be viewed and edited individually on the transmitter side.

3.3.2.2 Filter Mode

The Filter Mode is used whenever you wish to display only those labels and/or SDI's that you are interested in. All other words on the bus will be ignored and not displayed.

1. Press the F/FILT key. Enter label 035 at the LABEL ? XXX prompt and press the ENT key. Press the ENT key at the SDI ? XX prompt. The unit will now filter on label 035 (with any SDI pattern), if it is being received, and display it. This mode strips all irrelevant words from the received data for the sought after combination.

2. This label and its data can now be viewed as in the Normal Receive Mode.

3. To clear the Filter Mode and return to the Normal Receiver Mode, press the F/FILT key.

3.3.2.3 Normal Trap Mode

The Normal Trap Mode is used whenever it is desired to examine the next 255 words being received by the unit without regard to their label or data content. In this mode, each word occurrence is recorded with the time that has elapsed since the previous word being stored as the rate.

1. Press the TRAP key. The unit will display TRAP LABEL? XXX. Press the ENT key. The unit will display DATA ? XXXXXX. Press the ENT key a second time. The unit will display TRIG LABEL? XXX. Press the ENT key a third time. The unit will display DATA ? XXXXXX. Press the ENT key a fourth time and the unit will begin trapping.

2. To view the trapped words, press the appropriate ARROW key. To auto-scroll, press the C/AUTO key and the display will automatically display one label approximately every second. You can reverse the scroll direction by using the opposite ARROW key. The display will show the number of the trapped word. To stop auto-scroll, depress the C/AUTO key again.

3. By holding down either ARROW key, it is possible to speed up the sequence to reach a specific label more quickly.

4. To clear the trap memory, depress the TRAP key and the unit will return to receiving 4 labels only (normal receive mode).

3.3.2.4 Label/Data Only Trap Mode

The Label/Data Only Trap Mode is used whenever you wish to examine only one particular label. While it has the added benefit of storing more words than the Normal Trap Mode (511 vs. 255), the time between words is not kept track of (rate display always indicates 0).

1. Press the TRAP key, then the D/D.O. key and watch the display momentarily flash DATA ONLY. The unit is now set up to trap one label 511 times. To complete the process, enter 102 at the TRAP LABEL ? prompt. Then press the ENT key following each of the DATA ? XXXXXX, TRIG LABEL? XXX and DATA ? XXXXXX screens until the unit displays the TRAP WORDS screen and starts to trap. The unit will trap label 102, 511 times (which is being transmitted at the rate of 500 ms). It is possible to start viewing individual labels while the unit is still trapping by scrolling to the first few labels trapped. This does not interfere with the unit, which will continue to trap incoming words.

NOTE

When using the Label/Data Only trap mode, it is necessary to enter a label number (not just press the ENT key), as this mode traps off of the label it is searching for.

2. Once the unit is finished trapping, it is possible to scroll through each trapped word and view them individually. By pressing the LAB/DAT key and then the C/AUTO key, you can view label 102 which was trapped as it slewed from 9000 Ft. to 10000 Ft. It is also possible to view all data on each individual word trapped, including bits 11 to 29, SDI, SSM, etc.

3. To clear the trap memory and return to the Normal Receive Mode, press the TRAP key.

3.3.2.5 Data Trap Mode

The Data Trap Mode is useful when you wish to find a particular data pattern. It will search through all received words looking for and recording each match that it finds.

1. Press the TRAP key and then the ENT key at the TRAP LABEL? XXX prompt.

2. Enter the data you wish trapped at the DATA ? XXXXXX prompt. For purposes of our example, enter 627100 (which represents 10000 Ft. in label 102 which is being transmitted and simultaneously slewing from 9000 Ft. to 10000 Ft.) and press the ENT key.

3. The next screen will display CARES ? XXXXXX. It is now necessary to enter 7FFFFF, which will mask parity off to allow the unit to search for specific data without regard to the parity bit, and press the ENT key to complete the entry.

CARES is a 24 bit hex mask to determine if a bit in the data word will be checked for status. This function is particularly useful for trapping block data protocols such as Williamsburg Protocol, Bite Memory Transfer or Alpha-numeric messages. It is also useful for monitoring a bus for a specific flag such as an autopilot armed flag, where a specific bit in a specific word arms an autopilot and it is necessary to determine when this event occurs.

In the example we have used, we are searching for a specific data field and the CARES function is masked by the entry of 7FFFFF. Some useful cares patterns follow:

7FFFFF = Masks parity off and allows for checking all bits in the data field. In other words, it CARES about bits 9 through 31 and DOESN'T CARE about bit 32.

000003 = SDI bits 9 & 10 will be checked.

600003 = SSM and SDI bits only checked (bits 31 & 32 and 9 & 10).

4. At the TRIG LABEL? XXX prompt, press the ENT key to advance to the DATA ? XXXXXX screen. Press the ENT key again.

5. The unit will now look for a data pattern of 627100 only and trap only those words it receives with this data. It may take a few moments for the first word to be received. As soon as the first word is received, it is possible to view the word by scrolling to it and viewing the data by pressing the LAB/DATA key. The word should be 102 SEL ALTITUDE with a data display of 10000 FEET. By selecting HEX on the Display switch, the display should indicate 102 00 627100 11. 102 indicates the label in octal, 00 indicates the SDI (bits 10 & 9) in binary, 627100 indicates the entire data field (bits 32 through 9) in hex and 11 indicates the SSM (bits 31 & 30) in binary.

6. To turn off the Data Trap Mode and return to the Normal Receiver Mode, press the TRAP key.

3.3.2.6 Trigger Trap Mode

The Trigger Trap Mode is used to trap a string of data (up to 255 words) that begins on the first word received following either a particular label and/or a particular data pattern.

1. Press the TRAP key and then the ENT key twice. At the TRIG LABEL? XXX prompt, enter 102 and press the ENT key to complete the entry. At the DATA ? XXXXXX prompt, enter 627100 (which represents 10000 Ft. in label 102 which is being transmitted and simultaneously slewing from 9000 Ft. to 10000 Ft.) and press the ENT key. At the CARES ? XXXXXX prompt, enter 7FFFFF to mask the parity bit, and press the ENT key.

2. After the information is entered, the screen will display TRIGGER IS ARMED and the unit will wait until it receives this data. Once a match occurs, the unit will go into the normal trap mode and it will trap the **next** 255 words following the trigger word. The first word in this example should be label 035 which has the fastest word rate (100 ms).

3. The trapped words can then be viewed in the normal manner by scrolling. The second word should be 034 VOR FREQ followed by 033 ILS FREQ. Label 102 will only be seen in the string very sparingly, as its rate was set earlier at 500 ms.

4. To turn off the Trigger Trap Mode and return to the Normal Receiver Mode, press the TRAP key.

3.3.3 CHANGING EQUIPMENT ID CODES

The 429EX has the capability to change the Engineering Units conversion for those labels that have multiple Equipment ID codes (EQID) defined by ARINC Specification 429-11 (Attachment 2). This will allow those labels with multiple definitions to be read properly and conveniently in the ENG mode. For simplicity, JcAir Test Systems has arbitrarily chosen 00 (which is actually a non-ARINC defined code) as the default Equipment ID for the 429EX. Refer to Appendix A of this manual to determine the default definition for each label.

IMPORTANT

EQID 00 is the code to which the unit will default when first turned on unless the code has been previously changed and the unit turned off while in the PROTECTED mode. Entering an EQID for any label other than those listed in Appendix A will cause the default EQID (00) to be used.

1. With the unit in the TX mode, scroll through the transmitter slots until the display indicates 035 DME FREQ.

2. Press the E/EQID key and the unit will display EQPMT ID = 00.

3. Press the EDIT/DEL key and unit will display EQPMT ID ?. Enter 06 (06 is the Equipment ID used for ARINC 706 Air Data Systems) and press the ENT key.

4. The unit will now display label 035 as 035 BARO (IN). With the Display switch set to the ENG position, the data for label 035 will be presented as Barometric Altitude in Inches of Mercury, rather than DME Frequency in MHz as before. Note that label 034 has also been changed and it now displays 034 BARO (MB).

5. To return to the original Equipment ID code, simply use the same steps to enter 00.

The 429EX changes the definition of all labels that are defined in ARINC Specification 429-11 (Attachment 2) with the same Equipment ID. In the above example, the definitions identified with an ID of 06 would be desirable when working with Air Data Systems. It is also possible to change the ID codes while in the receiver mode by following the same sequence.

NOTE

Some ARINC labels, such as 077, do not have designated ID codes. To access these labels, JcAIR Test Systems has assigned a special EQID code of FF.

SECTION IV - THEORY OF OPERATION

4.1 GENERAL CIRCUIT THEORY

The Aeroflex JcAIR Test Systems Model 429EX, ARINC 429 single channel transmitter and receiver consists of three board level sub assemblies and a battery pack. The three boards are:

1) Display Board (JPN: 20-6782-10)
2) Digital Board (JPN: 20-6784-10)
3) Analog Board (JPN: 20-6783-00)

4.1.1 DISPLAY BOARD

The Display board performs the human interface function for the 429EX. It has three major sections of circuitry:

1) Display circuits
2) Keypad circuits
3) Slide Switch circuits

The Display circuits output data in visual form. The display circuit consists of the liquid crystal display (DS1). The Keypad switches allow data to be input to the unit. The keypad circuits consist of 23 momentary contact switches (S1 - S23). The switches are arranged in an X/Y matrix and are decoded by the firmware on the digital board. The slide switches allow various I/O information (Parity, TX Baud, etc.) to be changed and to turn the unit on and off. The slide switch circuits consist of 5 SPST slide switches (S24 - S28) and various discrete components (resistors, transistors and capacitors).

4.1.2 DIGITAL BOARD

The Digital board contains the digital circuitry for the 429EX. This circuitry has three major sections:

1) Control circuits
2) 429 Receive Buffer
3) 429 Generator

The Control circuits are the "Heart" of the system that controls and monitors all other circuits in the system. The control circuits consist of the following components:

1) Microcontroller	(U1)
2) Firmware EPROM	(U2)
3) RAM	(U3)
4) Address Latch	(U4)
5) RAM IO	(U5)

The control circuits monitor the number of "bits" received and upon completion, will read the receive buffer.

The 429 Receive buffer stores the 429 bit stream data (Converted to TTL levels by the Analog board). The following components make up the 429 receive buffer.

1) Bit Latch	(1/2 U8)
2) Serial Register	(1/2 U6)
3) Mux	(U14)

The 429 Generator circuits send TTL level bit stream data to the Analog board, where it is converted to the correct levels for output. The Generator is loaded and started by the Control circuits. The Generator consists of the following components:

1) Digital drivers	(U9)
2) Serial Register	(1/2 U6)
3) Baud Clock/Bit Counter	(U5)
4) Driver Enable	(1/2 U8)

4.1.3 ANALOG BOARD

The Analog board contains the analog circuitry for the 429EX. This circuitry has three major sections:

1) Power Circuits
2) 429 Receiver
3) 429 Driver

The Power circuits supply power to the system from one of two sources. If the battery charger is disconnected, the circuits supply power to the system from the battery pack. The battery voltage is monitored by the power circuits. Should the voltage drop to an insufficient level it is the power circuits that will indicate this to the Control circuits. An indication of low power will be seen on the display board should the aforementioned conditions exist. If the charger is connected, the power circuits will supply power to the system from the charger and will also trickle charge the NiCad batteries. The power circuits of the following components:

1) Low Drop Out Regulator	(U5)
2) Voltage converter	(U6)
3) Monitor	(U7)

The 429 Receiver circuits convert ARINC 429 RZ transmitted signals form 10V levels (between A & B) to TTL level signals for use by the 429 Receiver Buffer on the Digital board. The 429 receiver circuits consist of a Comparator and a number of discrete components. The 429 driver circuits convert the TTL level signal from the digital board into 10V (between A and B) ARINC 429 compatible signal levels.

The 429 Driver circuits consist of the following components:

1) "1" Driver	(U2, Q1, Q2)
2) "0" Driver	(U3, Q3, Q4)
3) Speed Switch	(U1)

The battery Pack supplies power to the system and consists of the following components:

1) Battery Holder
2) Six (6) "AA" NiCad rechargeable batteries.

SECTION V - MAINTENANCE

5.1 INTRODUCTION

Bills of material, assembly drawings, schematics, and test procedures are located in the 429EX Maintenance Manual (JPN: 06-1001-05 for hard copy, E6-1001-05 for CD) available separately from Aeroflex JcAIR Test Systems.

APPENDIX A

MODEL 429EX (VERS. 1.1): DEFINED LABELS AND DEFAULT DATA

LABEL[1]	EQID	DESCRIPTION	RANGE[2,3]	UNITS	DEFAULT RATE[3]
001	**00**	**DIST TO GO**	**± 3999.9**	**N.M.**	**100ms**
	02	DIST TO GO	± 3999.9	N.M.	100ms
002	**00**	**TIME TO GO**	**0-399.9**	**MIN**	**100ms**
	02	TIME TO GO	0-399.9	MIN	100ms
003	**00**	**X TRACK DIST**	**0-399.9**	**N.M.**	**100ms**
	02	X TRACK DIST	0-399.9	N.M.	100ms
004	**00**	**RUNWAY DIST**	**0-79900**	**FEET**	**100ms**
	01	RUNWAY DIST	0-79900	FEET	100ms
005	**00**	**SPARE LABEL**	**000000-FFFFFF**	**HEX**	**200ms**
006	**00**	**SPARE LABEL**	**000000-FFFFFF**	**HEX**	**200ms**
007	**00**	**SPARE LABEL**	**000000-FFFFFF**	**HEX**	**200ms**
010	**00**	**PRES POS LAT**	**180N-180S**	**DEG:MIN**	**250ms**
	02	PRES POS LAT	180N-180S	DEG:MIN	250ms
	04	PRES POS LAT	180N-180S	DEG:MIN	250ms
	38	PRES POS LAT	180N-180S	DEG:MIN	250ms
011	**00**	**PRES POS LNG**	**180E-180W**	**DEG:MIN**	**250ms**
	02	PRES POS LNG	180E-180W	DEG:MIN	250ms
	04	PRES POS LNG	180E-180W	DEG:MIN	250ms
	38	PRES POS LNG	180E-180W	DEG:MIN	250ms
012	**00**	**GROUND SPEED**	**0-7000**	**KNOTS**	**250ms**
	02	GROUND SPEED	0-7000	KNOTS	250ms
	04	GROUND SPEED	0-7000	KNOTS	250ms
	05	GROUND SPEED	0-7000	KNOTS	250ms
	25	GROUND SPEED	0-7000	KNOTS	250ms
	38	GROUND SPEED	0-7000	KNOTS	250ms
013	**00**	**TRK ANG TRUE**	**0-359.9**	**DEG**	**250ms**
	02	TRK ANG TRUE	0-359.9	DEG	250ms
	04	TRK ANG TRUE	0-359.9	DEG	250ms
	38	TRK ANG TRUE	0-359.9	DEG	250ms
014	**00**	**MAG HEADING**	**0-359.9**	**DEG**	**250ms**
	05	MAG HEADING	0-359.9	DEG	250ms
	38	MAG HEADING	0-359.9	DEG	250ms
015	**00**	**WIND SPEED**	**0-799**	**KNOTS**	**250ms**
	02	WIND SPEED	0-799	KNOTS	250ms
	04	WIND SPEED	0-799	KNOTS	250ms
	05	WIND SPEED	0-799	KNOTS	250ms
	38	WIND SPEED	0-799	KNOTS	250ms

LABEL[1]	EQID	DESCRIPTION	RANGE[2,3]	UNITS	DEFAULT RATE[3]
016	**00**	**WIND DIR TRU**	**0-359**	**DEG**	**250ms**
	04	WIND DIR TRU	0-359	DEG	250ms
	38	WIND DIR TRU	0-359	DEG	250ms
017	**00**	**SEL RNWY HDG**	**0-359.9**	**DEG**	**168ms**
	10	SEL RNWY HDG	0-359.9	DEG	168ms
	A0	SEL RNWY HDG	0-359.9	DEG	168ms
	B0	SEL RNWY HDG	0-359.9	DEG	168ms
020	**00**	**SEL VERT SPD**	**± 6000**	**FT/MIN**	**100ms**
	20	SEL VERT SPD±	6000	FT/MIN	100ms
	A1	SEL VERT SPD±	6000	FT/MIN	100ms
021	**00**	**SEL EPR**	**0-3**	**NUMERIC**	**100ms**
	02	SEL EPR	0-3	NUMERIC	100ms
	20	SEL EPR	0-3	NUMERIC	100ms
	A1	SEL EPR	0-3	NUMERIC	100ms
022	**00**	**SEL MACH**	**0-4**	**MACH**	**100ms**
	20	SEL MACH	0-4	MACH	100ms
	A1	SEL MACH	0-4	MACH	100ms
023	**00**	**SEL HEADING**	**0-359**	**DEG**	**100ms**
	20	SEL HEADING	0-359	DEG	100ms
	A1	SEL HEADING	0-359	DEG	100ms
024	**00**	**SEL COURSE 1**	**0-359**	**DEG**	**168ms**
	11	SEL COURSE 1	0-359	DEG	168ms
	20	SEL COURSE 1	0-359	DEG	168ms
	A1	SEL COURSE 1	0-359	DEG	168ms
	B1	SEL COURSE 1	0-359	DEG	168ms
025	**00**	**SEL ALTITUDE**	**0-50,000**	**FEET**	**100ms**
	20	SEL ALTITUDE	0-50,000	FEET	100ms
	A1	SEL ALTITUDE	0-50,000	FEET	100ms
026	**00**	**SEL AIRSPEED**	**30-450**	**KNOTS**	**100ms**
	03	SEL AIRSPEED	30-450	KNOTS	100ms
	20	SEL AIRSPEED	30-450	KNOTS	100ms
	A1	SEL AIRSPEED	30-450	KNOTS	100ms
027	**00**	**SEL COURSE 2**	**0-359**	**DEG**	**168ms**
	11	SEL COURSE 2	0-359	DEG	168ms
	20	SEL COURSE 2	0-359	DEG	168ms
	A1	SEL COURSE 2	0-359	DEG	168ms
	B1	SEL COURSE 2	0-359	DEG	168ms
030	**00**	**VHF COM FREQ**	**118-135.975**	**MHz**	**100ms**
	20	VHF COM FREQ	118-135.975	MHz	100ms
	24	VHF COM FREQ	118-135.975	MHz	100ms
	B6	VHF COM FREQ	118-135.975	MHz	100ms

LABEL[1]	EQID	DESCRIPTION	RANGE[2,3]	UNITS	DEFAULT RATE[3]
031	**00**	**BCN ATC CODE**	**0-7777**	**REPLY CODE**	**100ms**
	20	BCN ATC CODE	0-7777	REPLY CODE	100ms
	B8	BCN ATC CODE	0-7777	REPLY CODE	100ms
032	**00**	**ADF FREQ**	**190-1750**	**Khz**	**100ms**
	12	ADF FREQ	190-1750	Khz	100ms
	20	ADF FREQ	190-1750	Khz	100ms
	B2	ADF FREQ	190-1750	Khz	100ms
034	**00**	**VOR FREQ**	**108-117.95**	**MHz**	**168ms**
	02	VOR FREQ	108-117.95	MHz	168ms
	06	BARO (MB)	745-1050	MB	64ms
	11	VOR FREQ	108-117.95	MHz	168ms
	20	VOR FREQ	108-117.95	MHz	168ms
	B0	VOR FREQ	108-117.95	MHz	168ms
035	**00**	**DME FREQ**	**108-135.95**	**MHz**	**100ms**
	02	DME FREQ	108-135.95	MHz	100ms
	06	BARO (IN)	22-31	IN HG	64ms
	09	DME FREQ	108-135.95	MHz	100ms
	20	DME FREQ	108-135.95	MHz	100ms
	A9	DME FREQ	108-135.95	MHz	100ms
036	**00**	**MLS FREQ**	**000000-FFFFFF**	**HEX**	**100ms**
	02	MLS FREQ	000000-FFFFFF	HEX	100ms
	20	MLS FREQ	000000-FFFFFF	HEX	100ms
	C7	MLS FREQ	000000-FFFFFF	HEX	100ms
037	**00**	**HF COM FREQ**	**2.8-24**	**MHz**	**100ms**
	20	HF COM FREQ	2.8-24	MHz	100ms
	B9	HF COM FREQ	2.8-24	MHz	100ms
040	**00**	**SPARE LABEL**	**000000-FFFFFF**	**HEX**	**200ms**
041	**00**	**SET LATITUDE**	**180N-180S**	**DEG:MIN**	**250ms**
	02	SET LATITUDE	180N-180S	DEG:MIN	250ms
	04	SET LATITUDE	180N-180S	DEG:MIN	250ms
	20	SET LATITUDE	180N-180S	DEG:MIN	250ms
	A4	SET LATITUDE	180N-180S	DEG:MIN	250ms
042	**00**	**SET LONGTUDE**	**180E-180W**	**DEG:MIN**	**250ms**
	02	SET LONGTUDE	180E-180W	DEG:MIN	250ms
	04	SET LONGTUDE	180E-180W	DEG:MIN	250ms
	20	SET LONGTUDE	180E-180W	DEG:MIN	250ms
	A4	SET LONGTUDE	180E-180W	DEG:MIN	250ms
043	**00**	**SET MAG HEAD**	**0-359**	**DEG**	**250ms**
	02	SET MAG HEAD	0-359	DEG	250ms
	04	SET MAG HEAD	0-359	DEG	250ms
	20	SET MAG HEAD	0-359	DEG	250ms
	A4	SET MAG HEAD	0-359	DEG	250ms

LABEL[1]	EQID	DESCRIPTION	RANGE[2,3]	UNITS	DEFAULT RATE[3]
044	**00**	**TRUE HEADING**	**0-359.9**	**DEG**	**250ms**
	04	TRUE HEADING	0-359.9	DEG	250ms
	38	TRUE HEADING	0-359.9	DEG	250ms
045	**00**	**MIN AIRSPEED**	**0-259.9**	**KNOTS**	**64ms**
	03	MIN AIRSPEED	0-259.9	KNOTS	64ms
046	**00**	**ENG SER# LSD**	**0999**	**NUMERIC**	**500ms**
	33	ENG SER# LSD	0999	NUMERIC	500ms
047	**00**	**ENG SER# MSD**	**0999**	**NUMERIC**	**500ms**
	33	ENG SER# MSD	0999	NUMERIC	500ms
050	**00**	**SPARE LABEL**	**000000-FFFFFF**	**HEX**	**200ms**
051	**00**	**SPARE LABEL**	**000000-FFFFFF**	**HEX**	**200ms**
052	**00**	**SPARE LABEL**	**000000-FFFFFF**	**HEX**	**200ms**
053	**00**	**TRAK ANG MAG**	**0-359**	**DEG**	**250ms**
	04	TRAK ANG MAG	0-359	DEG	250ms
	05	TRAK ANG MAG	0-359	DEG	250ms
054	**00**	**SPARE LABEL**	**000000-FFFFFF**	**HEX**	**200ms**
055	**00**	**SPARE LABEL**	**000000-FFFFFF**	**HEX**	**200ms**
056	**00**	**ETA**	**0-23:59.9**	**HR:MIN**	**250ms**
	02	ETA	0-23:59.9	HR:MIN	250ms
	05	WIND DIR MAG	0-359	DEG	250ms
	37	GROSS WEIGHT	0-19999	KG	250ms
057	**00**	**SPARE LABEL**	**000000-FFFFFF**	**HEX**	**200ms**
060	**00**	**LI TIRE PRES**	**0-1024**	**PSI**	**50ms**
	37	LB TIRE LOAD	0-299.9	%	100ms
	3C	LI TIRE PRES	0-1024	PSI	50ms
061	**00**	**LO TIRE PRES**	**0-1024**	**PSI**	**50ms**
	37	RB TIRE LOAD	0-299.9	%	100ms
	3C	LO TIRE PRES	0-1024	PSI	50ms
062	**00**	**RI TIRE PRES**	**0-1024**	**PSI**	**50ms**
	37	LW TIRE LOAD	0-299.9	%	100ms
	3C	RI TIRE PRES	0-1024	PSI	50ms
063	**00**	**RO TIRE PRES**	**0-1024**	**PSI**	**50ms**
	37	RW TIRE LOAD	0-299.9	%	100ms
	3C	RO TIRE PRES	0-1024	PSI	50ms
064	**00**	**NOSE TIRE**	**0-1024**	**PSI**	**50ms**
	37	NS TIRE LOAD	0-299.9	%	100ms
	3C	NOSE TIRE	0-1024	PSI	50ms

LABEL[1]	EQID	DESCRIPTION	RANGE[2,3]	UNITS	DEFAULT RATE[3]
065	**00**	**GROSS WEIGHT**	**0-12000**	**100 LB**	**100ms**
	03	GROSS WEIGHT	0-12000	100 LB	100ms
	37	GROSS WEIGHT	0-12000	100 LB	100ms
066	**00**	**LONG CG**	**0-100.00**	**% MAC**	**100ms**
	02	LONG CG	0-100.00	% MAC	100ms
	37	LONG CG	0-100.00	% MAC	100ms
067	**00**	**LAT CG**	**0-100.00**	**% MAC**	**100ms**
	37	LAT CG	0-100.00	% MAC	100ms
070	**00**	**AC FREQ ENG**	**0-512**	**Hz**	**100ms**
	02	REF AIRSPEED	0-512	KNOTS	100ms
	29	AC FREQ ENG	0-512	Hz	100ms
	CC	L PRES NORM	0-4096	PSI	100ms
071	**00**	**AC FREQ ALT**	**0-512**	**Hz**	**100ms**
	02	CLIMB SPD V2	0-512	KNOTS	50ms
	29	AC FREQ ALT	0-512	Hz	100ms
	33	VBV	0-64	DEG	50ms
	CC	L PRES ALT	0-4096	PSI	100ms
072	**00**	**STAT VAN ANG**	**0-360**	**DEG**	**100ms**
	02	ROT SPD (VR)	0-512	KNOTS	500ms
	1C	STAT VAN ANG	0-360	DEG	100ms
	29	AC VOLT ENG	0-256	VOLTS	100ms
	2F	STAT VAN ANG	0-360	DEG	100ms
	33	STAT VAN ANG	0-64	DEG	150ms
	CC	R PRES NORM	0-4096	PSI	50ms
073	**00**	**OIL QUANTITY**	**0-32768**	**CC**	**100ms**
	02	ENG FAIL SPD	0-512	KNOTS	100ms
	1C	OIL QUANTITY	0-32768	CC	100ms
	29	OIL QUANTITY	0-128	PINTS	100ms
	A2	ENG FAIL SPD	0-512	KNOTS	100ms
	CC	R PRES ALT	0-4096	PSI	50ms
074	**00**	**0 FUEL WEIGHT**	**0-1310720**	**LBS**	**100ms**
	02	0 FUEL WEIGHT	0-1310720	LBS	100ms
	2C	0 FUEL WEIGHT	0-1310720	LBS	100ms
	33	LP BLEED POS	0-4	INCHES	100ms
075	**00**	**GROSS WEIGHT**	**0-1310720**	**LBS**	**100ms**
	02	GROSS WEIGHT	0-1310720	LBS	100ms
	0B	GEODETIC ALT	0-131072	FEET	500ms
	29	AC VOLTAGE	0-256	VOLTS	100ms
	2C	GROSS WEIGHT	0-1310720	LBS	100ms
	37	GROSS WEIGHT	0-1310720	LBS	100ms
	3E	GROSS WEIGHT	0-1310720	LBS	100ms

LABEL[1]	EQID	DESCRIPTION	RANGE[2,3]	UNITS	DEFAULT RATE[3]
076	**00**	**AC VOLT BB**	**0-256**	**VOLTS**	**100ms**
	0B	GPS HEIGHT	0-131072	FEET	26ms
	29	AC VOLT BB	0-256	VOLTS	100ms
	37	LONG CG	0-163.84	% MAC	100ms
	3E	LONG CG	0-164	%	100ms
077	**00**	**AC LOAD ENG**	**0-256**	**%**	**100ms**
	02	TARGT AIRSPD	0-512	KNOTS	100ms
	0B	GPS H/V DEV	0-128	% FS	26ms
	29	AC LOAD ENG	0-256	%	100ms
	FF	AC LOAD ENG	0-256	%	100ms
100	**00**	**SEL COURSE 1**	**0-360**	**DEG**	**168ms**
	02	SEL COURSE 1	0-360	DEG	168ms
	11	SEL COURSE 1	0-360	DEG	168ms
	20	SEL COURSE 1	0-360	DEG	168ms
	29	AC LOAD	0-128	%	100ms
	37	GROSS WEIGHT	0-655360	KG	100ms
	A1	SEL COURSE 1	0-360	DEG	168ms
	B1	SEL COURSE 1	0-360	DEG	168ms
	BB	OB FLAPS PDU	0-360	DEG	20ms
101	**00**	**SEL HEADING**	**0-360**	**DEG**	**32ms**
	02	SEL HEADING	0-360	DEG	32ms
	20	SEL HEADING	0-360	DEG	32ms
	29	DC CUR (TRU)	0-256	AMPS	100ms
	A1	SEL HEADING	0-360	DEG	32ms
	BB	IB FLAPS PDU	0-360	DEG	20ms
102	**00**	**SEL ALTITUDE**	**0-65536**	**FEET**	**100ms**
	02	SEL ALTITUDE	0-65536	FEET	100ms
	20	SEL ALTITUDE	0-65536	FEET	100ms
	29	DC CUR (BAT)	0-256	AMPS	100ms
	A1	SEL ALTITUDE	0-65536	FEET	100ms
103	**00**	**SEL AIRSPEED**	**0-512**	**KNOTS**	**100ms**
	01	SEL AIRSPEED	0-512	KNOTS	100ms
	02	SEL AIRSPEED	0-512	KNOTS	100ms
	03	SEL AIRSPEED	0-512	KNOTS	100ms
	1B	LFT/PDU FLAP	0-360	DEG	100ms
	20	SEL AIRSPEED	0-512	KNOTS	100ms
	29	DC VOLT(TRU)	0-128	VOLTS	100ms
	2B	SEL AIRSPEED	0-512	KNOTS	100ms
	A1	SEL AIRSPEED	0-512	KNOTS	100ms
	BB	L OB FLP POS	0-360	DEG	20ms
104	**00**	**SEL VERT SPD**	**0-16384**	**FT/MIN**	**100ms**
	01	SEL VERT SPD	0-16384	FT/MIN	100ms
	02	SEL VERT SPD	0-16384	FT/MIN	100ms
	1B	RT/PDU FLAP	0-360	DEG	100ms
	20	SEL VERT SPD	0-16384	FT/MIN	100ms
	29	DC VOLT(BAT)	0-128	VOLTS	100ms
	2B	SEL VERT SPD	0-16384	FT/MIN	100ms
	A1	SEL VERT SPD	0-16384	FT/MIN	100ms
	BB	R OB FLP POS	0-360	DEG	20ms

LABEL[1]	EQID	DESCRIPTION	RANGE[2,3]	UNITS	DEFAULT RATE[3]
105	**00**	**SEL RNWY HDG**	**0-360**	**DEG**	**168ms**
	02	SEL RNWY HDG	0-360	DEG	168ms
	10	SEL RNWY HDG	0-360	DEG	168ms
	1B	LFT/PDU SLAT	0-360	DEG	100ms
	20	SEL RNWY HDG	0-360	DEG	168ms
	29	OIL TEMP INP	0-2048	DEG C	100ms
	A1	SEL RNWY HDG	0-360	DEG	168ms
	B0	SEL RNWY HDG	0-360	DEG	168ms
	BB	L IB FLP POS	0-360	DEG	20ms
106	**00**	**SEL MACH**	**0-4096**	**MACH**	**32ms**
	02	SEL MACH	0-4096	MACH	32ms
	1B	RT/PDU SLAT	0-360	DEG	100ms
	20	SEL MACH	0-4096	MACH	32ms
	29	OIL TEMP OUT	0-2048	DEG C	100ms
	A1	SEL MACH	0-4096	MACH	32ms
	BB	R IB FLP POS	0-360	DEG	20ms
107	**00**	**FLP/SLAT LEV**	**0-360**	**DEG**	**100ms**
	02	SEL CRUS ALT	0-65536	FEET	100ms
	1B	FLP/SLAT LEV	0-360	DEG	100ms
110	**00**	**SEL COURSE 2**	**0-360**	**DEG**	**168ms**
	01	SEL COURSE 2	0-360	DEG	168ms
	02	SEL COURSE 2	0-360	DEG	168ms
	10	SEL COURSE 2	0-360	DEG	168ms
	11	SEL COURSE 2	0-360	DEG	168ms
	20	SEL COURSE 2	0-360	DEG	168ms
	A1	SEL COURSE 2	0-360	DEG	168ms
	B1	SEL COURSE 2	0-360	DEG	168ms
111	**00**	**TEST WORD(A)**	**000000-FFFFFF**	**HEX**	**200ms**
112	**00**	**RNWY LENGTH**	**0-20480**	**FEET**	**250ms**
	02	RNWY LENGTH	0-20480	FEET	250ms
	A1	SEL EPR	0-4	NUMERIC	100ms
113	**00**	**SPARE LABEL**	**000000-FFFFFF**	**HEX**	**200ms**
114	**00**	**DESRD TRACK**	**0-360**	**DEG**	**32ms**
	02	DESRD TRACK	0-360	DEG	32ms
	29	BRAKE TMP-LI	0-2048	DEG C	100ms
	2F	AMP PRESSURE	0-32	PSI	100ms
	3F	PAMB SENSOR	0-32	PSI	100ms
	CC	WHL TORQ OUT	0-16384	LB/FT	50ms
115	**00**	**WAYPOINT BRG**	**0-360**	**DEG**	**32ms**
	02	WAYPOINT BRG	0-360	DEG	32ms
	29	BRAKE TMP-LO	0-2048	DEG C	100ms
	2F	FUEL TEMP	0-512	DEG C	100ms
	3F	FUEL TEMP	0-512	DEG C	100ms
	BC	FUEL TEMP	0-256	DEG C	500ms
	CC	WHL TORQ OUT	0-16384	LB/FT	50ms

LABEL[1]	EQID	DESCRIPTION	RANGE[2,3]	UNITS	DEFAULT RATE[3]
116	**00**	**X TRACK DIST**	**0-128**	**N.M.**	**32ms**
	02	X TRACK DIST	0-128	N.M.	32ms
	29	BRAKE TMP-RI	0-2048	DEG C	100ms
	CC	WHL TORQ OUT	0-16384	LB/FT	100ms
117	**00**	**VERT DEVIATN**	**0-2048**	**FEET**	**32ms**
	02	VERT DEVIATN	0-2048	FEET	32ms
	29	BRAKE TMP-RO	0-2048	DEG C	50ms
	CC	WHL TORQ OUT	0-16384	LB/FT	50ms
120	**00**	**RANGE TO ALT**	**0-512**	**N.M.**	**26ms**
	02	RANGE TO ALT	0-512	N.M.	26ms
121	**00**	**HZ CMD SIGN**	**0-360**	**DEG**	**50ms**
	02	HZ CMD SIGN	0-360	DEG	50ms
122	**00**	**VER CMD SIGN**	**0-360**	**DEG**	**50ms**
	02	VER CMD SIGN	0-360	DEG	50ms
123	**00**	**THROTTLE CMD**	**0-256**	**DEG/SEC**	**50ms**
	02	THROTTLE CMD	0-256	DEG/SEC	50ms
124	**00**	**SPARE LABEL**	**000000-FFFFFF**	**HEX**	**200ms**
125	**00**	**GMT**	**0-2400**	**HR:MIN**	**100ms**
	31	GMT	0-2400	HR:MIN	100ms
126	**00**	**VERT DEVIATN**	**0-32768**	**FEET**	**32ms**
	02	VERT DEVIATN	0-32768	FEET	32ms
127	**00**	**SLAT ANGLE**	**0-360**	**DEG**	**100ms**
	02	SEL LNDG ALT	0-65536	FEET	100ms
	1B	SLAT ANGLE	0-360	DEG	100ms
	33	P14	0-32	PSI	100ms
130	**00**	**FAN TTL TEMP**	**0-128**	**DEG C**	**100ms**
	1A	FAN TTL TEMP	0-128	DEG C	100ms
	1C	FAN TTL TEMP	0-128	DEG C	100ms
	2F	FAN TTL TEMP	0-128	DEG C	100ms
	30	TCAS ADV RGE	0-15.9375	N.M.	200ms
	35	TCAS ADV RGE	0-15.9375	N.M.	200ms
	3F	FAN TTL TEMP	0-128	DEG C	100ms
131	**00**	**FAN TTL PRES**	**0-32**	**PSI**	**100ms**
	1A	FAN TTL PRES	0-32	PSI	100ms
	1C	FAN TTL PRES	0-32	PSI	100ms
	2D	FAN TTL PRES	0-32	PSI	100ms
	2F	FAN TTL PRES	0-32	PSI	100ms
	30	TCAS ADV ALT	0-12700	FEET	200ms
	33	FAN TTL PRES	0-32	PSI	100ms
	35	TCAS ADV ALT	0-12700	FEET	200ms

LABEL[1]	EQID	DESCRIPTION	RANGE[2,3]	UNITS	DEFAULT RATE[3]
132	**00**	**EXH GAS PRES**	**0-32**	**PSI**	**100ms**
	1A	EXH GAS PRES	0-32	PSI	100ms
	1C	EXH GAS PRES	0-32	PSI	100ms
	30	TCAS ADV BRG	0-360	DEG	200ms
	33	EXH GAS PRES	0-32	PSI	100ms
	35	TCAS ADV BRG	0-360	DEG	200ms
133	**00**	**THRUST LEVER**	**0-360**	**DEG**	**100ms**
	1A	THRUST LEVER	0-360	DEG	100ms
	2F	THRUST LEVER	0-360	DEG	100ms
	3F	THRUST LEVER	0-360	DEG	100ms
134	**00**	**POWER LEVER**	**0-360**	**DEG**	**100ms**
	1C	POWER LEVER	0-360	DEG	100ms
135	**00**	**ENG VIBRAT[1]**	**0-8**	**IN/SEC**	**100ms**
	1C	ENG VIBRAT[1]	0-8	IN/SEC	100ms
	29	ENG FAN VIBR	0-128	%	100ms
136	**00**	**ENG VIBRAT[2]**	**0-8**	**IN/SEC**	**100ms**
	1C	ENG VIBRAT[2]	0-8	IN/SEC	100ms
137	**00**	**FLAP ANGLE**	**0-360**	**DEG**	**100ms**
	1B	FLAP ANGLE	0-360	DEG	100ms
	2A	FLAP ANGLE	0-360	DEG	100ms
	2F	THRUST FDBK	0-128	%	100ms
	3F	THRUST FDBK	0-128	%	100ms
140	**00**	**FLT DIR ROLL**	**0-360**	**DEG**	**50ms**
	01	FLT DIR ROLL	0-360	DEG	50ms
	25	FLT DIR ROLL	0-360	DEG	50ms
141	**00**	**FLT DIR PTCH**	**0-360**	**DEG**	**50ms**
	01	FLT DIR PTCH	0-360	DEG	50ms
	25	FLT DIR PTCH	0-360	DEG	50ms
142	**00**	**FAST / SLOW**	**0-32**	**KNOTS**	**32ms**
	02	FAST / SLOW	0-32	KNOTS	32ms
	03	FAST / SLOW	0-32	KNOTS	32ms
	25	FAST / SLOW	0-32	KNOTS	32ms
143[4]	**00**	**FLT DIR YAW**	**0-360**	**DEG**	**50ms**
	01	FLT DIR YAW	0-360	DEG	50ms
144[4]	**00**	**ALT. ERROR**	**0-8192**	**FEET**	**26ms**
	2B	ALT. ERROR	0-8192	FEET	26ms
145	**00**	**DSCR DATA[8]**	**000000-FFFFFF**	**HEX**	**200ms**
146	**00**	**DSCR DATA[9]**	**000000-FFFFFF**	**HEX**	**200ms**
147	**00**	**DSCR DATA[10]**	**000000-FFFFFF**	**HEX**	**200ms**

LABEL[1]	EQID	DESCRIPTION	RANGE[2,3]	UNITS	DEFAULT RATE[3]
150	**00**	**GMT**	**0-2400**	**HR:MIN**	**200ms**
	02	GMT	0-2400	HR:MIN	200ms
151	**00**	**LOC BRG TRU**	**0-360**	**DEG**	**168ms**
	02	LOC BRG TRU	0-360	DEG	168ms
152[4]	**00**	**MLS ELEVAT**	**000000-FFFFFF**	**HEX**	**200ms**
153[4]	**00**	**MAXIMUM ALT**	**000000-FFFFFF**	**HEX**	**200ms**
154	**00**	**RNWY HDG TRU**	**0-512**	**N.M.**	**84ms**
	02	RNWY HDG TRU	0-512	N.M.	84ms
155	**00**	**MLS GP ANGLE**	**000000-FFFFFF**	**HEX**	**1000ms**
156	**00**	**MAINT DATA[7]**	**000000-FFFFFF**	**HEX**	**200ms**
157	**00**	**MAINT DATA[8]**	**000000-FFFFFF**	**HEX**	**200ms**
160	**00**	**MAINT DATA[9]**	**000000-FFFFFF**	**HEX**	**200ms**
161	**00**	**MAINT DATA[10]**	**000000-FFFFFF**	**HEX**	**200ms**
162	**00**	**ADF BEARING**	**0-360**	**DEG**	**32ms**
	12	ADF BEARING	0-360	DEG	32ms
	29	CREW OX PRES	0-4096	PSI	100ms
163	**00**	**SPARE LABEL**	**000000-FFFFFF**	**HEX**	**200ms**
164	**00**	**MDA**	**0-8192**	**FEET**	**500ms**
	02	MDA	0-8192	FEET	500ms
	03	TARGT HEIGHT	0-8192	FEET	500ms
	07	RADIO HEIGHT	0-8192	FEET	26ms
	25	RADIO HEIGHT	0-8192	FEET	126ms
	3B	RADIO HEIGHT	0-32	VDC	150ms
165	**00**	**RADIO HEIGHT**	**± 7999.9**	**FEET**	**26ms**
	07	RADIO HEIGHT	± 7999.9	FEET	26ms
166	**00**	**RALT CHPT DV**	**0-512**	**FEET**	**200ms**
	07	RALT CHPT DV	0-512	FEET	200ms
167	**00**	**SPARE LABEL**	**000000-FFFFFF**	**HEX**	**200ms**
170	**00**	**DH SEL (EFI)**	**± 7000**	**FEET**	**100ms**
	25	DH SEL (EFI)	± 7000	FEET	100ms
	C5	DH SEL (EFI)	± 7000	FEET	100ms
171	**00**	**SPARE LABEL**	**000000-FFFFFF**	**HEX**	**200ms**
172	**00**	**SPARE LABEL**	**000000-FFFFFF**	**HEX**	**200ms**

LABEL[1]	EQID	DESCRIPTION	RANGE[2,3]	UNITS	DEFAULT RATE[3]
173	**00**	**LOC DEV**	**0-0.4**	**DDM**	**34ms**
	10	LOC DEV	0-0.4	DDM	34ms
	25	LOC DEV	0-0.4	DDM	34ms
	29	HYD QUANTITY	0-128	%	100ms
	3B	LOC DEV	0-4	DOTS	150ms
	BD	HYD QUANTITY	0-128	%	100ms
174	**00**	**GLS DEV**	**0-0.8**	**DDM**	**34ms**
	03	DLY FLAP SPD	0-512	KNOTS	100ms
	10	GLS DEV	0-0.8	DDM	34ms
	29	HYD PRESSURE	0-4096	PSI	100ms
	3B	GLS DEV	0-4	DOTS	150ms
175	**00**	**ECON SPEED**	**0-1024**	**N.M.**	**64ms**
	03	ECON SPEED	0-1024	N.M.	64ms
	29	EGT (APU)	0-2048	DEG C	100ms
	33	HYD DRN TEMP	0-256	DEG C	100ms
176	**00**	**ECON MACH**	**0-4096**	**MACH**	**64ms**
	03	ECON MACH	0-4096	MACH	64ms
	29	RPM (APU)	0-256	% RPM	100ms
	38	LF STAT PRES	0-2048	MB	20ms
	5A	FUEL TEMP	0-512	DEG C	100ms
	AD	LF STAT PRES	0-2048	MB	20ms
177	**00**	**ECON FLT LEV**	**0-131072**	**FEET**	**32ms**
	03	ECON FLT LEV	0-131072	FEET	32ms
	29	OIL QUANTITY	0-128	PINTS	100ms
	38	RT STAT PRES	0-2048	MB	20ms
	5A	FUEL TEMP	0-512	DEG C	100ms
	AD	RT STAT PRES	0-2048	MB	20ms
200	**00**	**DRIFT ANGLE**	**± 180**	**DEG**	**100ms**
	02	DRIFT ANGLE	± 180	DEG	100ms
	04	DRIFT ANGLE	± 180	DEG	100ms
	5A	FUEL TEMP	0-512	DEG C	100ms
201	**00**	**DME DISTANCE**	**-1-399.99**	**N.M.**	**84ms**
	09	DME DISTANCE	-1-399.99	N.M.	84ms
	5A	FUEL TEMP	0-512	DEG C	100ms
202	**00**	**DME DISTANCE**	**0-512**	**N.M.**	**84ms**
	02	EM CLEAN	0-512	N.M.	100ms
	09	DME DISTANCE	0-512	N.M.	84ms
	5A	FUEL TEMP	0-512	DEG C	100ms
203	**00**	**ALTITUDE**	**0-131072**	**FEET**	**32ms**
	02	EM SPD BRAKE	0-512	N.M.	100ms
	06	ALTITUDE	0-131072	FEET	32ms
	18	ALTITUDE	0-131072	FEET	32ms
	38	ALTITUDE	0-131072	FEET	32ms
	5A	FUEL TEMP	0-512	DEG C	100ms

LABEL[1]	EQID	DESCRIPTION	RANGE[2,3]	UNITS	DEFAULT RATE[3]
204	**00**	**BARD ALT.[#1]**	**0-131072**	**FEET**	**32ms**
	02	UTL AIRSPEED	0-512	KNOTS	500ms
	06	BARD ALT.[#1]	0-131072	FEET	32ms
	38	BARD ALT.[#1]	0-131072	FEET	32ms
	5A	FUEL TEMP	0-512	DEG C	100ms
205	**00**	**MACH**	**0-4096**	**MACH**	**64ms**
	02	HF COM FREQ	2.8-24	MHZ	100ms
	06	MACH	0-4096	MACH	64ms
	1A	MACH	0-4096	MACH	64ms
	38	MACH	0-4096	MACH	64ms
	B9	HF COM FREQ	2.8-24	MHZ	100ms
	5A	FUEL TEMP	0-512	DEG C	100ms
206	**00**	**CMP AIRSPEED**	**0-1024**	**KNOTS**	**64ms**
	06	CMP AIRSPEED	0-1024	KNOTS	64ms
	38	CMP AIRSPEED	0-1024	KNOTS	64ms
	CC	TAXI SPEED	0-512	KNOTS	50ms
207	**00**	**MAX AIRSPEED**	**0-1024**	**KNOTS**	**64ms**
	06	MAX AIRSPEED	0-1024	KNOTS	64ms
	0A	MAX AIRSPEED	0-512	KNOTS	100ms
	38	MAX AIRSPEED	0-1024	KNOTS	64ms
210	**00**	**TRU AIRSPEED**	**0-2048**	**KNOTS**	**64ms**
	06	TRU AIRSPEED	0-2048	KNOTS	64ms
	38	TRU AIRSPEED	0-2048	KNOTS	64ms
211	**00**	**TTL AIR TEMP**	**0-512**	**DEG C**	**250ms**
	02	TTL AIR TEMP	0-512	DEG C	250ms
	03	TTL AIR TEMP	0-512	DEG C	250ms
	06	TTL AIR TEMP	0-512	DEG C	250ms
	1A	TTL AIR TEMP	0-512	DEG C	250ms
	38	TTL AIR TEMP	0-512	DEG C	250ms
212	**00**	**ALTITUD RATE**	**0-32768**	**FT/MIN**	**32ms**
	04	ALTITUD RATE	0-32768	FT/MIN	32ms
	05	ALTITUD RATE	0-32768	FT/MIN	32ms
	06	ALTITUD RATE	0-32768	FT/MIN	32ms
	38	ALTITUD RATE	0-32768	FT/MIN	32ms
	3B	ALTITUD RATE	0-32768	FT/MIN	32ms
213	**00**	**STAT AIR TMP**	**0-512**	**DEG C**	**250ms**
	02	STAT AIR TMP	0-512	DEG C	250ms
	06	STAT AIR TMP	0-512	DEG C	250ms
	38	STAT AIR TMP	0-512	DEG C	250ms
	8D	FUEL USED	0-262144	LBS.	76ms
214	**00**	**SPARE LABEL**	**000000-FFFFFF**	**HEX**	**200ms**
215	**00**	**IMPACT PRESS**	**0-512**	**MB**	**64ms**
	06	IMPACT PRESS	0-512	MB	64ms
	1A	IMPACT PRESS	0-512	MB	64ms
	29	EPR ACTUAL	0-4	NUMERIC	50ms
	38	IMPACT PRESS	0-512	MB	64ms
	AD	DIFF PRESS	0-512	MB	20ms

LABEL[1]	EQID	DESCRIPTION	RANGE[2,3]	UNITS	DEFAULT RATE[3]
216	**00**	**SPARE LABEL**	**000000-FFFFFF**	**HEX**	**200ms**
217	**00**	**STATIC PRESS**	**0-64**	**IN HG**	**64ms**
	06	STATIC PRESS	0-64	IN HG	64ms
	29	EPR LIMIT	0-4	NUMERIC	100ms
	38	STATIC PRESS	0-64	IN HG	64ms
	AD	AV STAT PRES	0-2048	MB	20ms
220	**00**	**BARO ALT.[#2]**	**0-131072**	**FEET**	**32ms**
	06	BARO ALT.[#2]	0-131072	FEET	32ms
	38	BARO ALT.[#2]	0-131072	FEET	32ms
221	**00**	**ANG ATACK AV**	**0-360**	**DEG**	**32ms**
	06	ANG ATACK AV	0-360	DEG	32ms
	38	ANG ATACK AV	0-360	DEG	32ms
	AD	ANG ATACK AV	0-360	DEG	32ms
222	**00**	**VOR BRG**	**0-360**	**DEG**	**50ms**
	06	ANG ATTACK 1L	0-369	DEG	32ms
	11	VOR BRG	0-360	DEG	50ms
223	**00**	**ANG ATACK 1R**	**0-360**	**DEG**	**32ms**
	06	ANG ATACK 1R	0-360	DEG	32ms
224	**00**	**ANG ATACK 2L**	**0-360**	**DEG**	**32ms**
	06	ANG ATACK 2L	0-360	DEG	32ms
225	**00**	**ANG ATACK 2R**	**0-360**	**DEG**	**32ms**
	02	MIN AIRSPEED	0-512	KNOTS	500ms
	06	ANG ATACK 2R	0-360	DEG	32ms
	2B	ALTITUD RATE	0-32768	FT/MIN	26ms
226	**00**	**SPARE LABEL**	**000000-FFFFFF**	**HEX**	**200ms**
227	**00**	**BITE COMMAND**	**00-7F**	**COMMAND #**	**120ms**
	7E	BITE COMMAND	00-7F	COMMAND #	120ms
230	**00**	**TRU AIRSPEED**	**100-599**	**KNOTS**	**250ms**
	06	TRU AIRSPEED	100-599	KNOTS	250ms
	38	TRU AIRSPEED	100-599	KNOTS	250ms
231	**00**	**TTL AIR TEMP**	**-060-+099**	**DEG C**	**250ms**
	06	TTL AIR TEMP	-060-+099	DEG C	250ms
	38	TTL AIR TEMP	-060-+099	DEG C	250ms
	AD	TTL AIR TEMP	0-512	DEG C	20ms
232	**00**	**ALTITUD RATE**	**± 20000**	**FT/MIN**	**32ms**
	04	ALTITUD RATE	± 20000	FT/MIN	32ms
	05	ALTITUD RATE	± 20000	FT/MIN	32ms
	06	ALTITUD RATE	± 20000	FT/MIN	32ms
233	**00**	**STAT AIR TMP**	**-099-+060**	**DEG C**	**250ms**
	06	STAT AIR TMP	-099-+060	DEG C	250ms
	38	STAT AIR TMP	-099-+060	DEG C	250ms

LABEL[1]	EQID	DESCRIPTION	RANGE[2,3]	UNITS	DEFAULT RATE[3]
234	**00**	**BARO (MB)[#1]**	**745-1050**	**MB**	**64ms**
	06	BARO (MB)[#1]	745-1050	MB	64ms
	38	BARO (MB)[#1]	745-1050	MB	64ms
235	**00**	**BARO (IN)[#1]**	**22-31**	**IN HG**	**64ms**
	06	BARO (IN)[#1]	22-31	IN HG	64ms
	38	BARO (IN)[#1]	22-31	IN HG	64ms
236	**00**	**BARO (MB)[#2]**	**745-1050**	**MB**	**64ms**
	06	BARO (MB)[#2]	745-1050	MB	64ms
	38	BARO (MB)[#2]	745-1050	MB	64ms
237	**00**	**BARO (IN)[#2]**	**22-31**	**IN HG**	**64ms**
	06	BARO (IN)[#2]	22-31	IN HG	64ms
	38	BARO (IN)[#2]	22-31	IN HG	64ms
240	**00**	**SPARE LABEL**	**000000-FFFFFF**	**HEX**	**200ms**
241	**00**	**COR AOA**	**0-360**	**DEGREES**	**32ms**
	02	MIN AIRSPEED	0-512	KNOTS	500ms
	06	COR AOA	0-360	DEGREES	32ms
	38	COR AOA	0-360	DEGREES	32ms
242	**00**	**TOTAL PRESUR**	**0-2048**	**MB**	**64ms**
	06	TOTAL PRESUR	0-2048	MB	64ms
	1A	TOTAL PRESUR	0-2048	MB	64ms
	38	TOTAL PRESUR	0-2048	MB	64ms
	3B	SPEED DEV	0-4	DOTS	150ms
	AD	TOTAL PRESUR	0-2048	MB	64ms
243	**00**	**SPARE LABEL**	**000000-FFFFFF**	**HEX**	**200ms**
244	**00**	**FUEL FLOW ED**	**0-32768**	**LBS/HR**	**100ms**
	1C	FUEL FLOW ED	0-32768	LBS/HR	100ms
	33	FUEL FLOW	0-32768	LBS/HR	150ms
	3B	MACH ERROR	0-0.064	MACH	150ms
	8D	FUEL FLOW	0-32768	LBS/HR	76ms
245	**00**	**MIN AIRSPEED**	**0-256**	**KNOTS**	**64ms**
	02	MIN AIRSPEED	0-256	KNOTS	64ms
	03	MIN AIRSPEED	0-256	KNOTS	64ms
	0A	MIN AIRSPEED	0-512	KNOTS	64ms
	29	N3 (ENGINE)	0-256	% RPM	50ms
	38	AV STAT PRES	0-2048	MB	64ms
	3B	EPR ERROR	0-4	NUMERIC	150ms
246	**00**	**N1 (ENG DIR)**	**0-4096**	**RPM**	**100ms**
	02	VCMAX	0-512	KNOTS	50ms
	06	AV STAT PRES	0-2048	MB	64ms
	1C	N1 (ENG DIR)	0-4096	RPM	100ms
	29	N1 (ENG DIR)	0-256	% RPM	50ms
	38	AV STAT PRES	0-2048	MB	64ms
	3B	AOA ERROR	0-360	DEG	150ms

LABEL[1]	EQID	DESCRIPTION	RANGE[2,3]	UNITS	DEFAULT RATE[3]
247	**00**	**TOTAL FUEL**	**0-655360**	**LBS.**	**500ms**
	02	VCMIN	0-512	KNOTS	100ms
	1F	TOTAL FUEL	0-655360	LBS.	500ms
	2C	TOTAL FUEL	0-655360	LBS.	500ms
	3B	SPEED ERROR	0-256	KNOTS	150ms
	4D	TOTAL FUEL	0-655360	LBS.	500ms
	EB	FUEL REMAIN	0-1638400	LBS.	100ms
250	**00**	**PSEL FUEL QT**	**0-655360**	**LBS.**	**100ms**
	02	CONT N1 LMT	0-256	% RPM	50ms
	2B	MAX EPR LMT	0-4	NUMERIC	100ms
	2C	PSEL FUEL QT	0-655360	LBS.	100ms
	38	IND SS ANGLE	0-360	DEG	32ms
	AD	IND SS ANGLE	0-360	DEG	32ms
251	**00**	**BARO ALT.[#3]**	**0-131072**	**FEET**	**32ms**
	01	DIST TO GO	0-4096	N.M.	100ms
	02	DIST TO GO	0-4096	N.M.	100ms
	06	BARO ALT.[#3]	0-131072	FEET	32ms
	1A	LEG COUNTER	0-4095	LEGS	76ms
	38	BARO ALT.[#3]	0-131072	FEET	32ms
252	**00**	**BARO ALT.[#4]**	**0-131072**	**FEET**	**32ms**
	01	TIME TO GO	0-512	MIN	100ms
	02	TIME TO GO	0-512	MIN	100ms
	06	BARO ALT.[#4]	0-131072	FEET	32ms
	1A	EPR IDLE	0-4	NUMERIC	100ms
	2F	EPR IDLE REF	0-4	NUMERIC	100ms
	38	BARO ALT.[#4]	0-131072	FEET	32ms
	3F	EPR IDLE REF	0-4	NUMERIC	100ms
	EB	TIME TIL JET	0-64	MIN	500ms
253	**00**	**GO-A EPR LMT**	**0-4**	**NUMERIC**	**100ms**
	02	GO-A N1 LMT	0-256	% RPM	50ms
	1E	GO-A EPR LMT	0-4	NUMERIC	100ms
	38	COR SS ANGLE	0-360	DEG	32ms
254	**00**	**CRUS EPR LMT**	**0-4**	**NUMERIC**	**100ms**
	02	CRUS N1 LMT	0-256	% RPM	50ms
	1E	CRUS EPR LMT	0-4	NUMERIC	100ms
255	**00**	**CLMB EPR LMT**	**0-4**	**NUMERIC**	**100ms**
	02	CLIMB N1 LMT	0-256	% RPM	50ms
	1E	CLMB EPR LMT	0-4	NUMERIC	100ms
	2F	MAX CLMB EPR	0-4	NUMERIC	100ms
	3F	MAX CLMB EPR	0-4	NUMERIC	100ms
	8E	SPOILER POS	0-360	DEG	50ms
256	**00**	**FUEL QTY [#1]**	**0-131072**	**LBS.**	**500ms**
	02	TIME 4 CLIMB	0-512	MIN	100ms
	0A	V STICK SHKR	0-512	KNOTS	100ms
	2C	FUEL QTY [#1]	0-131072	LBS.	500ms
	37	FUEL QTY [#1]	0-131072	LBS.	500ms
	4D	TANKS 757/67	0-163840	LBS.	500ms

LABEL[1]	EQID	DESCRIPTION	RANGE[2,3]	UNITS	DEFAULT RATE[3]
257	**00**	**FUEL QTY [#2]**	**0-131072**	**LBS.**	**500ms**
	02	TIME 4 DSCNT	0-512	MIN	100ms
	2C	FUEL QTY [#2]	0-131072	LBS.	500ms
	37	FUEL QTY [#2]	0-131072	LBS.	500ms
260	**00**	**DATE/FLT LEG**	**31-12-9**	**DAY/MON/LEG**	**500ms**
	02	DATE/FLT LEG	31-12-9	DAY/MON/LEG	500ms
	2C	FUEL QTY [#3]	0-131072	LBS.	500ms
	33	T5	0-1024	DEG C	150ms
	A2	DATE/FLT LEG	31-12-9	DAY/MON/LEG	500ms
261	**00**	**FLIGHT #**	**0-9999**	**NUMERIC**	**500ms**
	02	FLIGHT #	0-9999	NUMERIC	500ms
	2C	FUEL QTY [#4]	0-131072	LBS.	500ms
	33	P49	0-128	PSI	150ms
	A2	FLIGHT #	0-9999	NUMERIC	500ms
262	**00**	**FUEL QTY [#5]**	**0-131072**	**LBS.**	**500ms**
	0A	AIRSPEED VAR	0-256	KNOTS	100ms
	1C	LP EXIT PRES	0-256	PSI	100ms
	2C	FUEL QTY [#5]	0-131072	LBS.	500ms
	33	LP EXIT PRES	0-64	PSI	150ms
263	**00**	**FUEL QTY [#6]**	**0-131072**	**LBS.**	**500ms**
	02	MINIMUM AFR	0-512	KNOTS	500ms
	0A	MINIMUM AFR	0-512	KNOTS	100ms
	1C	LP EXIT TEMP	0-256	DEG C	100ms
	2C	FUEL QTY [#6]	0-131072	LBS.	500ms
	33	LP EXIT TEMP	0-256	DEG C	100ms
264	**00**	**FUEL QTY [#7]**	**0-131072**	**LBS.**	**500ms**
	02	TIME 2 TCHDN	0-2048	MIN	100ms
	0A	MINIMUM ASR	0-512	KNOTS	100ms
	1C	HP EXIT PRES	0-512	PSI	100ms
	2C	FUEL QTY [#7]	0-131072	LBS.	500ms
	2F	BURNER PRES	0-512	PSI	100ms
	33	HP EXIR PTES	0-512	PSI	150ms
	3F	BURNER PRES	0-512	PSI	100ms
265	**00**	**FUEL QTY [#8]**	**0-131072**	**LBS.**	**500ms**
	02	MIN AIRSPEED	0-512	KNOTS	50ms
	0A	MANUV AIRSPD	0-512	KNOTS	100ms
	1C	HP EXIT TEMP	0-1024	DEG C	100ms
	2C	FUEL QTY [#8]	0-131072	LBS.	500ms
	33	HP EXIT TEMP	0-1024	DEG C	150ms
266	**00**	**TEST WORD B**	**000000-FFFFFF**	**HEX**	**200ms**
267	**00**	**THRTL POS CM**	**0-360**	**DEG**	**50ms**
	02	MAX MANV SPD	0-512	KNOTS	500ms
	0A	MAX MANV SPD	0-512	KNOTS	100ms
	2B	THRTL POS CM	0-360	DEG	50ms
	33	SPATE T/C	0-256	DEG C	150ms

LABEL[1]	EQID	DESCRIPTION	RANGE[2,3]	UNITS	DEFAULT RATE[3]
270	**00**	**DSCR DATA [1]**	**000000-FFFFFF**	**HEX**	**200ms**
271	**00**	**DSCR DATA [2]**	**000000-FFFFFF**	**HEX**	**200ms**
272	**00**	**DSCR DATA [3]**	**000000-FFFFFF**	**HEX**	**200ms**
273	**00**	**DSCR DATA [4]**	**000000-FFFFFF**	**HEX**	**200ms**
274	**00**	**DSCR DATA [5]**	**000000-FFFFFF**	**HEX**	**200ms**
275	**00**	**DSCR DATA [6]**	**000000-FFFFFF**	**HEX**	**200ms**
276	**00**	**DSCR DATA [7]**	**000000-FFFFFF**	**HEX**	**200ms**
277	**00**	**GEN TEST WD**	**000000-FFFFFF**	**HEX**	**200ms**
300	**00**	**SPARE LABEL**	**000000-FFFFFF**	**HEX**	**200ms**
301	**00**	**SPARE LABEL**	**000000-FFFFFF**	**HEX**	**200ms**
302	**00**	**SPARE LABEL**	**000000-FFFFFF**	**HEX**	**200ms**
303	**00**	**SPARE LABEL**	**000000-FFFFFF**	**HEX**	**200ms**
304	**00**	**SPARE LABEL**	**000000-FFFFFF**	**HEX**	**200ms**
305	**00**	**SPARE LABEL**	**000000-FFFFFF**	**HEX**	**200ms**
306	**00**	**SPARE LABEL**	**000000-FFFFFF**	**HEX**	**200ms**
307	**00**	**SPARE LABEL**	**000000-FFFFFF**	**HEX**	**200ms**
310	**00**	**PRES POS LAT**	**180N-180S**	**DEG**	**100ms**
	02	PRES POS LAT	180N-180S	DEG	100ms
	04	PRES POS LAT	180N-180S	DEG	100ms
	29	AILERON POS	0-360	DEG	50ms
	38	PRES POS LAT	180N-180S	DEG	100ms
311	**00**	**PRES POS LNG**	**180E-180W**	**DEG**	**100ms**
	02	PRES POS LNG	180E-180W	DEG	100ms
	04	PRES POS LNG	180E-180W	DEG	100ms
	29	AILERON TRIM	0-360	DEG	50ms
	38	PRES POS LNG	180E-180W	DEG	100ms
	3B	ROLL FORCE	0-64	LBS.	150ms
312	**00**	**GROUND SPEED**	**0-4096**	**KNOTS**	**26ms**
	02	GROUND SPEED	0-4096	KNOTS	26ms
	04	GROUND SPEED	0-4096	KNOTS	26ms
	05	GROUND SPEED	0-4096	KNOTS	26ms
	29	RUDDER POS	0-360	DEG	50ms
	38	GROUND SPEED	0-4096	KNOTS	26ms

LABEL[1]	EQID	DESCRIPTION	RANGE[2,3]	UNITS	DEFAULT RATE[3]
313	**00**	**TRK ANG TRUE**	**0-360**	**DEG**	**26ms**
	02	TRK ANG TRUE	0-360	DEG	26ms
	04	TRK ANG TRUE	0-360	DEG	26ms
	25	TRK ANG TRUE	0-360	DEG	126ms
	29	RUDDER TRIM	0-360	DEG	50ms
	38	TRK ANG TRUE	0-360	DEG	26ms
314	**00**	**TRUE HEADING**	**0-360**	**DEG**	**26ms**
	02	STAB POS IND	0-360	DEG	26ms
	04	TRUE HEADING	0-360	DEG	26ms
	25	TRUE HEADING	0-360	DEG	126ms
	29	ELEVATOR POS	0-360	DEG	50ms
	38	TRUE HEADING	0-360	DEG	26ms
	3B	PITCH FORCE	0-64	LBS.	150ms
315	**00**	**WIND SPEED**	**0-256**	**KNOTS**	**50ms**
	01	STAB POS	0-360	DEG	26ms
	02	WIND SPEED	0-256	KNOTS	50ms
	04	WIND SPEED	0-256	KNOTS	50ms
	05	WIND SPEED	0-256	KNOTS	50ms
	29	STAB POS	0-360	DEG	50ms
	38	WIND SPEED	0-256	KNOTS	50ms
	A1	STAB POS	0-360	DEG	26ms
316	**00**	**WIND ANGLE**	**0-360**	**DEG**	**50ms**
	02	WIND DIR TRU	0-360	DEG	26ms
	04	WIND ANGLE	0-360	DEG	50ms
	29	ENG OIL TEMP	0-2048	DEG C	100ms
	38	WIND ANGLE	0-360	DEG	50ms
317	**00**	**TRK ANG MAG**	**0-360**	**DEG**	**26ms**
	02	TRK ANG MAG	0-360	DEG	26ms
	04	TRK ANG MAG	0-360	DEG	26ms
	05	TRK ANG MAG	0-360	DEG	26ms
	25	TRK ANG MAG	0-360	DEG	126ms
	29	ENG OIL PRES	0-4096	PSI	50ms
	38	TRK ANG MAG	0-360	DEG	26ms
320	**00**	**MAG HEADING**	**0-360**	**DEG**	**26ms**
	04	MAG HEADING	0-360	DEG	26ms
	05	MAG HEADING	0-360	DEG	26ms
	25	MAG HEADING	0-360	DEG	126ms
	38	MAG HEADING	0-360	DEG	26ms
321	**00**	**DRIFT ANGLE**	**0-360**	**DEG**	**26ms**
	02	DRIFT ANGLE	0-360	DEG	26ms
	04	DRIFT ANGLE	0-360	DEG	26ms
	05	DRIFT ANGLE	0-360	DEG	26ms
	38	DRIFT ANGLE	0-360	DEG	26ms
322	**00**	**FLT PATH ANG**	**0-360**	**DEG**	**26ms**
	02	FLT PATH ANG	0-360	DEG	26ms
	04	FLT PATH ANG	0-360	DEG	26ms
	05	FLT PATH ANG	0-360	DEG	26ms
	38	FLT PATH ANG	0-360	DEG	26ms

LABEL[1]	EQID	DESCRIPTION	RANGE[2,3]	UNITS	DEFAULT RATE[3]
323	**00**	**FLT PATH ACL**	**0-4**	**G**	**10ms**
	04	FLT PATH ACL	0-4	G	10ms
	05	FLT PATH ACL	0-4	G	10ms
	38	FLT PATH ACL	0-4	G	10ms
324	**00**	**PITCH ANGLE**	**0-360**	**DEG**	**10ms**
	04	PITCH ANGLE	0-360	DEG	10ms
	05	PITCH ANGLE	0-360	DEG	10ms
	25	PITCH ANGLE	0-360	DEG	126ms
	38	PITCH ANGLE	0-360	DEG	10ms
325	**00**	**ROLL ANGLE**	**0-360**	**DEG**	**10ms**
	04	ROLL ANGLE	0-360	DEG	10ms
	05	ROLL ANGLE	0-360	DEG	10ms
	25	ROLL ANGLE	0-360	DEG	126ms
	2F	STAT VANE FB	0-4	INCHES	100ms
	38	ROLL ANGLE	0-360	DEG	10ms
	3F	STAT VANE FB	0-4	INCHES	100ms
326	**00**	**BDY PITCH RT**	**0-128**	**DEG/SEC**	**10ms**
	04	BDY PITCH RT	0-128	DEG/SEC	10ms
	05	BDY PITCH RT	0-128	DEG/SEC	10ms
	38	BDY PITCH RT	0-128	DEG/SEC	10ms
327	**00**	**BDY ROLL RT**	**0-128**	**DEG/SEC**	**10ms**
	04	BDY ROLL RT	0-128	DEG/SEC	10ms
	05	BDY ROLL RT	0-128	DEG/SEC	10ms
	38	BDY ROLL RT	0-128	DEG/SEC	10ms
330	**00**	**BDY YAW RATE**	**0-128**	**DEG/SEC**	**10ms**
	04	BDY YAW RATE	0-128	DEG/SEC	10ms
	05	BDY YAW RATE	0-128	DEG/SEC	10ms
	2F	HT/TC POS FB	0-128	%	100ms
	38	BDY YAW RATE	0-128	DEG/SEC	10ms
	3F	HT/TC POS FB	0-128	%	100ms
331	**00**	**BDY LNG ACCL**	**0-4**	**G**	**10ms**
	04	BDY LNG ACCL	0-4	G	10ms
	05	BDY LNG ACCL	0-4	G	10ms
	2F	LTC POS FB	0-128	%	100ms
	38	BDY LNG ACCL	0-4	G	10ms
	3F	LTC POS FB	0-128	%	100ms
332	**00**	**BDY LAT ACCL**	**0-4**	**G**	**10ms**
	04	BDY LAT ACCL	0-4	G	10ms
	05	BDY LAT ACCL	0-4	G	10ms
	2F	A/O POS FB	0-128	%	100ms
	38	BDY LAT ACCL	0-4	G	10ms
	3F	A/O POS FB	0-128	%	100ms

LABEL[1]	EQID	DESCRIPTION	RANGE[2,3]	UNITS	DEFAULT RATE[3]
333	**00**	**BDY NRM ACCL**	**0-4**	**G**	**10ms**
	04	BDY NRM ACCL	0-4	G	10ms
	05	BDY NRM ACCL	0-4	G	10ms
	2F	ACCL FF LMT	0-32768	LBS/HR	100ms
	38	BDY NRM ACCL	0-4	G	10ms
	3F	ACCL FF LMT	0-32768	LBS/HR	100ms
334	**00**	**PLTFORM HDNG**	**0-360**	**DEG**	**20ms**
	04	PLTFORM HDNG	0-360	DEG	20ms
	05	PLTFORM HDNG	0-360	DEG	20ms
	2F	FF COMMAND	0-32768	LBS/HR	100ms
	38	PLTFORM HDNG	0-360	DEG	20ms
	3F	FF COMMAND	0-32768	LBS/HR	100ms
335	**00**	**TRK ANG RATE**	**0-32**	**DEG/SEC**	**10ms**
	04	TRK ANG RATE	0-32	DEG/SEC	10ms
	05	TRK ANG RATE	0-32	DEG/SEC	10ms
	2F	2.5 BLD POS	0-128	%	100ms
	38	TRK ANG RATE	0-32	DEG/SEC	10ms
	3F	2.5 BLD POS	0-128	%	100ms
336	**00**	**INRT PTCH RT**	**0-128**	**DEG/SEC**	**10ms**
	04	INRT PTCH RT	0-128	DEG/SEC	10ms
	05	INRT PTCH RT	0-128	DEG/SEC	10ms
	1A	ENG TORQUE	0-256	%	100ms
	2F	N2 COR 2.5	0-128	%	100ms
	38	INRT PTCH RT	0-128	DEG/SEC	10ms
	3F	N2 COR 2.5	0-128	%	100ms
337	**00**	**INRT ROLL RT**	**0-128**	**DEG/SEC**	**10ms**
	04	INRT ROLL RT	0-128	DEG/SEC	10ms
	05	INRT ROLL RT	0-128	DEG/SEC	10ms
	1A	ENG RATING	0-256	%	100ms
	38	INRT ROLL RT	0-128	DEG/SEC	10ms
340	**00**	**EPR ACTUAL**	**0-4**	**NUMERIC**	**100ms**
	03	EPR ACTUAL	0-4	NUMERIC	100ms
	1A	EPR ACTUAL	0-4	NUMERIC	100ms
	29	EPR ACTUAL	0-4	NUMERIC	100ms
	2D	EPR ACTUAL	0-4	NUMERIC	100ms
	2F	EPR ACTUAL	0-4	NUMERIC	100ms
	33	EPR ACTUAL	0-4	NUMERIC	100ms
	3F	EPR ACTUAL	0-4	NUMERIC	100ms
341	**00**	**EPR COMMAND**	**0-4**	**NUMERIC**	**100ms**
	02	EPR COMMAND	0-4	NUMERIC	100ms
	03	EPR COMMAND	0-4	NUMERIC	100ms
	1A	EPR COMMAND	0-4	NUMERIC	100ms
	29	EPR COMMAND	0-4	NUMERIC	100ms
	2F	EPR COMMAND	0-4	NUMERIC	100ms
	3F	EPR COMMAND	0-4	NUMERIC	100ms

LABEL[1]	EQID	DESCRIPTION	RANGE[2,3]	UNITS	DEFAULT RATE[3]
342	**00**	**EPR LIMIT**	**0-4**	**NUMERIC**	**100ms**
	02	N1 BUG DRIVE	0-256	% RPM	100ms
	03	EPR LIMIT	0-4	NUMERIC	100ms
	1A	EPR MAXIMUM	0-4	NUMERIC	100ms
	29	EPR LIMIT	0-4	NUMERIC	100ms
	2F	MAX AVL EPR	0-4	NUMERIC	100ms
	3B	EPR LIMIT	0-4	NUMERIC	100ms
	3F	MAX AVL EPR	0-4	NUMERIC	100ms
343	**00**	**EPR RATE**	**0-4**	**NUMERIC**	**100ms**
	03	EPR RATE	0-4	NUMERIC	100ms
	1A	N1 DEMAND	0-256	% RPM	20ms
344	**00**	**N2**	**0-256**	**%RPM**	**50ms**
	1A	N2	0-256	%RPM	50ms
	1C	N2	0-256	%RPM	50ms
	29	N2	0-256	%RPM	50ms
	2F	N2	0-256	%RPM	50ms
	33	N2	0-256	%RPM	50ms
	3F	N2	0-256	%RPM	50ms
345	**00**	**EGT**	**0-2048**	**DEG C**	**100ms**
	1A	EGT	0-2048	DEG C	100ms
	1C	EGT	0-2048	DEG C	100ms
	29	EGT	0-2048	DEG C	100ms
	2F	EGT	0-2048	DEG C	100ms
	33	EGT	0-2048	DEG C	100ms
	3F	EGT	0-2048	DEG C	100ms
346	**00**	**N1 ACTUAL**	**0-256**	**%RPM**	**100ms**
	03	N1 ACTUAL	0-256	%RPM	100ms
	1A	N1 ACTUAL	0-256	%RPM	100ms
	2F	N1 ACTUAL	0-256	%RPM	100ms
	33	N1 ACTUAL	0-256	%RPM	100ms
	3F	N1 ACTUAL	0-256	%RPM	100ms
347[4]	**00**	**FUEL FLOW**	**0-32768**	**LBS/HR**	**50ms**
	29	FUEL FLOW	0-32768	LBS/HR	50ms
	37	FUEL FLOW	0-32768	LBS/HR	50ms
350	**00**	**FAULT SUMMARY**	**000000-FFFFFF**	**HEX**	**1000ms**
351	**00**	**MAINT DATA [2]**	**000000-FFFFFF**	**HEX**	**200ms**
352	**00**	**MAINT DATA [3]**	**000000-FFFFFF**	**HEX**	**200ms**
353	**00**	**MAINT DATA [4]**	**000000-FFFFFF**	**HEX**	**200ms**
354	**00**	**MAINT DATA [5]**	**000000-FFFFFF**	**HEX**	**200ms**
355	**00**	**ACKNOWLEDGE**	**000000-FFFFFF**	**HEX**	**200ms**
356	**00**	**MAINT ISO #5**	**A-Z,A-Z,A-Z**	**ISO ALPHA**	**200ms**
	7E	BITE STATUS	NUMERIC		200ms

LABEL[1]	EQID	DESCRIPTION	RANGE[2,3]	UNITS	DEFAULT RATE[3]
357	**00**	**ISO ALPHA #5**	**A-Z,A-Z,A-Z**	**ISO ALPHA**	**200ms**
360	**00**	**POT VERT SPD**	**0-32768**	**FT/MIN**	**10ms**
	04	POT VERT SPD	0-32768	FT/MIN	10ms
	05	POT VERT SPD	0-32768	FT/MIN	10ms
	38	POT VERT SPD	0-32768	FT/MIN	10ms
361	**00**	**INR ALTITUDE**	**0-131072**	**FEET**	**20ms**
	04	INR ALTITUDE	0-131072	FEET	20ms
	05	INR ALTITUDE	0-131072	FEET	20ms
	38	INR ALTITUDE	0-131072	FEET	20ms
362	**00**	**ATRK HZ ACCL**	**0-4**	**G**	**10ms**
	04	ATRK HZ ACCL	0-4	G	10ms
	38	ATRK HZ ACCL	0-4	G	10ms
363	**00**	**X TRACK ACCL**	**0-4**	**G**	**10ms**
	04	X TRACK ACCL	0-4	G	10ms
	38	X TRACK ACCL	0-4	G	10ms
364	**00**	**VERT ACCEL**	**0-4**	**G**	**10ms**
	04	VERT ACCEL	0-4	G	10ms
	05	VERT ACCEL	0-4	G	10ms
	38	VERT ACCEL	0-4	G	10ms
365	**00**	**INR VERT VEL**	**0-32768**	**FT/MIN**	**20ms**
	04	INR VERT VEL	0-32768	FT/MIN	20ms
	05	INR VERT VEL	0-32768	FT/MIN	20ms
	38	INR VERT VEL	0-32768	FT/MIN	20ms
366	**00**	**N-S VELOCITY**	**0-4096**	**KNOTS**	**50ms**
	04	N-S VELOCITY	0-4096	KNOTS	50ms
	38	N-S VELOCITY	0-4096	KNOTS	50ms
367	**00**	**E-W VELOCITY**	**0-4096**	**KNOTS**	**100ms**
	04	E-W VELOCITY	0-4096	KNOTS	100ms
	38	E-W VELOCITY	0-4096	KNOTS	100ms
370	**00**	**DH SEL (EFI)**	**0-8192**	**FEET**	**100ms**
	04	BODY NRM ACL	0-8	NUMERIC	100ms
	05	BODY NRM ACL	0-8	NUMERIC	100ms
	25	DH SEL (EFI)	0-8192	FEET	100ms
	C5	DH SEL (EFI)	0-16384	FEET	100ms
371	**00**	**GA EQUIP ID**	**000000-FFFFFF**	**HEX**	**200ms**
372	**00**	**WIND DIR MAG**	**0-360**	**DEG**	**50ms**
	05	WIND DIR MAG	0-360	DEG	50ms
373	**00**	**N-S VEL MAGN**	**0-4096**	**KNOTS**	**100ms**
	05	N-S VEL MAGN	0-4096	KNOTS	100ms
374	**00**	**E-W VEL MAGN**	**0-4096**	**KNOTS**	**100ms**
	05	E-W VEL MAGN	0-4096	KNOTS	100ms

LABEL[1]	EQID	DESCRIPTION	RANGE[2,3]	UNITS	DEFAULT RATE[3]
375	**00**	**A HDG ACCEL**	**0-4**	**G**	**10ms**
	05	A HDG ACCEL	0-4	G	10ms
	33	SPARE DC 1	0-16	VDC	150ms
376	**00**	**X HDG ACCEL**	**0-4**	**G**	**10ms**
	05	X HDG ACCEL	0-4	G	10ms
	33	SPARE DC 2	0-16	VDC	150ms
377	**00**	**EQUIPMENT ID**	**000000-FFFFFF**	**HEX**	**200ms**

NOTES:

1. Default (EQID 00) label definitions shown in **BOLD**.

2. Ranges shown are those specified by ARINC Specification 429-11 (Attachment 2) and are provided for reference only. The 429EX does not perform range checking to prevent over or under range entries. The user should insure that the ranges entered are within limits when making entries in the TX mode.

3. When in the TX mode, if you change the EQID after the label has been entered, you must reenter the label in order for the unit to revert to the default data and rate values of the new EQID. Otherwise, the values previously entered will be maintained.

4. These labels contain certain EQID codes that are referred TO by ARINC Specification 429-11 (Attachment 2) as being defined by other ARINC specifications. The 429EX label definition table does not support these codes.

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