# OPERATION MANUAL

# DATATRAC 200
## DATABUS ANALYZER

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## REVISION HISTORY

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## 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.

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# SECTION I

# GENERAL INFORMATION

## 1.1 INTRODUCTION

This document is furnished to customers of Aeroflex, to provide detailed instruction for the operation of the DATATRAC 200 unit. It contains all necessary illustrations and information to allow the unit to be interfaced with appropriate electronic equipment and operated in all of its modes: receive, transmit, record, and break. This section provides a general overview of the unit's features and operation. A detailed specification is also provided which describes its application and handling.

## 1.2 IDENTIFICATION

The unit's model description, DATATRAC 200, appears on the front of the unit and identifies it as a combination ARINC 429 and CSDB bus monitor. A serial tag on the rear of the unit provides serial number and revision status information. This plate must remain attached to the unit and referred to when reporting problems to Aeroflex personnel.

## 1.3 DESCRIPTION

The DATATRAC 200 is a digital data bus monitor, simulator, and recorder designed to support the development, production test, and field service of avionics equipment. The unit supports interface with either ARINC 429 or CSDB standard data buses. With its internal battery as well as external power provisions, all features valuable for laboratory testing are also available for ramp or in-flight troubleshooting.

The front and rear views of the unit are illustrated in Figures 1-1 and 1-2, respectively. The eight line display allows viewing of many data words simultaneously. It also supports a highly simplified setup of functions through the use of menu screens.

A pot adjustment allows the user to optimize the display contrast and viewing angle.

The upper left switch on the front of the unit is the master power control for the DATATRAC 200; battery charging circuits remain activated even with this switch off if external power has been connected to the rear of the unit.

The two slide switches on the front of the unit are used to select between the high and low speed buses of both the ARINC 429 and CSDB transmit and receive functions.

For each of the two data bus standards, the DATATRAC 200 allows four basic modes of operation:

RECEIVE: The user is able to select specific labels to receive or to allow the unit to receive all incoming data. Either hexadecimal, decimal, or binary format may be selected for the data display. In addition to displaying the label and data value, the update rate of the transmission is also presented. The user may scroll to place a desired label at the top of the display or view all of the received data.

TRANSMIT: The transmit capability applies to either the digital bus data or analog data outputted via a D/A converter and driver. Up to 16 digital words may be transmitted at various rates allowing most LRU's to be completely simulated. Output data is specified in hexadecimal units. A real time update capability allows the user to edit the output data without halting transmission. The D/A output may be setup to output a static value selected from the keyboard, convert received digital data to analog output, or to generate a trigger pulse on selected conditions of a received digital word.

RECORD: The DATATRAC 200 may be used to record and playback received data. The label and desired record rate are specified as a part of the setup procedure. At any time while data is being recorded or after all available memory has been filled, the user may select playback mode and examine the data either in hexadecimal format, as a strip chart-like recording in graphics mode, or as analog data on the D/A output line.

BREAKPOINT: This mode is used to halt the DATATRAC 200 when a specified label and data value have been received. After the break condition has been generated, a history of all received data may be examined.

**1.4 SPECIFICATION**

Table 1-1 provides characteristics and specifications for the DATATRAC 200.

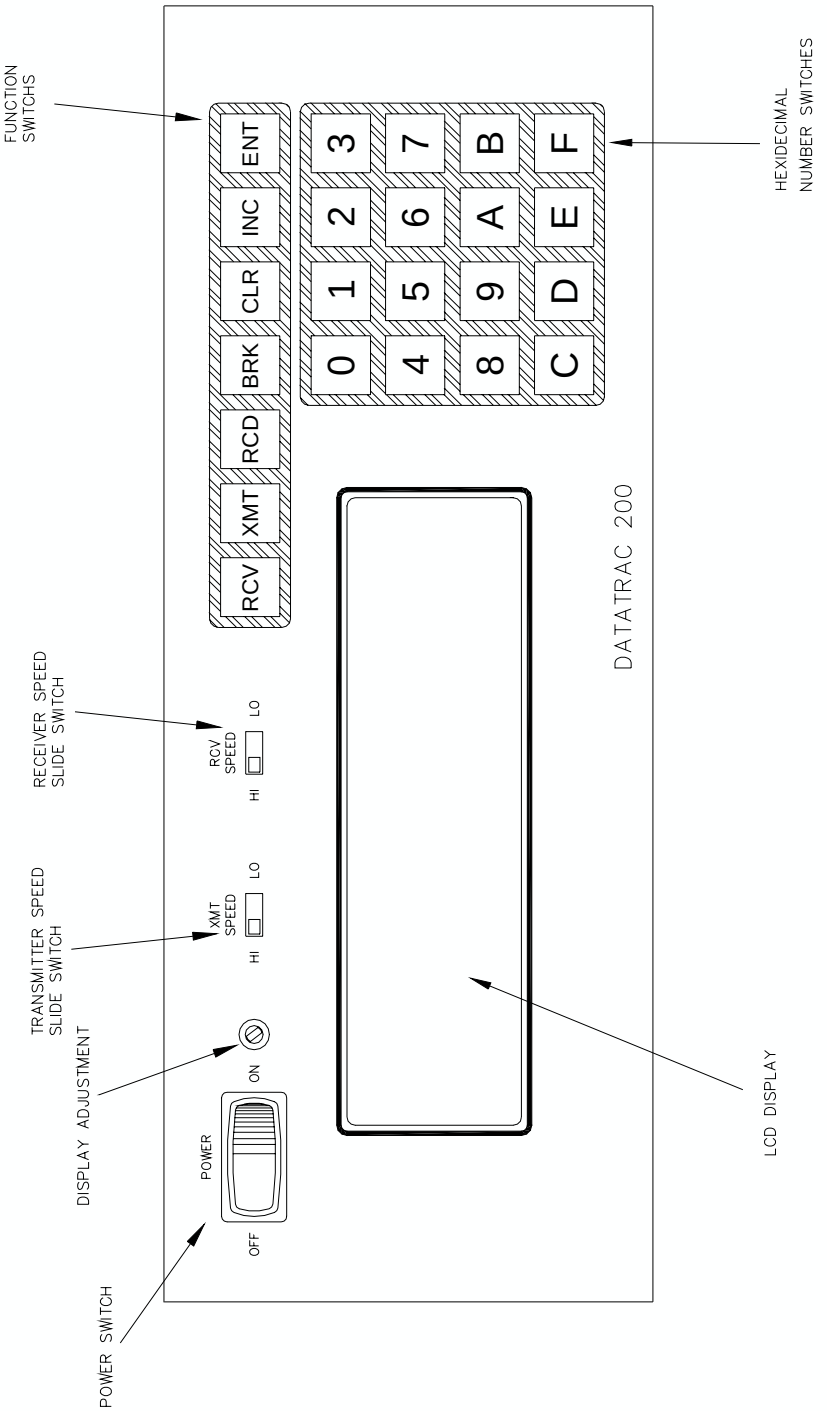



FIGURE 1-1
DATATRAC 200 FRONT VIEW

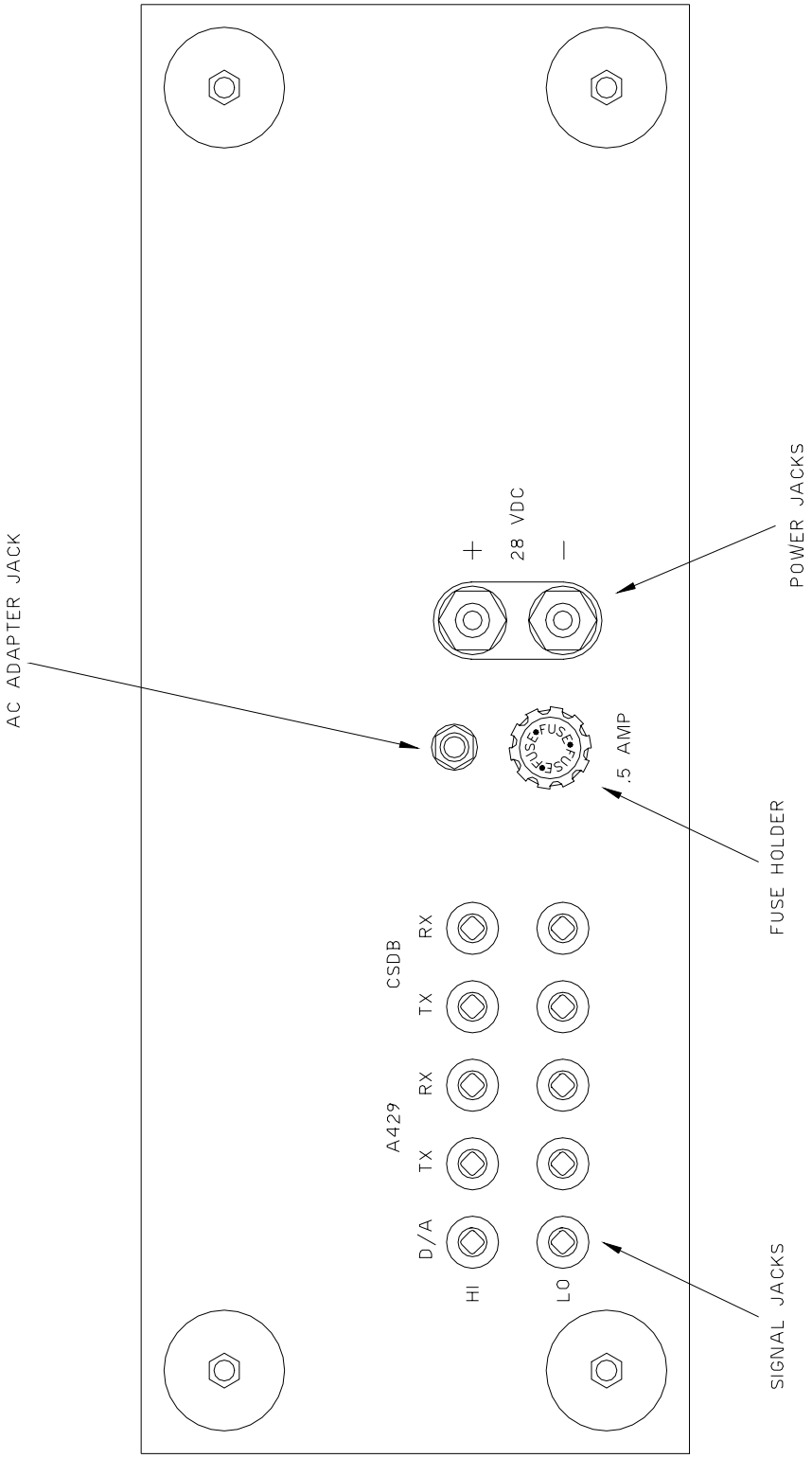



FIGURE 1-2
DATATRAC 200 REAR VIEW

TABLE 1-1 DATATRAC 200 SPECIFICATION

| ITEM | SPECIFICATION |
|---|---|
| SIZE | 5.0 IN. HEIGHT, 12.5 IN. WIDTH, 11.6 IN. DEPTH |
| WEIGHT | 7.5 LBS. |
| TEMPERATURE | 0 TO 40 DEG C |
| CASE | BLACK ABS PLASTIC |
| HANDLING | 15 G |
| DISPLAY | LIQUID CRYSTAL WITH 8 LINE BY 40 CHARACTER MODE OR 64 BY 256 DOT GRAPHICS MODE |
| POWER | 28.0 +/-1.0 VDC AT 8.4 WATTS or<br>115 VAC, 60 HZ (AC ADAPTER) AT 7 WATTS or<br>12 VDC INTERNAL BATTERY |
| BATTERY CAPACITY | 1.2 AMP-HR (PROVIDES BETWEEN 3 TO 6 HRS OPERATION DEPENDING ON STATE OF CHARGE, MODE OF OPERATION, ETC.) |
| DATA BUS | ARINC 429: ELECTRICAL AND DATA FORMAT CHARACTERISTICS PER A429-10.<br>HIGH AND LOW SPEED RECEIVE.<br>HIGH AND LOW SPEED TRANSMIT.<br><br>CSDB: ELECTRICAL CHARACTERISTIC PER RS422. DATA FORMAT PER COLLINS DOC. 523-0772774-00411R. HIGH AND LOW SPEED RECEIVE. HIGH AND LOW SPEED TRANSMIT. |
| D/A OUTPUT | +/-5.0 VDC RANGE.<br>SOURCE IMPEDANCE – 150 OHMS.<br>NOISE LEVEL - 100 MV. |

# SECTION II

# INSTALLATION

## 2.1 INTRODUCTION

This section provides information regarding the handling and maintenance of the DATATRAC 200 as well as interconnection information for various installations. The user is urged to read and follow all recommendations in this section very carefully to achieve many years of trouble free operation with the DATATRAC 200.

## 2.2 UNPACKING AND INSPECTION

The DATATRAC 200 has been carefully packed to survive all normal shipping and handling conditions. It is important that the customer immediately inspect the received shipment to ensure that all items are present and undamaged.

Contents:
1. DATATRAC 200 unit
2. Recoton Model AD 550 AC Adapter
3. Maintenance/Overhaul Manual

Inspect all items thoroughly for physical damage. If no damage is evident, connect the AC adapter to the unit and plug into a 110 VAC, 60 HZ wall outlet. Turn the power switch on the front of the DATATRAC 200 to ON. The basic Arinc 429/CSDB setup screen should immediately appear. If a problem is encountered at this point, verify that the 0.5 amp fuse is not open and contact an Aeroflex representative for assistance. DO NOT OPEN THE UNIT AND ATTEMPT REPAIRS.

The internal battery should be in a charged state, but as a precaution it is recommended that the unit be connected to 110 VAC, 60 Hz power through the AC adapter overnight before attempting to operate from the internal battery. The battery will be charged with the unit's power switch in the on or off position.

## 2.3 PHYSICAL HANDLING AND STORAGE

While the unit has been designed and manufactured for durability in a field support environment, the user is urged to take all reasonable precautions in the handling, operation, and storage of the DATATRAC 200. Avoid temperature conditions outside the 0 to 40 degree C range. While transporting or shipping protect against vibration or shocks beyond 15 G's.

## 2.4 POWER AND SIGNAL CONNECTION

The DATATRAC 200 may be powered with its internal battery or with external power. The source of the external power may be the AC adapter supplied with the unit or some source of 28 VDC power. IT IS IMPORTANT THAT THE OPERATOR NOT ATTEMPT TO SUBSTITUTE OTHER AC ADAPTERS FOR THE RECOTON AD550 SUPPLIED WITH THE DATATRAC 200. This adapter provides the proper voltage and polarity for the DATATRAC 200. Adjustment exist for polarity and voltage level which have been factory preset to the "+" polarity switch position and the highest voltage setting. The adapter switches have been covered by protective tape to prevent their inadvertent change. The adapter should be plugged into the jack on the rear of the unit above the fuse. With the adapter powered, it may be left connected to the unit indefinitely and will maintain the battery in a fully charged state.

A convenient source of 28 VDC may also be used to power the unit. Care should be taken to make sure that this power is regulated to within ± 1 VDC. The 0.5 amp fuse protects the unit from anomalies of either the AC adapter or 28 VDC power.

Signal connections with the DATATRAC 200 are made through banana jacks on the rear of the unit. Five high and low pairs of jacks allow the following connections:

A/D Output
A429 Transmit
A429 Receive
CSDB Transmit
CSDB Receive

**2.5 DISPLAY ADJUSTMENT**

The display may be adjusted for contrast and viewing angle with a pot located on the front panel next to the power switch as shown in Figure 1-1.

**2.6 BATTERY CHARGING**

A sealed lead acid battery contained within the DATATRAC 200 will normally provide problem free operation indefinitely. Fading of the display is an indication of battery discharge, and the unit should not remain powered after the display becomes difficult to read.

The internal charging circuit provides an ideal charging profile for the 12 volt battery. The first part of the cycle consists of a current limit of 0.25 amps. After the battery charge reduces the input current below 0.25 amps, a constant 14.7 volts is applied to the battery until current drops below approximately 10 milliamps. At this point a maintenance voltage of 13.5 volts is held on the battery. Either the AC adapter or the 28 VDC connection will charge and maintain the internal battery. A 3 to 4 hour period will generally restore 75% charge and an overnight, to 24 hour, period will ensure a peak charged condition.

# SECTION III

# OPERATION

## 3.1 INTRODUCTION

This section provides detailed instructions for operation of all functions of the DATATRAC 200. Independent subsections are dedicated to the two different bus standards: ARINC 429 and CSDB. A highly consistent format is used in the menu driven setup of all modes. Figures 1-1 and 1-2 containing illustrations of the front and rear views of the unit will be referred to frequently in the text.

## 3.2 FOUR BASIC MODES

After power on, the following screen will appear on the LCD display. It indicates that the unit is operating normally and first requests the operator to select either A for A429 mode or C for CSDB mode.

```
THE DATATRAC 200 IS OPERATIONAL

SELECT MODE (A=A429, C-CSDB): A
SELECT FUNCTION (RCV=RECEIVE,
XMT=TRANSMIT, RCD=RECORD): RCV

PRESS 'ENT' WHEN COMPLETE
```

Whether the operator has selected A429 or CSDB, four basic modes or functions are available to aid in the development and testing of his digital systems. These modes are receive, transmit, record, and break and are selected with the first four pushbuttons in the function row (top row of seven buttons shown in Figure 1-1). The user is prompted to select one of three functions, receive, transmit, or record, at this point in the setup. The break function is active only when the receiver has been setup and can not be selected here in the initial setup menu. After the initial selection of a function on this menu, the user may transition between functions by completing the current setup screen and then pushing the desired function button. The theory of operation remains the same for both modes with only slight variations for data format differences between A429 and CSDB.

The remaining three buttons in the function row are clear, increment and enter. These support setup operations for the four functions. The four by four keypad area contains all of the hexadecimal pushbuttons as well as the ± pushbutton.

In general, the hexadecimal pushbuttons are used to input setup information, and the 'ENT' key "loads" this data when the setup is complete. The 'CLR' key is used to erase and re-enter information prior to pushing the 'ENT' key.

An 'ENT' after the mode and function selection will lead to a series of setup screens appropriate to the selected mode and function. Transition between A429 and CSDB may only be performed when this menu is present. This menu is displayed if all functions have been turned 'off'.

## 3.3 ARINC 429 OPERATION

### 3.3.1 A429 RECEIVE MODE

#### 3.3.1.1 GENERAL RECEIVER SETUP DESCRIPTION

The A429 receiver setup screen is shown below.

DATA RECEIVER SETUP

SET HI/LO RECEIVER SWITCH: HI
SELECT FORMAT (1=DEC,2=HEX,3=BIN): DEC
SELECT LABELS (1=ALL,2=SEL,3=OFF): ALL

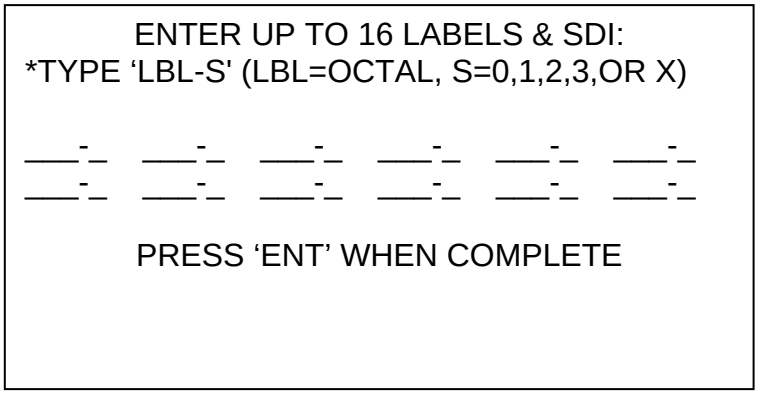
PRESS 'ENT' WHEN COMPLETE

The receiver speed slide switch is indicated in Figure 1-1 and must be set for either the 100 KHz (HI) or 12.5 KHz (LO) speed of the received bus.

The second setup line prompts the user for a decimal (engineering units), hexadecimal, or binary choice. This selection is made by pressing either the 1, 2, or 3 pushbutton. The basic presentation formats are hexadecimal or binary, and all data will be intelligently presented in these formats. For certain data words, however, range and scaling information have been prestored in an internal table so that these labels may be viewed with their information presented as decimal values and discretes. The list of scaled words is given in Table 3-1 along with their display formats. Press the 'INC' pushbutton for the next setup line.

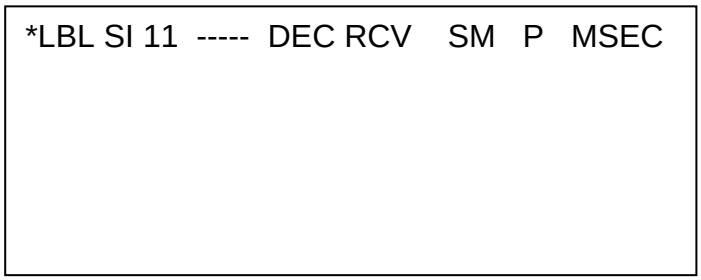
The third line allows the user to select 'ALL' to receive all incoming labels (up to 255), ‘SEL’ to preset only a selected set of labels (up to 16) to be received and displayed, or 'OFF' to turn the receiver off. The 'Select' mode may be desirable to reduce cluttering of the display or to place several desired labels in a particular order for viewing. 'Select' mode must also be setup in order to obtain a history of received data in break mode. This is discussed in more detail in section 3.3.4. When the same label is received in 'ALL' mode with different SDI'S, each label/SDI combination is displayed independently on separate lines.

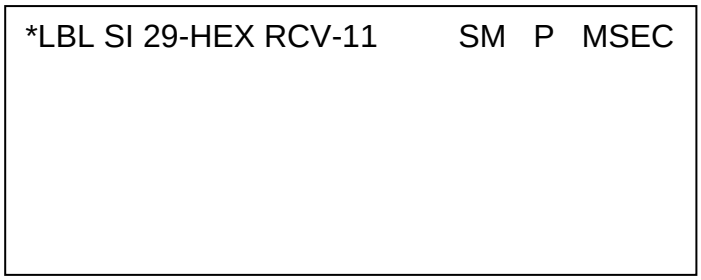
After making this final selection, press the 'ENT' pushbutton for the label selection screen. Note that if 'ALL' had been selected, the next screen would be the received data itself.

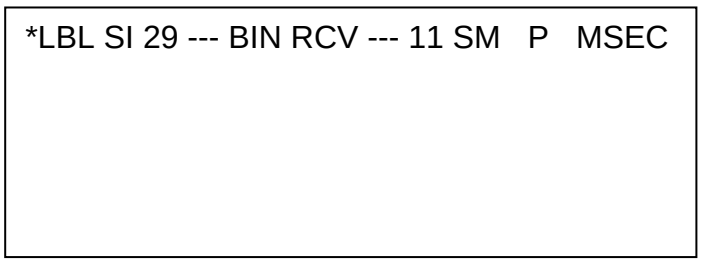



When defining the select labels, the user is prompted for the SDI as well as the label. The label should be entered in octal. A 0, 1, 2, or 3 (BCD representation for bits 10,9) may be entered and will cause the display of only that label/SDI combination when received. The user may alternatively push 'D’ for 'don't care' after entering the label (this will appear as 'X’). In this case, the SDI will be ignored and only one display of the specified label will appear. After the initial setup of the select labels or after operating in 'ALL' mode, the previous setup will be displayed when this menu is entered again. The labels may be edited by using the 'INC' key to move the cursor to the desired label to edit. Labels may be deleted by placing the cursor on the label to be deleted and pressing the 'CLR’ key.

A429 data will be displayed with one of the following screens.




The SDI bit order is bit 10, bit 9 and the SSM order is bit 31, bit 30. A 1 in the parity display column indicates that odd parity has been received. The data field will contain either a 4 to 5 digit decimal value, a 5 character hexadecimal value, or a 19 bit binary value. A set of enhanced labels are indicated by the asterisks in Table 3-1 and feature a more complete information display described in a later section. The instantaneous rate accurate to ± 10% is displayed in milliseconds. To rotate lines upward, sequentially press the 'INC' pushbutton. If no data is present on the digital bus at mode selection, a "NO DATA RECEIVED" message will appear. When a bus has been active but ceases to transmit data, the last data displayed will remain on the screen, but a set of double asterisks will appear 2 seconds after the bus has been lost.

If the receiver is operating in 'ALL' mode, the data is displayed in numerical order and may be quickly scrolled to a particular label by typing in the desired label to be viewed.

At any time while displaying dynamic data, the user may "freeze" the display by pressing 'ENT'. To return to normal display operation, press any key. The 'CLR' pushbutton can be used to clear old information from the display.

TABLE 3-1

DECIMAL MODE SCALING FOR A429

| LABEL | BNR/BCD | PARAMETER | SCALE | REFERENCE |
|---|---|---|---|---|
| 001 | BCD | DISTANCE TO GO | 0-3999.9 NM | A429 |
| 002 | BCD | TIME TO GO | 0-399.9 MIN | A429 |
| 003 | BCD | CROSS TRACK DIST. | 0-399.9 NM | A429 |
| 004 | BCD | RWY. DIST. TO GO | 0-79900. FT | A429 |
| 005 | ---------- HEX FORMAT ONLY---------- | | | |
| 006 | ---------- HEX FORMAT ONLY---------- | | | |
| 007 | ---------- HEX FORMAT ONLY---------- | | | |
| 010 | BCD | PRES. POS. LAT | N/S 180 DEG | A429 |
| 011 | BCD | PRES. POS. LONG. | E/W 180 DEG | A429 |
| 012 | BCD | GROUND SPEED | 0-2000. KTS | A429 |
| 013 | BCD | TRACK ANGLE | 0-359.9 DEG | A429 |
| 014 | BCD | MAG. HEADING | 0-359.9 DEG | A429 |
| 015 | BCD | WIND SPEED | 0-799. KTS | A429 |
| 016 | BCD | WIND DIRECTION | 0-359 DEG | A429 |
| 017 | * | ENHANCED LABEL | - SEE SECTION 3.3.1.4 | |
| 020 | BCD | SEL. VERT. SPD. | +/-6000. FPM | A429 |
| 021 | BCD | SEL. EPR | 0-3 | A429 |
| 022 | BCD | SEL. MACH | 0-4 | A429 |
| 023 | BCD | SEL. HEADING | 0-359 DEG | A429 |
| 024 | BCD | SEL. COURSE #1 | 0-359 DEG | A429 |
| 025 | BCD | SEL. ALT | 0-50000 FT | A429 |
| 026 | BCD | SEL. AIRSPD | 0-450 KTS | A429 |
| 027 | BCD | SEL. COURSE #2 | 0-359 DEG | A429 |
| 030 | * | ENHANCED LABEL - SEE SECTION 3.3.1.4 | | |
| 031 | * | ENHANCED LABEL - SEE SECTION 3.3.1.4 | | |
| 032 | * | ENHANCED LABEL - SEE SECTION 3.3.1.4 | | |
| 033 | * | ENHANCED LABEL - SEE SECTION 3.3.1.4 | | |
| 034 | * | ENHANCED LABEL - SEE SECTION 3.3.1.4 | | |
| 035 | * | ENHANCED LABEL - SEE SECTION 3.3.1.4 | | |
| 036 | * | ENHANCED LABEL - SEE SECTION 3.3.1.4 | | |
| 037 | * | ENHANCED LABEL - SEE SECTION 3.3.1.4 | | |
| 040 | ---------- HEX FORMAT ONLY---------- | | | |
| 041 | BCD | SET LATITUDE | N/S 180 DEG | A429 |
| 042 | BCD | SET LONGITUDE | E/W 180 DEG | A429 |
| 043 | BCD | SET HEADING | 0-359 DEG | A429 |
| 044 | BCD | TRUE HEADING | 0-359.9 DEG | A429 |
| 045 | BCD | MIN AIRSPEED | 0-259.9 | A429 |
| 046 | ---------- HEX FORMAT ONLY---------- | | | |
| 047 | ---------- HEX FORMAT ONLY---------- | | | |

| LABEL | BNR/BCD | PARAMETER | SCALE | REFERENCE |
|---|---|---|---|---|
| 050 | ---------- | HEX FORMAT ONLY---------- | | |
| 051 | ---------- | HEX FORMAT ONLY---------- | | |
| 052 | ---------- | HEX FORMAT ONLY---------- | | |
| 053 | BCD | TRACK ANGLE - MAG | 0-369 | A429 |
| 054 | ---------- | HEX FORMAT ONLY---------- | | |
| 055 | ---------- | HEX FORMAT ONLY---------- | | |
| 056 | BCD | WIND DIR - MAG | 0-359 | A429 |
| 057 | ---------- | HEX FORMAT ONLY---------- | | |
| 060 | ---------- | HEX FORMAT ONLY---------- | | |
| 061 | ---------- | HEX FORMAT ONLY---------- | | |
| 062 | ---------- | HEX FORMAT ONLY---------- | | |
| 063 | ---------- | HEX FORMAT ONLY---------- | | |
| 064 | ---------- | HEX FORMAT ONLY---------- | | |
| 065 | BCD | GROSS WT | 0-12000 100LB | A429 |
| 066 | BCD | LONG. CG | 0-100 %MAC | A429 |
| 067 | BCD | LAT. CG | 0-100 %MAC | A429 |
| 070 | BNR | AC FREQ | +/- 512 HZ | A429 |
| 071 | BNR | AC FREQ | +/- 512 HZ | A429 |
| 072 | BNR | STATOR VANE ANGLE | +/- 180 DEG | A429 |
| 073 | BNR | V1 | +/- 512 KTS | A429 |
| 074 | BNR | ZERO FUEL WT. | +/- 13107 10LB | A429 |
| 075 | BNR | GROSS WT. | +/- 13107 10LB | A429 |
| 076 | BNR | AC VOLTAGE | +/- 256 VOLTS | A429 |
| 077 | BNR | TARGET AIRSPEED | +/- 512 KTS | A429 |
| 100 | BNR | SELECTED COURSE | +/- 180 DEG | A429 |
| 101 | BNR | SELECTED HEADING | +/- 180 DEG | A429 |
| 102 | BNR | SELECTED ALTITUDE | 0-65536 FT | A429 |
| 103 | BNR | SELECTED AIRSPEED | 0-512 KTS | A429 |
| 104 | BNR | SELECTED VERT SPD | +/- 16384 FPM | A429 |
| 105 | BNR | SELECTED RWY HDG | +/- 180 DEG | A429 |
| 106 | BNR | SELECTED MACH | +/- 4096 mMACH | A429 |
| 107 | ---------- | HEX FORMAT ONLY---------- | | |
| 110 | BNR | SELECTED COURSE | +/- 180 DEG | A429 |
| 111 | ---------- | HEX FORMAT ONLY---------- | | |
| 112 | BNR | RWY LENGTH | 0-20480 FT | A429 |
| 113 | ---------- | HEX FORMAT ONLY---------- | | |
| 114 | BNR | DESIRED TRACK | +/- 180 DEG | A429 |
| 115 | BNR | WAYPT BEARING | +/- 180 DEG | A429 |
| 116 | BNR | CRS TRK DIST | +/- 128 NM | A429 |
| 117 | BNR | VERT DEV | +/- 2048 FT | A429 |
| 120 | BNR | RANGE TO ALT | +/- 512 NM | A429 |
| 121 | BNR | HORIZ. CMD | +/- 180 DEG | A429 |
| 122 | BNR | VERT. CMD | +/- 180DEG | A429 |
| 123 | BNR | THROTTLE CMD | +/- 256 DEG/SEC | A429 |
| 124 | ---------- | HEX FORMAT ONLY---------- | | |
| 125 | ---------- | HEX FORMAT ONLY---------- | | |
| 126 | ---------- | HEX FORMAT ONLY---------- | | |
| 127 | BNR | SLAT ANGLE | +/- 180 DEG | A429 |

| LABEL | BNR/BCD | PARAMETER | SCALE | REFERENCE |
|---|---|---|---|---|
| 130 | BNR | FAN INLET TOT TEMP | +/- 128 DEG C | A429 |
| 131 | BNR | FAN INLET TOT PRES | +/- 32 PSIA | A429 |
| 132 | BNR | EXH GAS TOT PRES | +/- 32 PSIA | A429 |
| 133 | BNR | THRST LEVER ANGLE | +/- 180 DEG | A429 |
| 134 | BNR | PWR LEVER ANGLE | +/- 180 DEG | A429 |
| 135 | BNR | ENG VIBRATION | +/- 8 IPS | A429 |
| 136 | BNR | ENG VIBRATION | +/- 8 IPS | A429 |
| 137 | BNR | FLAP ANGLE | +/- 180 DEG | A429 |
| 140 | BNR | FLT DIR ROLL | +/- 180 DEG | A429 |
| 141 | BNR | FLT DIR PIT | +/- 180 DEG | A429 |
| 142 | BNR | FLT DIR F/S | +/- 32 KTS | A429 |
| 143 | BNR | FLT DIR YAW | +/- 180 DEG | A429 |
| 144 | BNR | ALT ERR | +/- 8192 FT | A429 |
| 145 | ---------- | HEX FORMAT ONLY | ---------- | |
| 146 | ---------- | HEX FORMAT ONLY | ---------- | |
| 147 | ---------- | HEX FORMAT ONLY | ---------- | |
| 150 | ---------- | HEX FORMAT ONLY | ---------- | |
| 151 | BNR | LOC BEARING | +/- 180 DEG | A429 |
| 152 | ---------- | HEX FORMAT ONLY | ---------- | |
| 153 | ---------- | HEX FORMAT ONLY | ---------- | |
| 154 | BNR | RUNWAY | +/- 512 NM | A429 |
| 155 | ---------- | HEX FORMAT ONLY | ---------- | |
| 156 | ---------- | HEX FORMAT ONLY | ---------- | |
| 157 | ---------- | HEX FORMAT ONLY | ---------- | |
| 160 | ---------- | HEX FORMAT ONLY | ---------- | |
| 161 | ---------- | HEX FORMAT ONLY | ---------- | |
| 162 | BNR | ADF BEARING | +/- 180 DEG | A429 |
| 163 | ---------- | HEX FORMAT ONLY | ---------- | |
| 164 | BNR | MIN DESC ALT | +/- 8192 FT | A429 |
| 165 | ---------- | HEX FORMAT ONLY | ---------- | |
| 166 | BNR | RALT CHK PT DEV | +/- 512 FT | A429 |
| 167 | ---------- | HEX FORMAT ONLY | ---------- | |
| 170 | ---------- | HEX FORMAT ONLY | ---------- | |
| 171 | ---------- | HEX FORMAT ONLY | ---------- | |
| 172 | ---------- | HEX FORMAT ONLY | ---------- | |
| 173 | BNR | LOC DEV | +/- .4 DDM | A429 |
| 174 | BNR | GS DEV | +/- .8 DDM | A429 |
| 175 | BNR | ECON SPD | +/- 1024 KTS | A429 |
| 176 | BNR | ECON MACH | +/- 4096 mMACH | A429 |
| 177 | BNR | ECON FLT LEV | +/- 131072 FT | A429 |
| 200 | ---------- | HEX FORMAT ONLY | ---------- | |
| 201 | ---------- | HEX FORMAT ONLY | ---------- | |
| 202 | BNR | DME DIST | +/- 512 NM | A429 |
| 203 | BNR | ALTITUDE | +/- 131072 FT | A429 |
| 204 | BNR | BARO COR ALT #1 | +/- 131072 FT | A429 |
| 205 | BNR | MACH | +/- 4.096 | A429 |
| 206 | BNR | COMP AIRSPD | +/- 1024 KTS | A429 |
| 207 | BNR | MAX ALLOW AIRSPD | +/- 1024 KTS | A429 |

| LABEL | BNR/BCD | PARAMETER | SCALE | REFERENCE |
|---|---|---|---|---|
| 210 | BNR | TAS | +/- 2048 KTS | A429 |
| 211 | BNR | TAT | +/- 512 KTS | A429 |
| 212 | BNR | ALTITUDE RATE | +/- 32768 FPM | A429 |
| 213 | BNR | SAT | +/- 512 DEG C | A429 |
| 214 | ---------- | HEX FORMAT ONLY | ---------- | |
| 215 | BNR | IMPACT PRES | +/- 512 MB | A429 |
| 216 | ---------- | HEX FORMAT ONLY | ---------- | |
| 217 | BNR | STATIC PRES | +/- 64 IN HG | A429 |
| 220 | BNR | BARO CORR ALT #2 | +/- 131072 | A429 |
| 221 | BNR | IND AOA (AVG) | +/- 180 DEG | A429 |
| 222 | BNR | IND AOA (1# LEFT) | +/- 180 DEG | A429 |
| 223 | BNR | IND AOA (#1 RT) | +/- 180 DEG | A429 |
| 224 | BNR | IND AOA (#2 LFT) | +/- 180 DEG | A429 |
| 225 | BNR | IND AOA (#2 RT) | +/- 180 DEG | A429 |
| 226 | ---------- | HEX FORMAT ONLY | ---------- | |
| 227 | ---------- | HEX FORMAT ONLY | ---------- | |
| 230 | ---------- | HEX FORMAT ONLY | ---------- | |
| 231 | ---------- | HEX FORMAT ONLY | ---------- | |
| 232 | ---------- | HEX FORMAT ONLY | ---------- | |
| 233 | ---------- | HEX FORMAT ONLY | ---------- | |
| 234 | ---------- | HEX FORMAT ONLY | ---------- | |
| 235 | ---------- | HEX FORMAT ONLY | ---------- | |
| 236 | ---------- | HEX FORMAT ONLY | ---------- | |
| 237 | ---------- | HEX FORMAT ONLY | ---------- | |
| 240 | ---------- | HEX FORMAT ONLY | ---------- | |
| 241 | BNR | CORR AOA | +/- 180 DEG | A429 |
| 242 | BNR | TOT PRESS | +/- 2048 MB | A429 |
| 243 | ---------- | HEX FORMAT ONLY | ---------- | |
| 244 | BNR | FUEL FLOW | +/- 32768 LB/HR | A429 |
| 245 | BNR | MIN AIRSPD | +/- 256 KTS | A429 |
| 246 | BNR | AOA ERROR | +/- 180 DEG | A429 |
| 247 | BNR | SPD ERROR | +/- 256 KTS | A429 |
| 250 | BNR | EPR LIMIT | +/- 4. | A429 |
| 251 | BNR | DIST TO GO | +/- 4096 NM | A429 |
| 252 | BNR | TIME TO GO | +/- 512 MIN | A429 |
| 253 | BNR | GO ARND EPR LIMIT | +/- 4. | A429 |
| 254 | BNR | CRUISE EPR LIMIT | +/- 4. | A429 |
| 255 | BNR | CLIMB EPR LIMIT | +/- 4. | A429 |
| 256 | BNR | V STICK SHAKER | +/- 512 KTS | A429 |
| 257 | BNR | FUEL | +/- 13107 10LB | A429 |
| 260 | BNR | FUEL | +/- 13107 10LB | A429 |
| 261 | BNR | FUEL | +/- 13107 10LB | A429 |
| 262 | BNR | PRED AIRSPD VAR | +/- 256 KTS | A429 |
| 263 | BNR | MIN AIRSPD | +/- 512 KTS | A429 |
| 264 | BNR | MAN AIRSPD | +/- 512 KTS | A429 |
| 265 | BNR | MIN AIRSPD | +/- 512 KTS | A429 |
| 266 | ---------- | HEX FORMAT ONLY | ---------- | |
| 267 | BNR | PRED MAX MAN AIRSPD | +/- 512 KTS | A429 |

| LABEL | BNR/BCD | PARAMETER | SCALE | REFERENCE |
|---|---|---|---|---|
| 270 | ---------- | HEX FORMAT ONLY---------- | | |
| 271 | ---------- | HEX FORMAT ONLY---------- | | |
| 272 | ---------- | HEX FORMAT ONLY---------- | | |
| 273 | ---------- | HEX FORMAT ONLY---------- | | |
| 274 | ---------- | HEX FORMAT ONLY---------- | | |
| 275 | ---------- | HEX FORMAT ONLY---------- | | |
| 276 | ---------- | HEX FORMAT ONLY---------- | | |
| 277 | ---------- | HEX FORMAT ONLY---------- | | |
| 300 | ---------- | HEX FORMAT ONLY---------- | | |
| 301 | ---------- | HEX FORMAT ONLY---------- | | |
| 302 | ---------- | HEX FORMAT ONLY---------- | | |
| 303 | ---------- | HEX FORMAT ONLY---------- | | |
| 304 | ---------- | HEX FORMAT ONLY---------- | | |
| 305 | ---------- | HEX FORMAT ONLY---------- | | |
| 306 | ---------- | HEX FORMAT ONLY---------- | | |
| 307 | ---------- | HEX FORMAT ONLY---------- | | |
| 310 | BNR | LATITUDE | +/- 180 DEG | A429 |
| 311 | BNR | LONGITUDE | +/- 180 DEG | A429 |
| 312 | BNR | GROUND SPEED | +/- 4096 KTS | A429 |
| 313 | BNR | TRACK | +/- 180 DEG | A429 |
| 314 | BNR | HEADING | +/- 180 DEG | A429 |
| 315 | BNR | WIND SPEED | +/- 256 KTS | A429 |
| 316 | BNR | WIND ANGLE | +/- 180 DEG | A429 |
| 317 | BNR | MAG TRACK ANGLE | +/- 180 DEG | A429 |
| 320 | BNR | MAG HEADING | +/- 180 DEG | A429 |
| 321 | BNR | DRIFT ANGLE | +/- 180 DEG | A429 |
| 322 | BNR | FLT PATH ANGLE | +/- 180 DEG | A429 |
| 323 | BNR | FLT PATH ACCEL | +/- 4 G | A429 |
| 324 | BNR | PITCH | +/- 180 DEG | A429 |
| 325 | BNR | ROLL | +/- 180 DEG | A429 |
| 326 | BNR | BODY PITCH RATE | +/- 128 DEG/SEC | A429 |
| 327 | BNR | BODY ROLL RATE | +/- 128 DEG/SEC | A429 |
| 330 | BNR | BODY YAW RATE | +/- 128 DEG/SEC | A429 |
| 331 | BNR | BODY LONG ACCEL | +/- 4 G | A429 |
| 332 | BNR | BODY LAT ACCEL | +/- 4 G | A429 |
| 333 | BNR | BODY NORM ACCEL | +/- 4 G | A429 |
| 334 | BNR | PLATFORM HEADING | +/- 180 DEG | A429 |
| 335 | BNR | TRK ANGLE RATE | +/- 32 DEG/SEC | A429 |
| 336 | BNR | INERTIAL PIT RATE | +/- 128 DEG/SEC | A429 |
| 337 | BNR | INERTIAL ROLL RATE | +/- 128 DEG/SEC | A429 |
| 340 | BNR | ACT EPR | +/- 4. | A429 |
| 341 | BNR | N1 CMD | +/- 256% | A429 |
| 342 | BNR | N1 LIMIT | +/- 256% | A429 |
| 343 | BNR | N1 DERATE | +/- 256% | A429 |
| 344 | BNR | N2 | +/- 256% | A429 |
| 345 | BNR | EXH GAS TEMP | +/- 2048 DEG C | A429 |
| 346 | BNR | N1 ACT | +/- 256% | A429 |
| 347 | BNR | FUEL FLOW | +/- 32768 LB/HR | A429 |

| LABEL | BNR/BCD | PARAMETER | SCALE | REFERENCE |
|---|---|---|---|---|
| 350 | ---------- | HEX FORMAT ONLY---------- | | |
| 351 | ---------- | HEX FORMAT ONLY---------- | | |
| 352 | ---------- | HEX FORMAT ONLY---------- | | |
| 353 | ---------- | HEX FORMAT ONLY---------- | | |
| 354 | ---------- | HEX FORMAT ONLY---------- | | |
| 355 | ---------- | HEX FORMAT ONLY---------- | | |
| 356 | ---------- | HEX FORMAT ONLY---------- | | |
| 357 | ---------- | HEX FORMAT ONLY---------- | | |
| 360 | BNR | POT VERT SPD | +/- 32769 FPM | A429 |
| 361 | BNR | ALTITUDE | +/- 13107 10FT | A429 |
| 362 | BNR | ALG TRK ACCEL | +/- 4 G | A429 |
| 363 | BNR | CRS TRK ACCEL | +/- 4 G | A429 |
| 364 | BNR | VERT ACCEL | +/- 4 G | A429 |
| 365 | BNR | INERTIAL VERT VEL | +/- 32768 FPM | A429 |
| 366 | BNR | N-S VELOCITY | +/- 4096 KTS | A429 |
| 367 | BNR | E-W VELOCITY | +/- 4096 KTS | A429 |
| 370 | BNR | DEC HT SELECTED | +/- 8192 FT | A429 |
| 371 | ---------- | HEX FORMAT ONLY---------- | | |
| 372 | BNR | WIND DIR - MAG | +/- 180 DEG | A429 |
| 373 | BNR | N-S VELOCITY - MAG | +/- 4096 KTS | A429 |
| 374 | BNR | E-W VELOCITY - MAG | +/- 4096 KTS | A429 |
| 375 | BNR | ALG HDG ACCEL | +/- 4 G | A429 |
| 376 | BNR | CRS HDG ACCEL | +/- 4 G | A429 |
| 377 | ---------- | HEX FORMAT ONLY---------- | | |

**3.3.1.2 HEXIDECIMAL FORMAT DEFINITION**

The data field for ARINC 429 type labels is 19 bits organized in a 32 bit word as follows:

```
3 3 3 2 2 2 2 2 2 2 2 2 2 1 1 1 1 1 1 1 1 1 1 0 0 0 0 0 0 0 0 0
2 1 0 9 8 7 6 5 4 3 2 1 0 9 8 7 6 5 4 3 2 1 0 9 8 7 6 5 4 3 2 1

P S S M                                        L S S
A S S S----------------DATA---------- S  I  I ------ADDR-------
R M M B                                                    B 2 1
```

In order to display the data field in HEX format, one bit must be added to form a five digit hex data word. This pad bit will be added as described below:

BCD labels 001 through 067:

A ‘0’ pad bit will be added to the MSB position i.e.

| | | | | |
|---|---|---|---|---|
| 0XXX | XXXX | XXXX | XXXX | XXXX |
| P222 | 2222 | 2221 | 1111 | 1111 |
| A987 | 6543 | 2109 | 8765 | 4321 |
| D | | | | |

Binary labels 070 through 377:

A ‘0’ pad bit will be added to the LSB position i.e.

| | | | | |
|---|---|---|---|---|
| XXXX | XXXX | XXXX | XXXX | XXX0 |
| 2222 | 2222 | 2211 | 1111 | 111P |
| 9876 | 5432 | 1098 | 7654 | 321A |
| | | | | D |

**3.3.1.3 SPLIT SCREEN FORMAT**

The previous screens had represented the case of receive mode only selection. If the user wishes to view transmit data while in receive mode, the display is automatically configured for split screen operation. Four lines rather than seven lines of receive data are presented along with two lines of transmit data. The utility functions (ENT-freeze, CLR-clear, INC-increment) can still be used with the receive data but only if cursor control exists in the receive portion of the display. This is indicated by the square marker on the right side of the screen as shown in the following figure.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| LBL | SI | 11----- | DEC | RCV | SM | P | MSEC | ■ |
| | | | | | | | | |
| | | | | | | | | |
| LBL | SI | 11----- | DEC | XMT | SM | P | MSEC | |

If control exists in the transmit portion of the screen, it may be transferred to the receive screen by pressing the receive (RCV) button once. The user then has available all the receive data manipulation capabilities discussed for single screen operation. If the receive button is depressed a second time, the receive setup screen will appear.

To transfer cursor control to the transmit portion of the screen, the user must depress the transmit (XMT) button once moving the square to the lower half of the screen. The transmit data can then be rotated for viewing with the 'INC' pushbutton, cleared with the 'CLR' pushbutton, or edited as will be described in a later section.

### 3.3.1.4 ENHANCED LABEL FORMATS

The enhanced label display formats are shown below. Decimal mode is assumed to be selected in the receiver setup in all of these examples. Appendix A also contains a definition for these labels that has been excerpted from the Arinc 429 Specification. This is included for the user's convenience and contains the definitions for the discrete bits that are contained within each of the labels below (with the exception of 017).

| LBL | S1 | 11----- | DEC RCV | SM | P | MSEC |
|---|---|---|---|---|---|---|
| 017 | 01 | 1011 | 170.6 | 11 | 1 | 0100 |
| 030 | 01 | | 128.530 | 11 | 1 | 0100 |
| 031 | 01 | 1000101 | 3620 | 11 | 1 | 0100 |
| 032 | 01 | 100 | 1057.5 | 11 | 1 | 0100 |
| 033 | 01 | 1100 | 109.30 | 11 | 1 | 0100 |
| 034 | 01 | 0001 | 114.65 | 11 | 1 | 0100 |
| 035 | 01 | 1011011 | 115.65 | 11 | 1 | 0100 |
| 037 | 01 | 1 | 23.579 | 11 | 1 | 0100 |

Below is a bit by bit definition for each of the above enhanced labels:

017-Selected Runway Heading

| | LBL | SDI | Discretes | BCD | Degrees | SSM | PAR |
|---|---|---|---|---|---|---|---|
| Data: | 017 | 0 1 | 1 0 1 1 | 1 7 0 | .6 | 1 1 | 1 |
| Bit | 0 0 | 1 0 | 1 1 1 1 | 2 2 2 | 1 | 3 3 | 3 |
| Def: | 1-8 | 0 9 | 1 2 3 4 | 9 6 2 | 8 | 1 0 | 2 |

030-VHF COM Frequency

| | LBL | SDI | BCD Frequency, MHz | SSM | PAR |
|---|---|---|---|---|---|
| Data: | 030 | 0 1 | 1 2 8 . 5 3 0 | 1 1 | 1 |
| Bit | 0 0 | 1 0 | 2 2 2 1 1 | 3 3 | 3 |
| Def: | 1-8 | 0 9 | 9 6 2 8 4 | 1 0 | 2 |
| | | | - - - - - | | |
| | | | 2 2 1 1 1 | | |
| | | | 7 3 9 5 1 | | |

031-Beacon Transformer Code

| | LBL | SDI | - -Disc. Bits | Octal Reply Code | SSM | PAR |
|---|---|---|---|---|---|---|
| Data: | 031 | 0 1 | 1 0 0 0 1 0 1 | 3 6 2 0 | 1 1 | 1 |
| Bit | 0 0 | 1 0 | 1 1 1 1 1 1 1 | 2 2 2 2 | 3 3 | 3 |
| Def: | 1-8 | 0 9 | 1 2 3 4 5 6 7 | 9 6 3 0 | 1 0 | 2 |
| | | | | - - - - | | |
| | | | | 2 2 2 1 | | |
| | | | | 7 4 1 8 | | |

032-ADF Frequency

| | LBL | SDI | Discretes | BCD Freq., KHz | SSM | PAR |
|---|---|---|---|---|---|---|
| Data: | 032 | 0 1 | 1 0 0 | 1 0 5 7 . 5 | 1 1 | 1 |
| Bit | 0 0 | 1 0 | 1 1 1 | 2 2 2 1 1 | 3 3 | 3 |
| Def: | 1-8 | 0 9 | 1 2 3 | 9 6 2 8 4 | 1 0 | 2 |
| | | | | - - - - | | |
| | | | | 2 2 1 1 | | |
| | | | | 7 3 9 5 | | |

033-ILS Frequency

| | LBL | SDI | Discretes | BCD Freq., MHz | SSM | PAR |
|---|---|---|---|---|---|---|
| Data: | 033 | 0 1 | 1 1 0 0 | 1 0 9 . 3 0 | 1 1 | 1 |
| Bit | 0 0 | 1 0 | 1 1 1 1 | 2 2 2 1 | 3 3 | 3 |
| Def: | 1-8 | 0 9 | 1 2 3 4 | 9 6 2 8 | 1 0 | 2 |
| | | | | - - - | | |
| | | | | 2 2 1 1 | | |
| | | | | 7 3 9 5 | | |

034-VOR/ILS Frequency

| | LBL | SDI | Discretes | BCD Freq., MHz | SSM | PAR |
|---|---|---|---|---|---|---|
| Data: | 034 | 0 1 | 0 0 0 1 | 1 1 4 . 6 5 | 1 1 | 1 |
| Bit | 0 0 | 1 0 | 1 1 1 1 | 2 2 2 1 | 3 3 | 3 |
| Def: | 1-8 | 0 9 | 1 2 3 4 | 9 6 2 8 | 1 0 | 2 |
| | | | | - - - - | | |
| | | | | 2 2 1 1 | | |
| | | | | 7 3 9 5 | | |

035-DME Frequency

| | LBL | SDI | --Discretes-- | BCD Freq., MHz | SSM | PAR |
|---|---|---|---|---|---|---|
| Data: | 035 | 0 1 | 1 0 1 1 0 1 1 | 1 1 5 . 6 5 | 1 1 | 1 |
| Bit | 0 0 | 1 0 | 1 1 1 1 1 1 1 | 2 2 2 1 | 3 3 | 3 |
| Def: | 1-8 | 0 9 | 1 2 3 4 5 6 7 | 9 6 2 8 | 1 0 | 2 |
| | | | | - - - | | |
| | | | | 2 2 1 | | |
| | | | | 7 3 9 | | |

037-HF COM Frequency

| | LBL | SDI | Discr. | BCD Freq., MHz | SSM | PAR |
|---|---|---|---|---|---|---|
| Data: | 037 | 0 1 | 1 | 2 3 . 5 7 9 | 1 1 | 1 |
| Bit | 0 0 | 1 0 | 1 | 2 2 2 1 1 | 3 3 | 3 |
| Def: | 1-8 | 0 9 | 1 | 9 7 3 9 5 | 1 0 | 2 |
| | | | | - - - - - | | |
| | | | | 2 2 2 1 1 | | |
| | | | | 8 4 0 6 2 | | |

### 3.3.2 A429 TRANSMIT MODE

The first transmit setup screen to appear after mode selection is shown below.

A429 TRANSMITTER SETUP

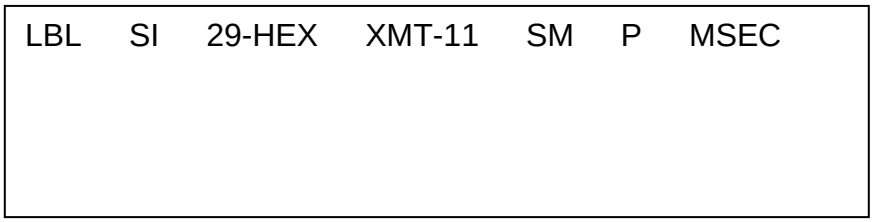
TRANSMITTER STATUS (1=ON,2=OFF): ON
TRANSMITTER MODE (1=DIG,2=D/A): DIG

PRESS 'ENT' TO CONTINUE

The first setup line of the screen prompts the user to select the transmitter to be either on or off. The second line of the setup prompts the user to select either the digital data transmitter or the D/A output. If the digital transmitter is selected, the transmitter speed slide switch that is indicated in Figure 1-1 must be set to either the 100 kHz (HI) or 12.5 kHz (LO) position at this point in the setup.

#### 3.3.2.1 DIGITAL DATA TRANSMISSION

If the digital data transmitter mode is selected, the following screen will appear after the 'ENT' key is pressed on the above setup menu.




The user must enter the label in octal, the SDI bits (10 followed by 9), the data in hex format, the SSM bits (31 followed by 30), a parity selection, and the desired transmission interval. A 1 in the 'PI column causes odd parity to be used in the transmission. After entering the label a default entry appears, and the user actually edits these values by shifting the cursor with the lateral arrow buttons and writing over the existing entry. After entering one complete line, the user presses the 'INC' key to initiate transmission and move the cursor to the next line ready to begin a new setup.

As many as 16 labels may be entered. These can be reviewed by pushing the 'INC' button. This allows all current transmit data to be rotated for viewing. At any point while the cursor is positioned on a line with data entered, edits may be made using two lateral arrow buttons to move the cursor to the bit to be changed (the 'RCD'(<--) and 'BRK'(-->) keys). (Transmit setup is the only mode in which the lateral arrows are recognized). When edits are complete, pressing the 'INC' button causes the new word to replace the previously transmitted word. To add another output word, press the 'INC' key until it positions the cursor on a blank line and enter the additional transmission data. In addition to editing, an entry line may be deleted by pressing 'CLR' when the cursor has been positioned on the line.

Operation with a split screen was discussed in the previous section. Transmit data is manipulated exactly the same as described above and the only difference is that only two lines are provided for viewing the transmit data.

When defining a hex word for transmission the user should be aware of the BCD Vs binary conventions of Section 3.3.1.2 for adding pad zeros. Examples of this have been included in Appendix A of this manual to help the user understand the hex format.

The user is allowed to select different transmission rates but these must be a 1, 2, 4, or 10 multiple of the lowest (fastest) rate. Incorrect entries will be rounded down to the next lower rate.

In general, the DATATRAC 200 can be operated in receive and transmit modes simultaneously with no inaccuracy or variation of data rate. For the case of both high speed received data and high speed transmitted data, some loss of transmission rate accuracy, etc. may be observable, and this mode of operation is not recommended.

#### 3.3.2.1.1 BURST MODE TRANSMISSION SETUP

The previous section described the procedure for setting up labels for continuous transmission. Certain labels associated with radio transmission may require transmission in "burst mode" in which the word is output a specified number of times and at a specified interval. This mode is set up by pressing the 'B' pushbutton when the cursor is located on the first digit of the rate-value. This leads to the default below in which the word will be transmitted every 50 msec a total of 16 times when the user presses the 'ENT' button. The default values may be changed by positioning the cursor appropriately and editing.

| LBL | SI | 29-HEX XMT-11 | SM | P | MSEC | |
|---|---|---|---|---|---|---|
| 030 | 01 | 2853B | 11 | 1 | B16 | 50 |

#### 3.3.2.2 D/A OUTPUT

If the D/A output mode had been selected, the following setup screen would appear prompting the user to select the desired operating mode for the D/A.

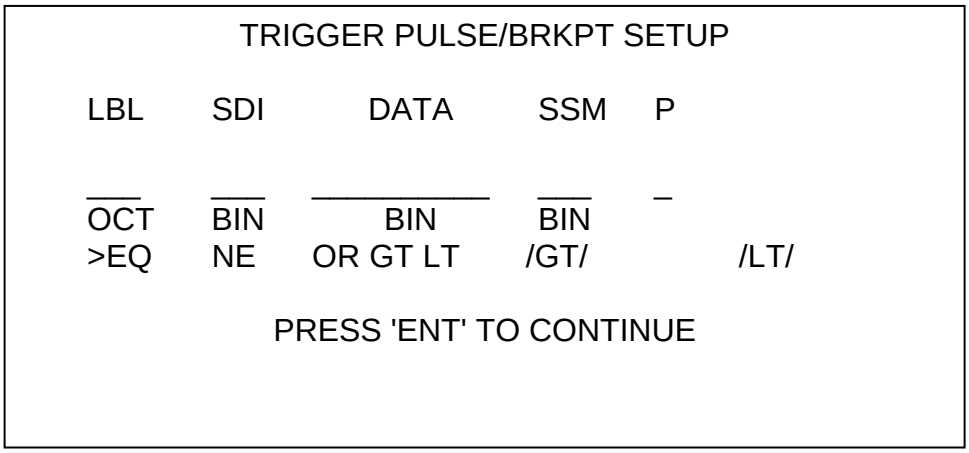
SELECT D/A OUTPUT MODE

ENTER:
'0' FOR D/A OUTPUT OFF
'1' FOR TRIGGER ON RCVD DATA
'2' FOR RECEIVED DATA
'3' FOR KEYBD ENTRY DATA
YOU HAVE SELECTED: 1
PRESS 'ENT' TO CONTINUE

The D/A setup choices are listed on the above screen, and the user must select a corresponding number and then 'ENT'.

Selection of '0' or D/A OUTPUT OFF caused 0.00 volts to be output on the D/A output.

Selection of '1' or TRIGGER ON RCVD DATA will lead to the following screen.




The label is entered as a standard ARINC 429 label in octal. The SDI, DATA, SSM, and P data fields are all entered as a binary 0 or 1. The SDI is entered bit 10, bit 9; the DATA is entered as bits 29 through 11; the SSM is entered bit 31, bit 30; and the P (parity) is bit 32. In addition to the 0 or 1 entry, the user may enter 'D' for 'don't care' (it will appear as an 'X') in any or all bit positions. After entering the entire ARINC word, the user must push 'INC' to continue the setup on the condition line. The selection arrow can be repeatedly incremented through the various options on this line. These are:

EQ D/A output pulse will occur when an exact match of the non-'don't care' bits exists.

NE D/A output pulse will occur when any bit does not equal any of the non-'don't care' bits.

OR D/A output pulse will occur when a match with any of the non-'don't care' bits exists.

GT D/A output pulse will occur when the data value (only the 16 most significant bits of the data field) in the received word is greater than the user defined value (only the 16 most significant bits of the data field).

LT D/A output pulse will occur when the data value (only the 16 most significant bits of the data field) in the received word is less than the user defined value (only the 16 most significant bits of the data field).

/GT/ D/A output pulse will occur when the absolute data value (only the 16 most significant bits of the data field) of the received word is greater than the positive user defined value (only the 16 most significant bits of the data field).

/LT/ D/A output pulse will occur when the absolute data value (only the 16 most significant bits of the data field) of the received word is less than the positive user defined value (only the 16 most significant bits of the data field).

The DATATRAC should be operated in the 'SELECT' receive mode. When complete, 'ENT' should be pressed to start the output pulses. Trigger pulse width is 35 microseconds. The delay from the last data bit to the trigger pulse output is 0.26 milliseconds. For high bus speed operation only, if the next label immediately following the trigger label follows within 0.33 msec of the trigger label, this next label may not be displayed on the receive display screen.

Selection of '2' or RECEIVED DATA will lead to the following screen.

D/A OUTPUT WORD SETUP

LABEL: 105
SCALE FACTOR (1,2,8): 2
DATA OFFSET (HEX): 1F00

PRESS 'ENT' TO CONTINUE

A label is entered in octal format followed by an 'INC'. The next line prompts the user to enter a scale factor of either 1, 2 or 8. A '1' means that the contents of the digital word will be output as a $\pm$ 5.0 volt signal, '2' means that one half of the digital word will be represented by the $\pm$ 5.0 volt output range, and an '8' means that one eighth of the digital word will be represented by the $\pm$ 5.0 volts. The data offset is a data value that should be entered in hex and this value is subtracted from the data word before the scale factor is applied. Pressing 'ENT' completes the setup.

The timing of the data conversion is identical for all operating modes (ALL mode, SELECT mode, high and low bus speeds). The delay from the last data bit to the DC output is 0.14 milliseconds.

Selection of '3' or KEYBD ENTRY DATA will lead to the following screen.

D/A OUTPUT DATA SETUP

ENTER DATA: +0.50

PRESS 'ENT' TO CONTINUE

This screen allows the user to set up a static value on the D/A output. A value between ± 1.00 (± 1.00 = ± 5.00 V) is defined and then entered by the user. The polarity of the data can be toggled using the 'F' key.

### 3.3.3 A429 RECORD MODE

The record feature may be used to store 6144 bytes of data. The user may elect to record 2048 values of a single selected label (3 bytes saved per received word), 1365 values each of two selected labels, or 682 values each of three selected labels. The setup screen for record mode is shown below.

INITIALIZE DATA RECORDER

SET HI/LO RECEIVER SPEED: HI
ENTER RECORD INTERVAL (SEC): 0.50
ENTER LABEL(S) TO RECORD: 030 105 350

PRESS 'ENT' TO CONTINUE

The record interval is entered on the first line as a decimal value between 0.01 sec and 5.00 sec. The labels (1, 2, or 3) are entered on the next line. The 'ENT' pushbutton is then pressed, and the following screen appears.

RECORDED DATA - RECORD MODE

030 105 350
03F8 _____ _____ _____
RECORD INTERVAL= 0.50 SEC

PRESS 'ENT' TO TOGGLE RECORD/PLAY

The top line of the display indicates that the unit is in record rather than playback mode. The next line displays the labels that are being recorded followed by a display of the recording index and current values (both in hexadecimal). At any time the user may switch to playback mode by pressing the 'ENT' pushbutton. In all playback modes except the D/A output, the recording of data will continue even while viewing the recorded data. The following screen will then appear requesting the user to select either hexadecimal, graphics, or D/A output mode.

RECORDED DATA PLAYBK MODE

SELECT PLYBK DISPLAY MODE: 2
(1=HEX,2=GRAPH,3=D/A OUT)
SELECT SCALE (1, 2, OR 8): 1
ENTER DATA OFFSET (HEX): 1F00

PRESS 'ENT' TO CONTINUE

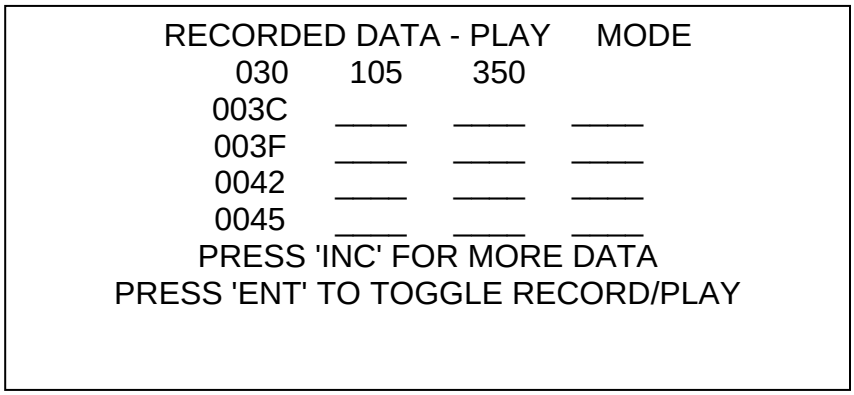
Only if the graphics or D/A output modes are selected, will the scaling information and data offset entered on the next two lines be recognized. The three options for scaling are:

1 - The entire signed digital word will be represented by the ± 32 dots of the graphics display.

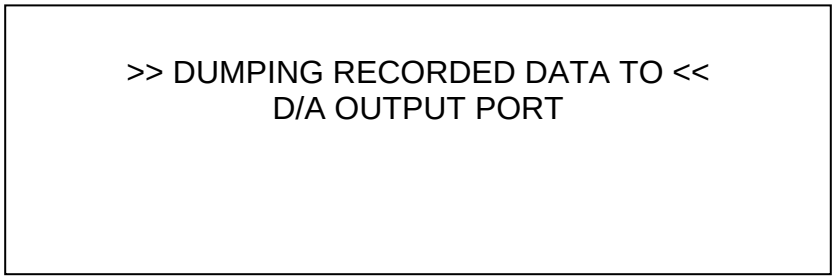
2 - The ± 32 dots of the graphics display will represent ± 50% of the digital word.

8 - The ±32 dots of the graphics display will represent ± 12.5% of the digital word.

The ± 5.0 volt D/A output is similarly scaled by the 1, 2, 8 code. The data offset is entered as a hex data word and is subtracted from the received word before scaling. This feature allows the user to view data on the X2 or X8 scale that has a large offset from zero. After this selection is entered, one of the following three screens will appear.




**Error! Not a valid link.**




In the first two cases the 'INC' pushbutton is used to sequence through the data in the chronological sequence that it was recorded. For the hexadecimal format, an index provides a time reference for data values. In the graphics presentation, each dot position in the horizontal direction represents a record interval point, and 240 dots are presented on each screen. In the vertical direction, ± 32 dots represent the full digital word, one half the digital word, or one eighth of the digital word depending on the selected scale. Continuing to press 'INC' will allow recycling through the recorded data. A heavy vertical line indicates the end of recorded data for the current word. Pressing 'INC' presents the first graphics screen for the next word. Continuing to press 'INC' will allow repeated cycling through the graphics data.

Pressing 'ENT' will recall the record setup screen and allow the user to record more data or cycle back to playback mode with a new scale selection. The upper left digit on the graphics screen indicates the scale that has been selected. The lower left digit is an index for the 12 screens of graphics data.

The hexadecimal display of recorded data is different than that discussed earlier for receive mode. Here 6 characters are used to represent bits 32 through 9 in that order. (For receive mode, only the data field, bits 29 through 11, were displayed with the 5 character hexadecimal word.)

To output data via the D/A, the record process should be allowed to complete. If multiple words have been selected, they are completely output in the order they have been defined with no demarcation between data groups. Data words are output at the same time interval used for their recording. Pressing the 'ENT' key at any time stops the output.

To exit record mode, cycle to the record screen first and then press the desired function pushbutton. A warning message will appear to alert the user that exiting record mode or starting a new record session will cause the data currently recorded to be lost. To continue to exit record mode, simply press the desired function key again. To return to record mode and retain the current record data, press the 'ENT' key. This screen is shown below.

ALL RECORDED DATA WILL BE LOST

YOU MUST REMAIN IN THIS RECORD SETUP
IN ORDER TO RETAIN DATA

PRESS 'ENT' TO RETURN TO CURRENT SETUP
OR
PRESS ANY FUNCTION KEY TO EXIT

### 3.3.4 A429 BREAK MODE

The SELECT mode of the receive function must always be setup in order to generate a breakpoint and review data history. A break may be generated manually or by programming a label/data condition. Both cases allow the user to perform a detailed examination of current and history data for all labels that have been received. A warning message is displayed on the breakpoint setup screen if 'Select' mode has not been setup. To generate a manual break or to program a breakpoint requires that the user push the 'BRK' pushbutton while the receiver is active, generating the following screen.

```
RECEIVE DATA BREAKPOINT SETUP

ENTER:      '1' TO SETUP BRKPT CONDITION
            '2' TO REVIEW DATA HISTORY
            YOU HAVE SELECTED: 1

        PRESS 'ENT' WHEN COMPLETE
```

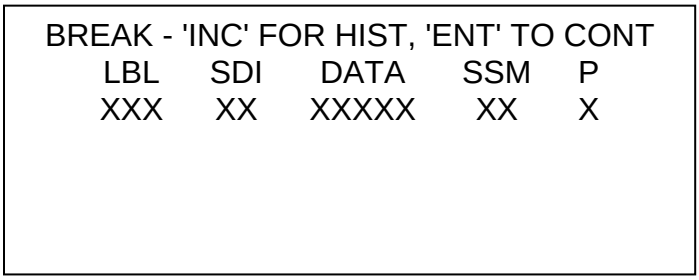
At this point, the user may review history data (by entering a 2) or program a break condition (by entering a 1). Entering a 1 leads to the following setup screen.

```
TRIGGER PULSE/BRKPT SETUP

LBL     SDI          DATA              SSM        P
____    ___          ______________    ___        _
OCT     BIN          BIN               BIN
>EQ     NE    OR     GT        LT      /GT   /LT/

        PRESS 'ENT' WHEN COMPLETE
```

The user enters the desired label in octal format and either 1, 0, or D for "don't care" ('X' appears) in the remainder of the field. The order of the SDI entry is bits 10-9, the data is 29-11, and the SSM is 31-30. The increment pushbutton moves the selector arrow through the various break condition codes in the next line. See section 3.3.2.2 for a definition of the breakpoint conditions. When all data has been set up, the user presses 'ENT' and the DATATRAC 200 is ready to generate a breakpoint on incoming data. Until a break condition occurs, a "WAITING ON RCVR DATA BREAKPT" message appears. When a break condition occurs (or the user elects to review data after a manual break), the following screen appears.




The user may now examine up to 85 history words that preceded the break condition by sequentially pressing 'INC'. The history for the selected label is presented first, but the user can then review 85 words of history for all labels that have been received. At any time the user may exit from the present label history and jump to the next label's history field. This is accomplished by pressing 'CLR' and allows the user to very rapidly cycle through a large amount of saved data.

The history information is formatted as follows:

SDI - The order of the bits is 10-9.

DATA -A five character hexadecimal data presentation is used for the data field, bits 29 through 11 with a zero pad bit added at either the beginning or end of the word depending on the label as is defined in section 3.3.1.2.

SSM - The order of the bits is 31-30.

When in the data review screen, pressing 'ENT' will cause another break to occur on the currently setup condition. Pressing any function key from this screen will cause an exit from break mode into the selected function.

### 3.4 CSDB OPERATION

### 3.4.1 CSDB RECEIVE MODE

#### 3.4.1.1 GENERAL RECEIVER SETUP DESCRIPTION

The CSDB receiver setup screen is shown below.

CSDB RECEIVER SETUP

SET HI/LO RECEIVER SWITCH: HI
SELECT FORMAT (1=DEC,2=HEX,3=BIN): DEC
SELECT LABELS (1=ALL,2=SEL,3=OFF): ALL
ENTER # OF SYNC CHARACTERS: 8

PRESS 'ENT' WHEN COMPLETE

The receiver speed slide switch is indicated in Figure 1-1 and must be set for either the 50 KHz (HI) or 12.5 KHz (LO) speed of the received bus. The next setup line prompts the user to press either a ‘1’ for decimal format (engineering units), a ‘2’ for hexadecimal format, or a ‘3’ for binary format. The basic presentation format is hexadecimal or binary, and all data will be intelligently presented in this form. For certain data words however, range and scaling information have been prestored in an internal table so that these labels may be viewed as decimal values. The list of decimal scaled words is given in Table 3-2. All hex labels which are currently undefined by the CSDB specification and therefore not listed in Table 3-2, can still be received and will be displayed in the hex format when decimal format is selected for the receiver. The labels with an asterisk are a subset with particular display enhancements which will be described in a later section. Press the 'INC' pushbutton for the next setup line.

The third line allows the user to preset only a selected set of labels (up to 16) to be received and displayed rather than all incoming data (up to 16 labels). This may be desirable to reduce cluttering of the display or to place several desired labels in a particular order for viewing. Press 'INC' to move to the next line.

The next setup line requests the number of A5 sync characters on the data bus being monitored (either 6 or 8).

After making this final selection, press the 'ENT' pushbutton for the label selection screen. Note that if 'ALL' had been selected, the next screen would have been the received data itself.

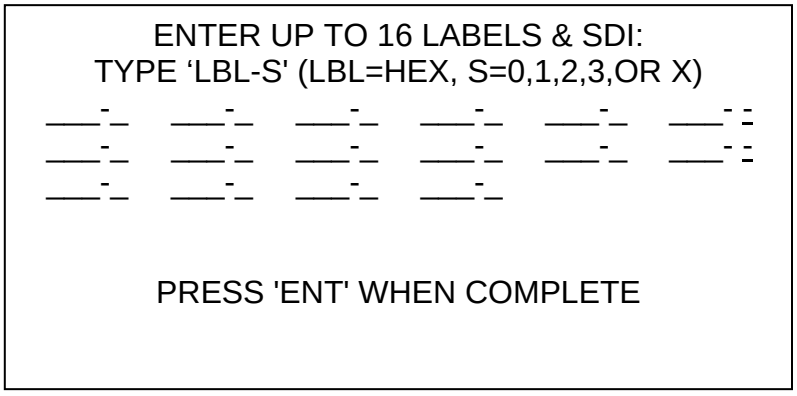
TABLE 3-2

DECIMAL MODE SCALING FOR CSDB

| LABEL | BNR/BCD | PARAMETER | SCALING |
|---|---|---|---|
| 10 | * | ENHANCED LABEL - SEE SECTION 3.4.1.4 | |
| 11 | * | ENHANCED LABEL - SEE SECTION 3.4.1.4 | |
| 1E | * | ENHANCED LABEL - SEE SECTION 3.4.1.4 | |
| IF | * | ENHANCED LABEL - SEE SECTION 3.4.1.4 | |
| 20 | * | ENHANCED LABEL - SEE SECTION 3.4.1.4 | |
| 21 | * | ENHANCED LABEL - SEE SECTION 3.4.1.4 | |
| 22 | * | ENHANCED LABEL - SEE SECTION 3.4.1.4 | |
| 24 | * | ENHANCED LABEL - SEE SECTION 3.4.1.4 | |
| 25 | * | ENHANCED LABEL - SEE SECTION 3.4.1.4 | |
| 26 | * | ENHANCED LABEL - SEE SECTION 3.4.1.1 | |
| 27 | ---------- | HEX FORMAT ONLY ---------- | |
| 2A | BNR | STR CMD & ALT REF | +/- 180 (ALL) |
| 2B | * | ENHANCED LABEL – SEE SECTION 3.4.1.4 | |
| 2C | * | ENHANCED LABEL – SEE SECTION 3.4.1.4 | |
| 30 | * | ENHANCED LABEL – SEE SECTION 3.4.1.4 | |
| 31 | * | ENHANCED LABEL – SEE SECTION 3.4.1.4 | |
| 32 | * | ENHANCED LABEL – SEE SECTION 3.4.1.4 | |
| 33 | * | ENHANCED LABEL – SEE SECTION 3.4.1.4 | |
| 34 | * | ENHANCED LABEL – SEE SECTION 3.4.1.4 | |
| 40 | BNR | BODY RATES | +/- 256 DEG/SEC |
| 41 | BNR | BODY ACCELERATIONS | +/- 10 G |
| 42 | BNR | LEVEL ACCELERATIONS | +/- 10 G |
| 43 | BNR | EULER ANGLES | +/- 180 DEG |
| 46 | BNR | MAG HEADING | +/- 180 DEG |
| 47 | BNR | AHRS CONTROL LAT/HDG | +/- 180 DEG |
| 70 | ---------- | HEX FORMAT ONLY ---------- | |
| 72 | BNR | VS/IAS/MACH REF | +/- 512 KTS (ALL) |
| A0 | BNR | ALTITUDE | +/- 32768 FT |
| A1 | BNR | VERT SPD/IAS | +/- 512 KTS (ALL) |
| A2 | BNR | TAS/SPARE | +/- 1024 KTS |
| A3 | BNR | MACH | +/- 1.024 KTS |
| A4 | BNR | VS/IAS BUGS | +/- 512 KTS (ALL) |
| A6 | BNR | SAT, VMO/MMO | +/- 512 KTS (ALL) |
| A7 | BNR | TAT/PRE-ALT | +/- 512 KTS (ALL) |
| A8 | BNR | MMO/BARO SET | +/- 1.024 (ALL) |
| AA | ---------- | HEX FORMAT ONLY ---------- | |
| AB | ---------- | HEX FORMAT ONLY ---------- | |
| B0 | BNR | PITCH CMD/VERT DEV | +/- 90 DEG (ALL) |
| B1 | BNR | DIST TO TRK/ALT | +/- 2048 NM |
| B2 | BNR | SEL ANGLE/COMP ANGLE | +/- 90 DEG |
| B3 | BNR | AIMPT ALT/VS SEL | +/- 20480 FMP (ALL) |

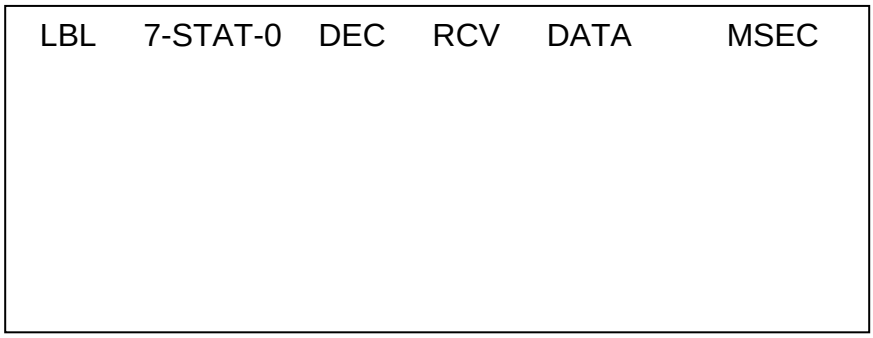
| LABEL | BNR/BCD | PARAMETER | SCALING |
|---|---|---|---|
| C0 | ---------- HEX FORMAT ONLY ---------- | | |
| C1 | BNR | HDG/HDG ERR | +/- 180 DEG |
| C2 | BNR | CRS ERROR | +/- 180 DEG |
| C3 | BNR | RADIO ALT/DH | +/- 4096 FT |
| C4 | BNR | FCS DEVIATIONS | +/- 8 DOTS |
| C5 | BNR | FCS DEVIATIONS | +/- 8 DOTS |
| C6 | BNR | NAV ROLL/PIT CMDS | +/- 90 DEG |
| C7 | BNR | LOC/GS DEV | +-/ 8 DOTS |
| C8 | BRN | FCS DIST | +/- 2048 NM |
| C9 | BNR | WIND VEL/DIR | +/- 2048 KTS (ALL) |
| CA | BRN | SEL CRS | +/- 180 DEG |
| CB | BNR | EFIS CURSOR POS | +/- 2048 NM (ALL) |
| CC | ---------- HEX FORMAT ONLY ---------- | | |
| F3 | ---------- HEX FORMAT ONLY ---------- | | |

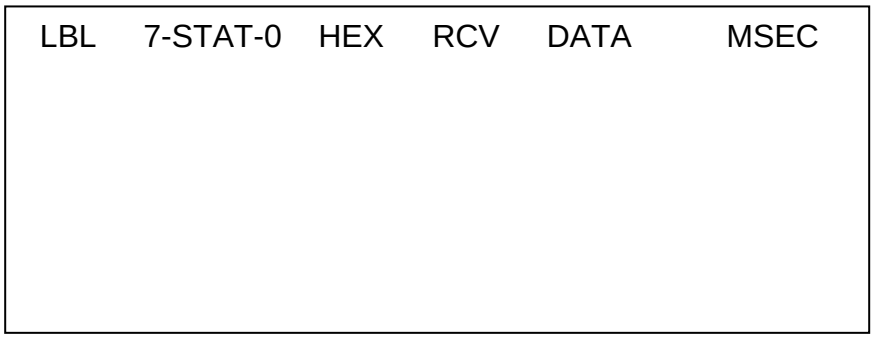
Below is the menu for setting up the select labels.

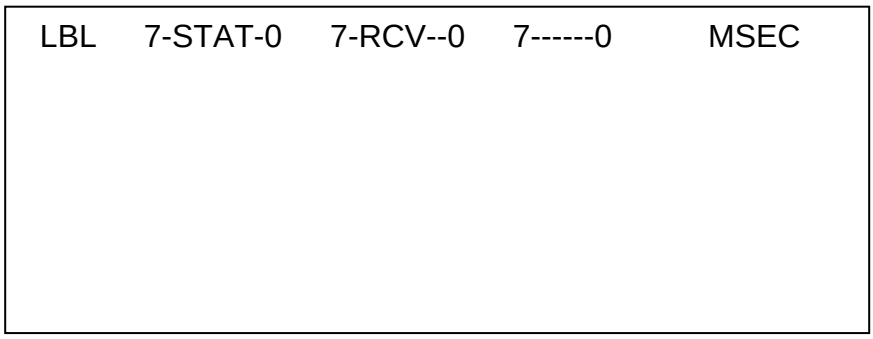



In addition to specifying the label, the user is prompted to enter a D (don't care (appears as an 'X')), 0, 1, 2, or 3 as a BCD representation for the source identification bits 1 and 0, of the status word. The label/SI combination received data will then be displayed or all received data with the specified label will be displayed in the case of a "don't care" entry. In 'ALL' mode each separate label/SI combination that is received will be displayed on a separate line.

On the select label setup, hexadecimal labels should be entered using the 'INC' button to move the cursor, the 'CLR' to remove unwanted labels, and the hexadecimal pushbuttons to enter labels. When the set of select labels has been setup, pressing 'ENT' will lead to one of the following three receive data display screens depending on the format previously selected.



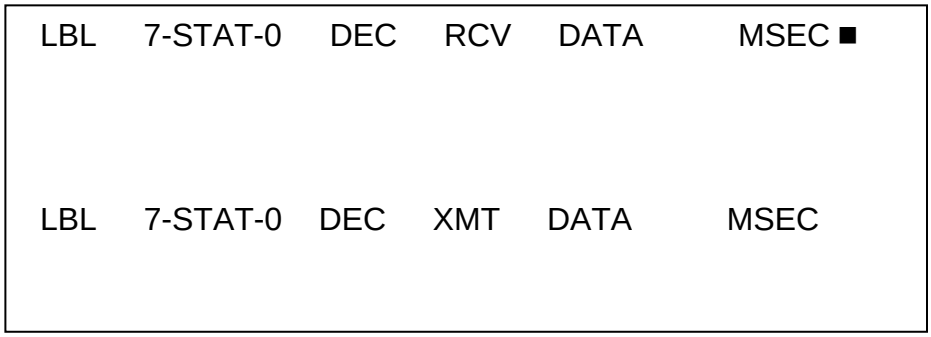




If the number of received labels is greater than the display area, lines may be rotated upward by pressing the 'INC' pushbutton.

At any time while displaying dynamic data, the user may "freeze" the display by pressing 'ENT'. To return to normal display operation, press any key. The 'CLR' pushbutton can be used to clear old information from the display.

### 3.4.1.2 SPLIT SCREEN FORMAT

The previous screens represented the cases of receive mode only selection. If the user wishes to view transmit data while in receive mode, the display is automatically configured for split screen operation. A reduced amount of receive data is available for viewing in order to allow two transmit labels to be presented as shown below.




The utility functions (ENT-freeze, CLR-clear, and INC-increment) can still be used with the receive data but only if cursor control exists in the receive portion of the display. This is indicated by the square marker on the right side of the screen as shown above. If control exists in the transmit portion of the screen, it may be transferred to the receive screen by pressing the ‘RCV’ button once. The user then has available all the receive data manipulation ,capabilities discussed for single screen operation. If the receive button is depressed a second time, the receive setup screen will appear.

To transfer cursor control to the transmit portion of the screen, the user must depress the transmit (XMT) button once moving the square marker to the lower half of the screen. The transmit data can then be rotated for viewing with the 'INC' pushbutton, cleared with the 'CLR’ pushbutton, or edited as will be described in the transmitter section which follows.

### 3.4.1.3 ENHANCED LABEL FORMATS

The enhanced label display formats are presented in this section. To avoid confusion over the presentation order of data, the following convention is adopted regarding the numbering of 4 bit nibbles of data in each CSDB transmission.

| Byte No. | | Bit 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|---|
| 0 | Address | | NBL 2 | | | | NBL 1 | | |
| 1 | Status | | NBL 4 | | | | NBL 3 | | |
| 2 | Data | | NBL 6 | | | | NBL 5 | | |
| 3 | Data | | NBL 8 | | | | NBL 7 | | |
| 4 | Data | | NBL 10 | | | | NBL 9 | | |
| 5 | Data | | NBL 12 | | | | NBL 11 | | |

The display order of the nibbles is included with each label content description. Decimal receive format is assumed in the examples. Appendix C also contains these label definitions excerpted from the CSDB specification. On the screen shown below, is an example for each of the enhanced labels.

| LBL | 7-STAT-0 | DEC RCV DATA | MSEC |
|---|---|---|---|
| 10 | 10101100 | 112.108 | 0050 |
| 11 | 10110001 | 112.108 | 0050 |
| 1E | 10000010 | 2373 4562 | 0050 |
| 1F | 10000010 | 2373 4562 | 0050 |
| 20 | 10000001 | 109.10 | 0050 |
| 21 | 11000010 | 7 123.2 117.05 | 0050 |
| 22 | 11001010 | 8 +.0325 +.0782 | 0050 |
| 24 | 10000001 | 123.50 | 0050 |
| 25 | 11011001 | 115.65 +158.2 | 0050 |
| 26 | 11000111 | 046.0 0350 | 0050 |
| 2B | 11000001 | 090.0 1715.5 | 0050 |
| 2C | 10000010 | 1715.5 | 0050 |
| 30 | 10000001 | 117.05 33 | 0050 |
| 31 | 10000010 | 109.050 3F | 0050 |
| 32 | 10000110 | 1715.5 CC | 0050 |
| 33 | 10000001 | 3472 A6 | 0050 |
| 34 | 10000101 | 115.65 CD | 0050 |

Below is a bit by bit definition for each of the above enhanced labels:

| | LBL | 7-STATUS-0 | DEC RCV DATA |
|---|---|---|---|
| 10-VHF COM Frequency from Controller | | | |
| | 10 | 10101100 | 112.108 |
| NBL: | 2-1 | 4 – 3 | 10 - 6 |
| | | | BCD Frequency, MHz |

11-VHF COM Frequency from Radio

| | | | |
|---|---|---|---|
| | 11 | 10110001 | 112.108 |
| NBL: | 2-1 | 4 – 3 | 10 - 6 |
| | | | BCD Frequency, MHz |

1E-XPDR ATC Code/Altitude from Controller

| | | | | |
|---|---|---|---|---|
| | 1E | 10000010 | 2373 | 4562 |
| NBL: | 2-1 | 4 – 3 | 8-7 6-5 | 12-11 10-9 |
| | | | ALT Codes | |

1F-XPDR Output Data to Controller

| | | | | |
|---|---|---|---|---|
| | 1F | 10000010 | 2373 | 4562 |
| NBL: | 2-1 | 4 – 3 | 8-7 6-5 | 12-11 10-9 |
| | | | ALT Codes | |

20-VHF Nav Frequency from Controller

| | | | |
|---|---|---|---|
| | 20 | 10000001 | 109.10 |
| NBL: | 2-1 | 4 – 3 | 8-5 |
| | | | BCD Frequency, MHz |

21-VOR Data from Radio

| | | | | | |
|---|---|---|---|---|---|
| | 21 | 11000010 | 7 | 123.2 | 117.05 |
| NBL: | 2-1 | 4 – 3 | 5 | 8-6 | 12-9 |
| | | | Coded | 2's | BCD Frequency |
| | | | Disc. | Compl. | MHz |
| | | | Bits | Brg.-Deg. | |

22-ILS Data from Radio

| | | | | | |
|---|---|---|---|---|---|
| | 22 | 11001010 | 8 | +.0325 | +.0782 |
| NBL: | 2-1 | 4 – 3 | 5 | 8-6 | 12-9 |
| | | | Coded | 2's | 2's |
| | | | Disc. | Compl. | Compl. |
| | | | Bits | Glide Dev. | Loc. Dev. |

24-DME Frequency from Controller

| | | | |
|---|---|---|---|
| | 24 | 10000001 | 123.50 |
| NBL: | 2-1 | 4 – 3 | 8-5 |
| | | | BCD Frequency, MHz |

25-DME Frequency & Distance

| | | | | |
|---|---|---|---|---|
| | 25 | 11011001 | 115.65 | +.158.2 |
| NBL: | 2-1 | 4 – 3 | 8-5 | 12-9 |
| | | | BCD Frequency MHz | Binary Distance, NM |

26-DME Time-to-Station & Velocity

| | | | | |
|---|---|---|---|---|
| | 26 | 11000111 | 046.0 | 0350 |
| NBL: | 2-1 | 4 – 3 | 8-5 | 12-9 |
| | | | BCD T-T-S Min | BCD Vel Knots |

2B-ADF Data from Controller

| | | | | |
|---|---|---|---|---|
| | 2B | 11000001 | 090.0 | 1715.5 |
| NBL: | 2-1 | 4 – 3 | 7-5 | 12-8 |
| | | | 2's Compl. Bearing-Deg | BCD Freq MHz |

2C-ADF Frequency from Controller

| | | | |
|---|---|---|---|
| | 2C | 10000010 | 1715.5 |
| NBL: | 2-1 | 4 – 3 | 12-8 |
| | | | BCD Frequency, KHz |

30-Remote NAV Tune Data from Controller

| | | | | |
|---|---|---|---|---|
| | 30 | 10000001 | 117.05 | 33 |
| NBL: | 2-1 | 4 – 3 | 8-5 | 12-11 |
| | | | BCD Frequency MHz | Checksum in Hex |

31-Remote COM Tune Data from Controller

| | | | | |
|---|---|---|---|---|
| | 31 | 10000010 | 190.050 | 3F |
| NBL: | 2-1 | 4 – 3 | 10-6 | 12-11 |
| | | | BCD Frequency MHz | Checksum in Hex |

32-Remote ADF Tune Data from Controller

| | | | | |
|---|---|---|---|---|
| | 32 | 10000110 | 1715.5 | CC |
| NBL: | 2-1 | 4 – 3 | 10-6 | 12-11 |
| | | | BCD Frequency KHz | Checksum in Hex |

33-Remote ATC Tune Data from Controller

| | | | | |
|---|---|---|---|---|
| | 33 | 10000001 | ABCD | A6 |
| NBL: | 2-1 | 4 – 3 | 8-7 6-5 | 12-11 |
| | | | | Checksum in Hex |

34-Remote DME Tune Data from Controller

| | | | | |
|---|---|---|---|---|
| | 34 | 10000101 | 115.65 | CD |
| NBL: | 2-1 | 4 – 3 | 8-5 | 12-11 |
| | | | BCD Frequency MHz | Checksum in Hex |

### 3.4.2 CSDB TRANSMIT MODE

The first transmit setup screen to appear after mode selection is shown below.

TRANSMITTER SETUP

TRANSMITTER STATUS (1=ON,2=OFF): *ON*
TRANSMITTER MODE (1=DIG,2=D/A): DIG
ENTER # OF SYNC CHARACTERS: 6

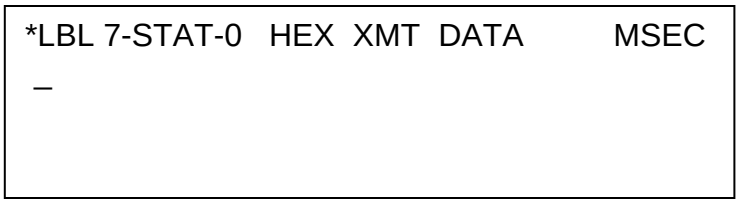
PRESS 'ENT' TO CONTINUE

The transmitter status selection allows the user to turn off a current transmission. The next line prompts the user to select either the digital data transmitter or the D/A output. If the digital data transmitter is selected, the transmitter speed switch (see Fig. 1-1) must also be set to the proper setting of either HI or LO at some time during this setup before pressing the 'ENT' key. 'HI' refers to the 50KHz rate and 'LO' to the 12.5 KHz rate. On the next line, the number of A5 sync characters must be entered appropriate to the transmission or LRU being simulated. The 'INC' key must be used to move the cursor to each setup line.

When the user is satisfied with the setup, the 'ENT' pushbutton should be pressed.

#### 3.4.2.1 DIGITAL DATA TRANSMISSION

The CSDB words to be transmitted are setup with the following screen.




The user is first prompted to enter a hexadecimal CSDB label. When a label is entered a default field appears and transmission data setup becomes a process of editing the default values. This is accomplished by moving the cursor right or left with the lateral arrow pushbuttons and writing over the default characters as desired. Each word to be transmitted along with its transmission interval is loaded with the 'INC' pushbutton pressed between successive words. At any point, a transmission word may be edited by rotating the list of transmit data until the label in question is positioned on the line with the cursor. The cursor is then moved right or left and the desired edits performed. When edits are complete, pressing the 'INC' pushbutton causes the edited word to immediately replace the previous word. Another output word is added by pressing the 'INC' key until it positions the cursor on a blank line. The additional transmission data can then by entered. In addition to editing, an entry line may be deleted by pressing 'CLR' when the cursor has been positioned on the line. The clearing process is completed by pressing the 'INC' to scroll data back onto the screen.

Operation with a split screen was discussed in the previous section. Transmit data is manipulated exactly the same as described above and the only difference is that only two lines are provided for viewing the transmit data.

As with A429, rates must be 1, 2, 4, or 10 multiples of the lowest rate, and incorrect entries are rounded down.

##### 3.4.2.1.1 BURST MODE TRANSMISSION SETUP

The previous section described the procedure for setting up labels for continuous transmission. Certain labels associated with radio equipment may require transmission using "burst mode" in which the word is output a specified number of times and at a specified interval; transmission then ceases. This mode is set up by pressing the 'B' pushbutton when the cursor is located on the first digit of the rate value. This leads to the default below in which the word will be transmitted every 50 msec a total of 16 times when the user presses the 'ENT' button. The default values may be changed by positioning the cursor appropriately and editing.

| LBL | 7-STAT-0 | HEX | XMT | DATA | MSEC |
|---|---|---|---|---|---|
| 30 | 10000001 | 00 | 00 | 10 | B16 050 |

**3.4.2.2 D/A OUTPUT**

If the D/A output mode has been selected, the following setup screen will appear prompting the user to select the desired operating mode for the D/A.

SELECT D/A OUTPUT MODE

ENTER: ‘0’ FOR D/A OUTPUT OFF
‘1’ FOR TRIGGER ON RCVD DATA
‘2’ FOR RECEIVED DATA
‘3’ FOR KEYBD ENTRY DATA
YOU HAVE SELECTED: 1
PRESS 'ENT' TO CONTINUE

The D/A setup choices are listed on the above screen, and the user must select a corresponding number and then 'ENT'.

Selection of ‘0’ or D/A OUTPUT OFF causes 0.0 volts to be output on the D/A output.

Selection of ‘1’ or TRIGGER ON RCVD DATA will lead to the following screen.

TRIGGER PULSE/BRKPT SETUP

LABEL: 2A STATUS: 01XX001X
BINARY DATA: 0001000XXX000X00
00X00101X0100X000
XXXXXXXXXX00X001

>EQ NE OR GT LT /GT/ /LT/

PRESS 'ENT' TO CONTINUE

The label byte is entered as a hexadecimal value. The status and data (4 or 6 bytes as appropriate) are entered as either 1 or 0 binary values or as D (don't care) values. The status byte is entered bit 7 through 0, and the data words as bits 15 through 0 (byte 3, byte 2; byte 5, byte 4; byte 7, byte 6 (for labels with 8 blocks/frame)). For the value conditions, GT, LT, /GT/, and /LT/, the data field is setup primarily to accommodate the binary data labels. If a break condition is to be setup for any 16 bit data word other than the first (bytes 3 and 2), don't cares must be entered prior to the one in question. An example of this is given in Section 3.4.4. After entering the label and data, the user must push 'INC' to continue the setup on the condition line. The selection arrow can be repeatedly incremented through the various options on this line. These are:

EQ - D/A output pulse will occur when an exact match of the non-'don't care' bits exists.

NE - D/A output pulse will occur when any bit does not equal any of the non-'don't care' bits.

OR - D/A output pulse will occur when a match with any of the non-'don't care' bits exists.

GT - D/A output pulse will occur when the data value in the received word is greater than the user defined value.

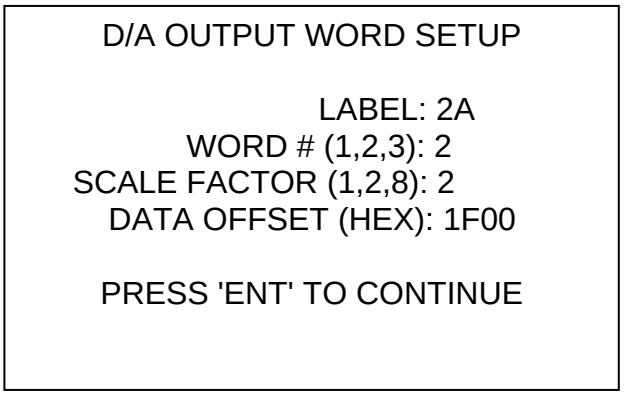
LT - D/A output pulse will occur when the data value in the received word is less than the user defined value.

/GT/ - D/A output pulse will occur when the absolute data value of the received word is greater than the positive user defined value.

/LT/ - D/A output pulse will occur when the absolute data value of the received word is less than the positive user defined value.

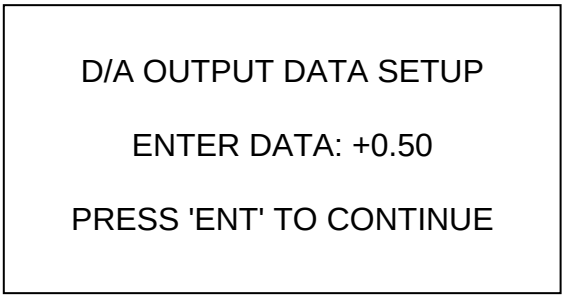
When complete, 'ENT' should be pressed to start the 5.0 ± 0.5 vdc, 0.50 ± 0.05 second conditional output pulses.

Selection of ‘2’ or RECEIVED DATA will lead to the following screen.




The user is prompted to enter a hex label on the first line and the particular word within that label on the second line. The third line prompts the user to enter a scale factor code of either 1, 2 or 8. A '1' means that the contents of the digital word will be output as a ± 5.0 volt signal, '2' means that one half of the digital word will be represented by the ± 5.0 volt output range, and an '8' means that one eighth of the digital word will be represented by the ± 5.0 volts. The data offset is a data value that should be entered in hex and this value is subtracted from the data word before the scale factor is applied. Pressing 'ENT' completes the setup.

Selection of '3' or KEYBD ENTRY DATA will lead to the following screen.




This screen allows the user to set up a static value on the D/A output. A value between ± 1.00 (±1.00 = ± 5.00V) is defined and then entered by the user. The polarity of the data can be toggled using the 'F' key.

### 3.4.3 CSDB RECORD MODE

The record feature may be used to store 6144 bytes of data. If a 4 byte label is selected, then 1536 values for each of the 2 words may be saved. If a 6 byte label is selected, then 1024 values for each of the 3 words may be saved. The setup screen for record mode is shown below.

INITIALIZE DATA RECORDER

SET HI/LO RECEIVER SPEED: LO
ENTER RECORD INTERVAL (SEC): 1.05
ENTER LABEL(S) TO RECORD: 72
SELECT # OF SYNC CHARACTERS: 6

PRESS 'ENT' WHEN COMPLETE

The user is first prompted to set up the proper receiver speed, and the setting is displayed.

The second line requests the desired record interval in seconds. A decimal value between 0.01 and 5.00 is entered. Pressing the 'INC' moves the cursor to the next line.

The third line requests the label to be recorded. The label byte is entered in hexadecimal, and the 'INC' pushbutton is pressed to move to the next line.

The last line requests the number of A5 sync characters (either 6 or 8 (this is also the number of bytes per block).

At any time, a change to the setup may be made by pressing the ‘CLR’ pushbutton or using the 'INC' key to increment to the line to be changed.

Pressing the 'ENT' pushbutton begins the recording process and causes the following screen to be displayed.

RECORDED DATA - RECORD MODE

CNT LBL STA DATA

0001 72 83 11 FE 23 57 89 7A

RECORD INTERVAL = 1.05 SEC

PRESS 'ENT' TO TOGGLE RECORD/PLAY

The top line of the display indicates that the record rather than playback mode is active. The next line displays the label that is being recorded along with current received status and data values. The “CNT" is the hexadecimal index for the data being recorded. At any time the user may switch to playback mode by pressing the 'ENT' pushbutton. The following screen will then appear requesting the user to select either hexadecimal, graphics, or D/A output mode.

```
RECORDED DATA PLAYBK MODE

SELECT PLYBK DISPLAY MODE: 2
(1=HEX,2=GRAPH,3=D/A OUT)
SELECT SCALE (1, 2, OR 8) : 1
ENTER DATA OFFSET (HEX):  1F00

PRESS 'ENT' TO CONTINUE
```

Only when the graphics or D/A output modes are selected, will the scaling information and data offset entered on the next two lines be recognized. The three options for scaling are:

1 - The entire signed digital word will be represented by the ± 32 dots of the graphics display.

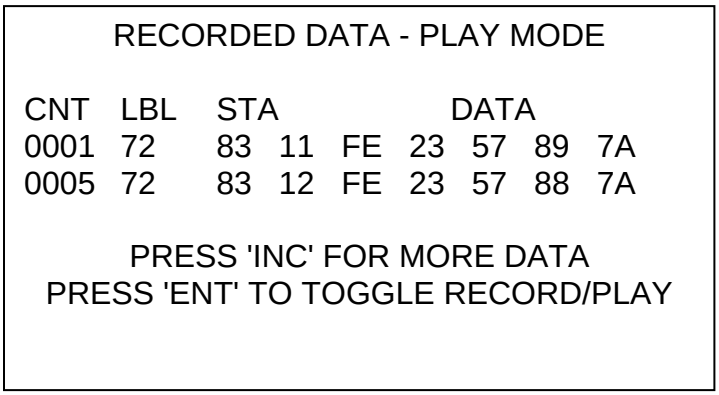
2 - The ± 32 dots of the graphics display will represent ± 50% of the digital word.

8 - The ± 32 dots of the graphics display will represent ± 12.5% of the digital word.

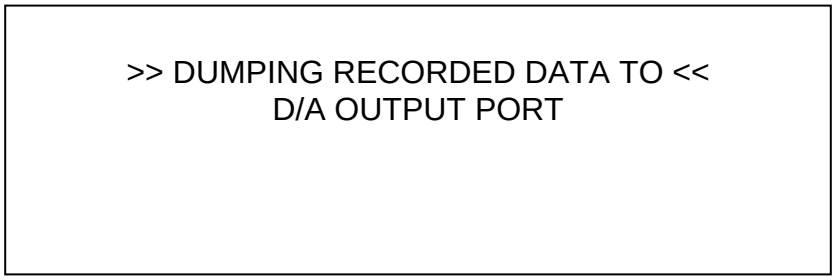
The ±5.0 volt D/A output is similarly scaled by the 1, 2, 8 code.

The data offset word is entered in hex format and is subtracted from the received data word before the scaling constant is applied.

After the 'ENT' key is pressed, one of the following three screens will appear.




**Error! Not a valid link.**




In the first two cases, the 'INC' pushbutton is used to step through the data in the chronological sequence that it was recorded. For the hexadecimal format, an index provides a time reference for data values. In the graphics presentation, each dot position in the horizontal direction represents a record interval point, and 240 dots are presented on each screen. In the vertical direction, ± 32 dots represent the full digital word, one half the digital word, or one eighth of the digital word depending on the selected scale. Continuing to press 'INC' will allow recycling through the record data. Pressing 'ENT' will recall the record setup screen and allow the user to record more data or cycle back to the playback mode with a new scale selection. The upper left digit on the graphics screen indicates the scale that has been selected. The lower left digit is an index for the 12 screens of graphics data.

The record process should be allowed to complete before initiating a D/A output. Each recorded word is output an entire block at a time with no demarcation between labels. The output is performed using the same time interval employed for recording the data. Pressing the 'ENT' key at any time stops the output.

To exit record mode, cycle to the record screen first and then press the desired function key. A warning message will appear to alert the user that exiting record mode or starting a new record session will cause the data currently recorded to be lost. To continue to exit record mode, simply press the desired function key again. To return to record mode and retain the current record data, press the 'ENT' key. This screen is shown below.

ALL RECORDED DATA WILL BE LOST

YOU MUST REMAIN IN THIS RECORD SETUP
IN ORDER TO RETAIN DATA

PRESS 'ENT' TO RETURN TO CURRENT SETUP
OR
PRESS ANY FUNCTION KEY TO EXIT

### 3.4.4 CSDB BREAK MODE

A break while in receive mode may be generated manually or by programming a label/data condition. Both cases allow the user to perform a detailed examination of current and history data for all labels that have been received. To generate a manual break or to program a breakpoint requires that the user push the 'BRK' pushbutton generating the following screen.

RECEIVE DATA BREAKPOINT SETUP

ENTER: '1' TO SETUP BRKPT CONDITION
'2' TO REVIEW DATA HISTORY
YOU HAVE SELECTED: 1

PRESS 'ENT' WHEN COMPLETE

At this point, the user may review history data (by entering a 2) or program a break condition (by entering a 1). Entering a 1 leads to the following setup screen.

```
TRIGGER PULSE/BRKPT SETUP
LABEL:   2A    STATUS: 01XX001X
BINARY DATA: 0001000XXX000X00
             00X0010X0100X000
             XXXXXXXXXX00X001
EQ    ->OR     GT    LT    /GT/   /LT/

PRESS 'ENT' WHEN COMPLETE
```

The label byte is entered as a hexadecimal value. The status and data (4 or 6 bytes as appropriate) are entered as either 1, 0 binary values or as D (don't care) values. The status byte is entered bit 7 through 0, and the data words as bits 15 through 0 (byte 3-byte 2; byte 5-byte 4; byte 7-byte 6 (for labels with 8 blocks/frame)). For the value conditions, GT, LT, /GT/, and /LT/, the data field is setup primarily to accommodate the binary data labels. If a break condition is to be setup for any 16 bit data word other than the first (bytes 3 and 2), don't cares must be entered prior to the one in question. For example, if you desired to setup a GT break condition on the second word of label 2A for any values greater than 0, the screen below shows this setup.

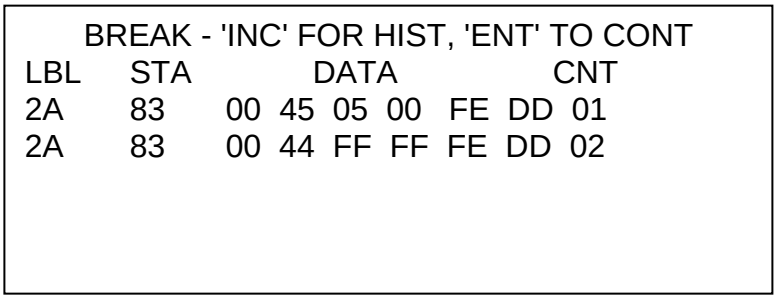
```
TRIGGER PULSE/BRKPT SETUP
LABEL: 2A       STATUS: XXXXXXXX
BINARY DATA:  XXXXXXXXXXXXXXXX
              0000000000000000
              XXXXXXXXXXXXXXXX

EQ    NE    OR    ->GT  LT    /GT/   /LT/

PRESS 'ENT' WHEN COMPLETE
```

The user then increments to continue the setup on the condition line. The 'INC' key moves the selector arrow through the various break condition codes. The user may re-input his selections at any time by pressing 'CLR'. When the setup is complete, the user presses 'ENT' and the DATATRAC 200 is ready to generate a breakpoint on incoming data.

When a break is generated either manually or based on programmed conditions, the user may examine data with the following screen.




This is accomplished by sequentially pressing 'INC'. The history for the selected label is first presented, but the user can then review the history for all other data words that have been received. At any time the user may exit from the present label history and jump to the next label's history field. This is accomplished by pressing 'CLR' and allows the user to very rapidly cycle through a large amount of saved data. Up to 51 history words for the 4 data byte case or 36 history words for the 6 data byte case are stored.

The 'ENT' pushbutton can be used to generate another programmed break based on the same setup conditions or in the case of a manual break to return to the receive screen. The user may elect to leave break mode at any time by pressing any of the other three mode pushbuttons. Pressing 'BRK' allows a new breakpoint setup.

# SECTION IV

# MAINTENANCE

## 4.1 MAINTENANCE

To assist in the maintenance of the DATATRAC 200, the Datatrac 200 Maintenance Manual (P/N 06-1400-00 for hard copy, E6-1400-00 for CD-ROM) is available separately from Aeroflex. The Datatrac 200 Maintenance Manual contains bills of material, assembly drawings, schematics, and test procedures to aid in maintenance and troubleshooting.

# APPENDIX A

# ARINC 429 SPECIFICATION FOR RADIO DATA

| 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) | RESERVED (SDI) | 030 LABEL VHF COM Frequency |
|---|---|---|---|---|---|---|---|---|---|
| Bit No. | 32 | 31 30 | 29 28 27 | 26 25 24 23 | 22 21 20 19 | 18 17 16 15 | 14 13 12 11 | 10 9 | 8 7 6 5 4 3 2 1 |
| Example | 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 |

| ATC TRANSPONDER Function | PARITY (odd) | SIGN/STATUS MATRIX | Pilot Selected Mode A Reply Code A4 A2 A1 (0-7 (1)) B4 B2 B1 (0-7 (6)) C4 C2 C1 (0-7 (2)) D4 D2 D1 (0-7 (0)) | Control Function | Alt. Data Source Select | Ident. | Control Function | Alt. Rep. On/Off | RESERVED (SDI) | 031 LABEL Beacon Transponder Code |
|---|---|---|---|---|---|---|---|---|---|---|
| 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)

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

(2) Control Panel Function

| Function | BIT 17 | 16 | 15 | 12 |
|---|---|---|---|---|
| DABS ON/ ASAS OFF | 0 | 0 | 0 | 1 |
| Reset Aural Warning Signal | 0 | 0 | 1 | 0 |
| Remainder are Reserved for future use. | | | | |

| ADF Function | PARITY (odd) | SIGN/STATUS MATRIX | 1000 kHz (1) | 100 kHz (0) | 10 kHz (5) | 1 kHz (7) | 0.5 kHz (0.5) | SPARE | ANT | BFO | RESERVED (SDI) | 032 LABEL ADF Frequency |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bit No. | 32 | 31 30 | 29 28 27 | 26 25 24 23 | 22 21 20 19 | 18 17 16 15 | 14 | 13 | 12 | 11 | 10 9 | 8 7 6 5 4 3 2 1 |
| Example | 1 | 0 0 | 0 0 1 | 0 0 0 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) | (3) | | |

(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 0.5kHz above this frequency.

(2)(3)

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

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

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

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

(1) Bit no. 14 should be set to "zero" for VOR frequencies and "one" for ILS frequencies by the tuning information sources.

| 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 | 035 LABEL DME Frequency |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bit No. | 32 | 31 30 | 29 28 27 | 26 25 24 23 | 22 21 20 19 | 18 | 17 16 | 15 | 14 | 13 12 11 | 10 9 | 8 7 6 5 4 3 2 1 |
| Examples (1) | 1 | 0 0 | 0 0 1 | 0 1 0 1 | 0 1 1 0 | 1 (2) | 0 1 (7) | 0 | 0 (3) | 0 0 0 (4) | 0 0 (6) | 1 0 1 1 1 0 0 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.

(6) SDI is to be used only on input words. Output frequencies to be coded 0,0.

(7) Bit 16 when equal to "1" specifies that a displayable BCD output is to be provided for that station and when bit 17 is a "1", an ident output is to be generated for that station.

| 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 Identifier | 037 LABEL HF COM Frequency |
|---|---|---|---|---|---|---|---|---|---|---|
| Bit No. | 32 | 31 30 | 29 28 | 27 26 25 24 | 23 22 21 20 | 19 18 17 16 | 15 14 13 12 | 11 | 10 9 | 8 7 6 5 4 3 2 1 |
| Example | 0 | 0 0 | 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) | |

(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.

| HF COM Word#2 Function | PARITY (odd) | SIGN/STATUS MATRIX | .1KHz (5) | NOT USED | RESERVED Word Identifier | 037 LABEL HF COM Frequency |
|---|---|---|---|---|---|---|
| Bit No. | 32 | 31 30 | 29 28 27 26 | 25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 | 10 9 | 8 7 6 5 4 3 2 1 |
| Example | 0 | 0 0 | 0 1 0 1 | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | 0 1 | 1 1 1 1 1 0 0 0 |

Note: Bit No. 10 is reserved for CW mode select. The CW mode is selected when bit no. 10 is a "1".

When the second word is transmitted, it should immediately follow the first HF word.

# APPENDIX B

# HEX TRANSMIT DATA EXAMPLES

EXAMPLES FOR HEX MODE TRANSMIT

**1.0 BCD data - Labels 001 through 067**

**1.1 Standard BCD format**

These two examples cover the majority of the BCD labels.

a. Label 034

If the user desires to set up label 034 for 114.65 MHz and to set the ILS Mode discrete bit (bit 14) to 1, the following setup shows the data to enter on the display:

Note: For the radio data, frequencies above 100 MHz do not contain the 100 MHz decimal place in the data field, so the data that is to be setup is 14.65.

```
Bit      3 3 3 2 2 2 2 2 2 2 2 2 2 1 1 1 1 1 1 1 1 1 0
Pos.:    2 1 0 9 8 7 6 5 4 3 2 1 0 9 8 7 6 5 4 3 2 1 0 9
         P S S * ---------DATA FIELD---------------- *S S
         A S S                                        D D
         R M M                                        I I
```

The data field contains 19 bits; bits 29 through 11. The 5 digit hex word that is entered corresponds to the bits shown below:

```
          2 2 2  2 2 2 2  2 2 2 1  1 1 1 1  1 1 1 1
          9 8 7  6 5 4 3  2 1 0 9  8 7 6 5  4 3 2 1
Hex
digit:      1      2      3      4      5
```

Note that a zero is added to the MSB of the first hex digit since each hex digit contains 4 bits.

Now to enter the data ‘14.65’, the A429 spec defines which bits correspond to each digit of the frequency data. This is:

| | | |
|---|---|---|
| tens of MHz | (1) | - bits 29-27 |
| units of MHz | (4) | - bits 26-23 |
| tenths of MHz | (6) | - bits 22-19 |
| hundredths of MHz | (5) | - bits 18-15 |

Inserting this data into the data format gives:

```
         2 2 2  2 2 2 2  2 2 2 1  1 1 1 1  1 1 1 1
         9 8 7  6 5 4 3  2 1 0 9  8 7 6 5  4 3 2 1

        0 0 0 1  0 1 0 0  0 1 1 0  0 1 0 1  1 0 0 0
Hex
digit:     1        2        3        4        5

Hex
Value:     1        4        6        5        8
```

The last digit contains 3 spare bits (bits 11-13) and the discrete bit 14 which is defined as the ILS mode. The user would enter ‘14658’ in the data field on the transmit screen. The binary to hex conversion table provided in Table B-1 can be used to determine the hex value to enter for transmit data.

b. Label 025

If the user desires to set up label 025 for 31,295 feet for selected altitude, the following example shows the data to enter on the display:

```
Bit     3  3 3 2 2 2 2 2 2 2 2 2 2 1 1 1 1 1 1 1 1 1 1 0
Pos.:     2 1 0 9 8 7 6 5 4 3 2 1 0 9 8 7 6 5 4 3 2 1 0 9
          P S S *--------- DATA FIELD ---------- * S S
          A S S                                      D D
          R M M                                      I I
```

The data field contains 19 bits; bits 29 through 11. The 5 digit hex word that is entered corresponds to the bits shown below:

```
         0 2 2 2  2 2 2 2  2 2 2 1  1 1 1 1  1 1 1 1
         0 9 8 7  6 5 4 3  2 1 0 9  8 7 6 5  4 3 2 1
Hex
digit:     1        2        3        4        5
```

Note that a zero is added to the MSB of the first hex digit since each hex digit contains 4 bits.

Now to enter the data '31295', the A429 spec defines which bits correspond to each digit the frequency data. This is:

| | |
|---|---|
| tens of thousands (3) | bits 29-27 |
| thousands (1) | bits 26-23 |
| hundreds (2) | bits 22-19 |
| tens (9) | bits 18-15 |
| ones (5) | bits 14-11 |

Inserting this data into the data format gives:

| | | | | | |
|---|---|---|---|---|---|
| | 0 2 2 2 | 2 2 2 2 | 2 2 2 1 | 1 1 1 1 | 1 1 1 1 |
| | 0 9 8 7 | 6 5 4 3 | 2 1 0 9 | 8 7 6 5 | 4 3 2 1 |
| | 0 0 1 1 | 0 0 0 1 | 0 0 1 0 | 1 0 0 1 | 0 1 0 1 |
| Hex digit: | 1 | 2 | 3 | 4 | 5 |
| Hex Value to enter: | 3 | 1 | 2 | 9 | 5 |

As can be seen from this example, the hex data to enter for transmit is equal to the data itself in engineering units. This is usually the case for most of the BCD labels. The exceptions to this are covered in the examples in 1.2 and 1.3.

**1.2 Latitude-Longitude Data; Labels 010, 011, 041, 042**

Labels 010, 011, 041, and 042 deviate from the standard BCD format as shown in the example below.

If the user desires to set up label 041 for 123.42.5 degrees east (or positive), the following setup shows the data to enter on the display:

```
Bit      3 3 3 2 2 2 2 2 2 2 2 2 2 1 1 1 1 1 1 1 1 1 0
Pos.:     2 1 0 9 8 7 6 5 4 3 2 1 0 9 8 7 6 5 4 3 2 1 0 9
          P S S *--------- DATA FIELD ---------- * S S
         A S S                                      D D
         R M M                                      I I
```

The usual data field contains 19 bits; bits 29 through 11.

The 5 digit hex word that is entered corresponds to the bits shown below:

| | | | | | |
|---|---|---|---|---|---|
| | 0 2 2 2 | 2 2 2 2 | 2 2 2 1 | 1 1 1 1 | 1 1 1 1 |
| | 0 9 8 7 | 6 5 4 3 | 2 1 0 9 | 8 7 6 5 | 4 3 2 1 |
| Hex digit: | 1 | 2 | 3 | 4 | 5 |

Note that a zero is added to the MSB of the first hex digit since each hex digit contains 4 bits.

For this set of labels, the SDI bits (bits 10 & 9) are used as part of the data field. Now to enter the data '123.42.5', the GAMA 429 data bus spec defines which bits correspond to each digit of the data. This is:

| | | |
|---|---|---|
| hundreds of degrees | (1) | -bit 29 |
| tens of degrees | (2) | -bits 28-25 |
| units of degrees | (3) | -bits 24-21 |
| tens of minutes | (4) | -bits 20-17 |
| units of minutes | (2) | -bits 16-13 |
| tenths of minutes | (5) | -bits 12-09 |

Inserting this data into the data format gives:

| | | | | | | |
|---|---|---|---|---|---|---|
| | 2 2 2 2 | 2 2 2 2 | 2 2 2 1 | 1 1 1 1 | 1 1 1 1 | 10 |
| | 0 9 8 7 | 6 5 4 3 | 2 1 0 9 | 8 7 6 5 | 4 3 2 1 | 09 |
| | 0 1 0 0 | 1 0 0 0 | 1 1 0 1 | 0 0 0 0 | 1 0 0 1 | 01 |
| Data: | 1 | 2 | 3 | 4 | 2 | 5 |
| Hex digit: | 1 | 2 | 3 | 4 | 5 | |
| Hex value to enter: | 4 | 8 | D | 0 | 9 | |

The data to enter on the transmit screen for the data field is '48D09' and the SDI field should be entered as '01'. The sign of the data is entered in the SSM field (bits 31 & 30). For this example, the SSM should be '00' (see section 2.1.5.1 of the ARINC 429 spec for a complete definition of the SSM). The binary to hex conversion table provided in Table B-1 can be used to determine the hex value to enter for transmit data.

### 1.3 HF Com Frequency; Label 037

Label 037 deviates from the standard BCD format as shown in the example below.

If the user desires to set up label 037 for 23.579 MHz, the following setup shows the data to enter on the display:

```
Bit      3 3 3 2 2 2 2 2 2 2 2 2 2 1 1 1 1 1 1 1 1 1 0
Pos.:      2 1 0 9 8 7 6 5 4 3 2 1 0 9 8 7 6 5 4 3 2 1 0 9
           P S S *--------- DATA FIELD ---------- * S S
           A S S                                       D D
           R M M                                   I   I
```

The usual data field contains 19 bits; bits 29 through 11. The 5 digit hex word that is entered corresponds to the bits shown below:

```
          0 2 2 2  2 2 2 2  2 2 2 1  1 1 1 1  1 1 1 1
          0 9 8 7  6 5 4 3  2 1 0 9  8 7 6 5  4 3 2 1
Hex
digit:      1        2        3        4        5
```

Note that a zero is added to the MSB of the first hex digit since each hex digit contains 4 bits.

Now to enter the data ‘23.579’, the ARINC 429 data bus spec defines which bits correspond to each digit of the data. This is:

| | | |
|---|---|---|
| tens of MHz | (2) | -bits 29-28 |
| units of MHz | (3) | -bits 27-24 |
| tenths of MHz | (5) | -bits 23-20 |
| hundredths of MHz | (7) | -bits 19-16 |
| thousandths of MHz | (9) | -bits 15-12 |

Bit 11 is a discrete data bit defined as USB/LSB MODE. Inserting this data into the data format gives:

```
          2 2 2 2  2 2 2 2  2 2 2 1  1 1 1 1  1 1 1 1
          0 9 8 7  6 5 4 3  2 1 0 9  8 7 6 5  4 3 2 1

          0 1 0 0  0 1 1 0  1 0 1 0  1 1 1 1  0 0 1 1
Data:       2        3        5        7        9
```

| Hex digit: | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Hex value to enter: | 4 | 6 | A | F | 3 |

The data to enter on the transmit screen for the data field is ‘46AF3'. Note that bit 11 is set to a ‘1’ indicating that this is the upper significant byte (USB). The binary to hex conversion table provided in Table B-1 can be used to determine the hex value to enter for transmit data.

TABLE B-1

| BINARY DATA | DECIMAL DATA | HEX VALUE |
|---|---|---|
| 0000 | 0 | 0 |
| 0001 | 1 | 1 |
| 0010 | 2 | 2 |
| 0011 | 3 | 3 |
| 0100 | 4 | 4 |
| 0101 | 5 | 5 |
| 0110 | 6 | 6 |
| 0111 | 7 | 7 |
| 1000 | 8 | 8 |
| 1001 | 9 | 9 |
| 1010 | 10 | A |
| 1011 | 11 | B |
| 1100 | 12 | C |
| 1101 | 13 | D |
| 1110 | 14 | E |
| 1111 | 15 | F |

**2.0 BINARY data - Labels 070 through 377**

If the user desires to set up label 210 for 300 knots of TAS, the following setup shows the data to enter on the display:

```
Bit      3 3 3 2 2 2 2 2 2 2 2 2 2 1 1 1 1 1 1 1 1 1 0
Pos.:      2 1 0 9 8 7 6 5 4 3 2 1 0 9 8 7 6 5 4 3 2 1 0 9
           P S S *--------- DATA FIELD ---------- * S S
           A S S                                       D D
           R M M                                   I   I
```

The data field contains 19 bits; bits 29 through 11. The 5 digit hex word that is entered corresponds to the bits shown below:

| | 2 2 2 2 | 2 2 2 2 | 2 2 1 1 | 1 1 1 1 | 1 1 1 0 |
|---|---|---|---|---|---|
| | 9 8 7 6 | 5 4 3 2 | 1 0 9 8 | 7 6 5 4 | 3 2 1 0 |
| Hex digit: | 1 | 2 | 3 | 4 | 5 |

Note that a zero is added to the LSB of the last hex digit since each hex digit contains 4 bits.

Now to enter the data ‘300.0’, the A429 spec defines label 210 to be scaled as a 2's complement word with a range of 2048. The 300 knots must be scaled by the range of 2048 to compute the proper hex value to enter for transmission. This is shown below:

300/2048 = 0.14648

0.14648 x 32768 = 4800

4800 is the decimal equivalent of the hex value to be entered. A calculator with a decimal to hex conversion is a good tool to use to convert.

4800 decimal 12C0 hex

If the user does not have any tools available, the conversion can be performed as follows:

| | |
|---|---|
| 4800/4096 = 1 w/ | 704 remainder |
| 704/256 = 2 w/ | 192 remainder |
| 192/16 = 12 w/ | 0 remainder |

For numbers between 10 and 16, use Table B-1 to convert to a hex digit. The answer using this method is 12C0.

If a negative number is being converted, the number should first be converted and then have a 2's complement performed. In the above example, if -300 was to be entered, after obtaining the 12C0 hex number the 2's complement is computed as shown below:

| | 1 | 2 | C | 0 |
|---|---|---|---|---|
| | 0 0 0 1 | 0 0 1 0 | 1 1 0 0 | 0 0 0 0 |
| Neg each bit | 1 1 1 0 | 1 1 0 1 | 0 0 1 1 | 1 1 1 1 |

| | | | | |
|---|---|---|---|---|
| Add 1 | 0 0 0 0 | 0 0 0 0 | 0 0 0 0 | 0 0 0 1 |
| Sum | 1 1 1 0 | 1 1 0 1 | 0 1 0 0 | 0 0 0 0 |
| Hex Data | E | D | 4 | 0 |

From the first part, inserting the data 300 knots or 12C0 hex into the data format gives:

| | | | | |
|---|---|---|---|---|
| | 0 2 2 2 | 2 2 2 2 | 2 2 2 1 | 1 1 1 1 | 1 1 1 1 |
| | 0 9 8 7 | 6 5 4 3 | 2 1 0 9 | 8 7 6 5 | 4 3 2 1 |
| | 0 0 0 1 | 0 0 1 0 | 1 1 0 0 | 0 0 0 0 | 0 0 0 0 |
| Hex digit: | 1 | 2 | 3 | 4 | 5 |
| Hex Value: | 1 | 2 | C | 0 | 0 |

The user should enter ‘12C00’ in the data field on the transmit setup screen.

# APPENDIX C

# CSDB SPECIFICATION FOR RADIO DATA

COMMERCIAL STANDARD DIGITAL BUS------CSDB---------STANDARD 523-0772774

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DETAILED MESSAGE BLOCK DEFINITIONS (IN ADDRESS ORDER)

TITLE: VHF COM FREQ

ADDRESS 10

| BYTE (#) | BIT 7 | BIT 6 | BIT 5 | BIT 4 | BIT 3 | BIT 2 | BIT 1 | BIT 0 |
|---|---|---|---|---|---|---|---|---|
| (0) | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| | HEX 1 | | | | HEX 0 | | | |
| | ADDRESS | | | | BYTE | | | |
| (1) | FREQ VALID 1=VAL | PAD | XFR CTL 1=XFR | SQLCH CTL * | SI | TEST CTL 1=ON | SI | SI SOURCE IDENT |
| (2) | 8 | 4 | 2 | 1 | PAD | PAD | PAD | PAD |
| | BCD | | | | | | | |
| | 0.001 MHZ | | | | | | | |
| (3) | 8 | 4 | 2 | 1 | 8 | 4 | 2 | 1 |
| | BCD | | | | BCD | | | |
| | 0.1 MHZ | | | | 0.01 MHZ | | | |
| (4) | PAD | 4 | 2 | 1 | 8 | 4 | 2 | 1 |
| | BCD | | | | BCD | | | |
| | 10.0 MHZ | | | | 1.0 MHZ | | | |
| (5) | PAD | PAD | PAD | PAD | PAD | PAD | PAD | PAD |

NOTE (1): SOURCE IDENT BITS (3,1,0) BYTE (1)

| | | | |
|---|---|---|---|
| 0 0 0 | ALL UNITS | 1 0 0 | --- |
| 0 0 1 | #1 UNIT | 1 0 1 | #1 PRESET |
| 0 1 0 | #1 UNIT | 1 1 0 | #2 PRESET |
| 0 1 1 | #1 UNIT | 1 1 1 | #3 PRESET |

NOTE (2): SQUELCH CONTROL, BIT (4) BYTE (1)

0=AUTOMATIC SQUELCH
1=AUDIO ENABLED (SEQUELCH DISABLED)

COMMERCIAL STANDARD DIGITAL BUS------CSDB---------STANDARD 523-0772774

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TITLE: VHF COM DATA

ADDRESS 11

| BYTE (#) | BIT 7 | BIT 6 | BIT 5 | BIT 4 | BIT 3 | BIT 2 | BIT 1 | BIT 0 |
|---|---|---|---|---|---|---|---|---|
| (0) | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| | HEX 1 | | | | HEX 1 | | | |
| | ADDRESS | | | | BYTE | | | |
| (1) | FREQ VALID 1=VAL | FREQ LIMIT B | FREQ LIMIT A | XMIT IND 1=ON | SI | SELF TEST 1=ON | SI SOURCE IDENT | |
| (2) | 8 | 4 | 2 | 1 | PAD | PAD | PAD | PAD |
| | BCD | | | | | | | |
| | 0.001 MHZ | | | | | | | |
| (3) | 8 | 4 | 2 | 1 | 8 | 4 | 2 | 1 |
| | BCD | | | | BCD | | | |
| | 0.1 MHZ | | | | 0.01 MHZ | | | |
| (4) | PAD | 4 | 2 | 1 | 8 | 4 | 2 | 1 |
| | BCD | | | | BCD | | | |
| | 10.0 MHZ | | | | 1.0 MHZ | | | |
| (5) | PAD | PAD | PAD | PAD | PAD | PAD | PAD | PAD |

NOTE (1): SOURCE IDENT BITS (3,1,0) BYTE (1)

| | | | |
|---|---|---|---|
| 0 0 0 | ALL UNITS | 1 0 0 | --- |
| 0 0 1 | #1 UNIT | 1 0 1 | #1 PRESET |
| 0 1 0 | #2 UNIT | 1 1 0 | #2 PRESET |
| 0 1 1 | #3 UNIT | 1 1 1 | #3 PRESET |

NOTE (2): FREQ LIMITS, BITS (6,5) BYTE (1)

| | |
|---|---|
| 0 0 | NOT USED |
| 0 1 | 135.975 MHZ |
| 1 0 | 136.975 MHZ |
| 1 1 | 151.975 MHZ |

COMMERCIAL STANDARD DIGITAL BUS------CSDB---------STANDARD 523-0772774

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TITLE: TRANSPONDER ATC CODE/ALTITUDE

ADDRESS 1E

| BYTE (#) | BIT 7 | BIT 6 | BIT 5 | BIT 4 | BIT 3 | BIT 2 | BIT 1 | BIT 0 |
|---|---|---|---|---|---|---|---|---|
| | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 |
| (0) | *---------- HEX 1 ----------* | | | | ---------- HEX E ----------* | | | |
| | *---------- ADDRESS ----------BYTE----------* | | | | | | | |
| | CODE VALID 1=VAL | PAD | MODE 1=STBY | ALT REPRT 1=ON | ATC IDENT 1-ON | TEST 1=ON | SI | SI SOURCE IDENT |
| (1) | | | | | | | | |
| | PAD | 4 | 2 | 1 * | PAD | 4 | 2 | 1 |
| (2) | *---------- ATC CODE C----------* | | | | ----------ATC CODE D----------* | | | |
| | *----------BCD, (0-7 ONLY)----------* | | | | | | | |
| | PAD | 4 | 2 | 1 * | PAD | 4 | 2 | 1 |
| (3) | *---------- ATC CODE A----------* | | | | ----------ATC CODE B----------* | | | |
| | *----------BCD, (0-7 ONLY)----------* | | | | | | | |
| | PAD | 4 | 2 | 1 * | PAD | 4 | 2 | 1 |
| (4) | *---------- ALT CODE C----------* | | | | ----------ALT CODE D----------* | | | |
| | *----------ALTITUDE REPORTING, GRAY CODE----------* | | | | | | | |
| | PAD | 4 | 2 | 1 * | PAD | 4 | 2 | 1 |
| (5) | *---------- ALT CODE A----------* | | | | ----------ALT CODE B----------* | | | |
| | *----------ALTITUDE REPORTING, GRAY CODE----------* | | | | | | | |

NOTE (1): SOURCE IDENT BITS (1,0) BYTE (1)

| | | | |
|---|---|---|---|
| 0 0 | NOT USED | 1 0 | #2 UNIT |
| 0 1 | #1 UNIT | 1 1 | NOT USED |

COMMERCIAL STANDARD DIGITAL BUS------CSDB---------STANDARD 523-0772774

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TITLE: TRANSPONDER OUTPUT DATA

ADDRESS 1F

| BYTE (#) | BIT 7 | BIT 6 | BIT 5 | BIT 4 | BIT 3 | BIT 2 | BIT 1 | BIT 0 |
|---|---|---|---|---|---|---|---|---|
| | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 |
| (0) | *---------- HEX 1 ----------* | | | | *---------- HEX F ----------* | | | |
| | *---------- ADDRESS ----------BYTE----------* | | | | | | | |
| | CODE VALID 1=VAL | XMIT 1=ON | MODE 1=STBY | ALT REPRT 1=ON | ATC IDENT 1-ON | TEST 1=ON | SI SOURCE IDENT | SI |
| (1) | | | | | | | | |
| | PAD | 4 | 2 | 1 | * PAD | 4 | 2 | 1 |
| (2) | *---------- ATC CODE C----------* | | | | ----------ATC CODE D----------* | | | |
| | *----------BCD, (0-7 ONLY)----------* | | | | | | | |
| | PAD | 4 | 2 | 1 | * PAD | 4 | 2 | 1 |
| (3) | *---------- ATC CODE A----------* | | | | ----------ACT CODE B----------* | | | |
| | *----------BCD, (0-7 ONLY)----------* | | | | | | | |
| | PAD | 4 | 2 | 1 | * PAD | 4 | 2 | 1 |
| (4) | *---------- ALT CODE C----------* | | | | ----------ALT CODE D----------* | | | |
| | *----------ALTITUDE REPORTING, GRAY CODE----------* | | | | | | | |
| | PAD | 4 | 2 | 1 | * PAD | 4 | 2 | 1 |
| (5) | *---------- ALT CODE A----------* | | | | ----------ALT CODE B----------* | | | |
| | *----------ALTITUDE REPORTING, GRAY CODE----------* | | | | | | | |

NOTE (1): SOURCE IDENT BITS (1,0) BYTE (1)

| | | | |
|---|---|---|---|
| 0 0 | NOT USED | 1 0 | #2 UNIT |
| 0 1 | #1 UNIT | 1 1 | NOT USED |

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TITLE: VHF NAV FREQ

ADDRESS 20

| BYTE (#) | BIT 7 | BIT 6 | BIT 5 | BIT 4 | BIT 3 | BIT 2 | BIT 1 | BIT 0 |
|---|---|---|---|---|---|---|---|---|
| | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| (0) | HEX 2 | | | | HEX 0 | | | |
| | ADDRESS | | | | BYTE | | | |
| | FREQ | PAD | PAD | MKR | DME | TEST | SI | SI |
| (1) | VALID | | | SENS | HOLD | | SOURCE | |
| | 1=VAL | | | 1=LOW | 1-ON | 1=ON | IDENT | |
| | 8 | 4 | 2 | 1 | 8 | 4 | 2 | 1 |
| (2) | BCD | | | | BCD | | | |
| | 0.1 MHZ | | | | 0.01 MHZ | | | |
| | PAD | 4 | 2 | 1 | 8 | 4 | 2 | 1 |
| (3) | BCD | | | | BCD | | | |
| | 10.0 MHZ | | | | 1.0 MHZ | | | |
| | PAD | PAD | PAD | PAD | PAD | PAD | PAD | PAD |
| (4) | | | | | | | | |
| | PAD | PAD | PAD | PAD | PAD | PAD | PAD | PAD |
| (5) | | | | | | | | |

NOTE (1): SOURCE IDENT BITS (1,0) BYTE (1)

| | | | |
|---|---|---|---|
| 0 0 | NOT USED | 1 0 | #2 UNIT |
| 0 1 | #1 UNIT | 1 1 | #3 UNIT |

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TITLE: VOR DATA

ADDRESS 21

| BYTE (#) | BIT 7 | BIT 6 | BIT 5 | BIT 4 | BIT 3 | BIT 2 | BIT 1 | BIT 0 |
|---|---|---|---|---|---|---|---|---|
| (0) | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| | *---------- HEX 2 ----------*---------- HEX 1 ----------* | | | | | | | |
| | *---------- ADDRESS ----------BYTE----------* | | | | | | | |
| (1) | VOR VALID 1=VAL | FREQ VALID 1=VAL | 2/5 TUNE 1=ENB | MKR SENS 1=LOW | ROT MOD FILTER 1=ACTV | TEST 1=ON | SI | SI SOURCE IDENT |
| (2) | <----------LSB | | | | PAD | MARKER INN 1=ON | MDL 1=ON | BEACONS OUT 1=ON |
| | <----------* | | | | | | | |
| (3) | MSB----------2'S COMPLEMENT, 12-BIT----------> | | | | | | | |
| | -180----------DEGREES----------> | | | | | | | |
| | *----------VOR BEARING, FROM A/C TO STATION----------> | | | | | | | |
| (4) | 8 | 4 | 2 | 1 | 8 | 4 | 2 | 1 |
| | *----------BCD----------*----------BCD----------* | | | | | | | |
| | *----------0.1 MHZ----------*----------0.01 MHZ----------* | | | | | | | |
| (5) | PAD | 4 | 2 | 1 | 8 | 4 | 2 | 1 |
| | *----------BCD----------*----------BCD----------* | | | | | | | |
| | *----------10.0 MHZ----------*----------1.0 MHZ----------* | | | | | | | |

NOTE (1): SOURCE IDENT BITS (1,0) BYTE (1)

| | | | |
|---|---|---|---|
| 0 0 | NOT USED | 1 0 | #2 UNIT |
| 0 1 | #1 UNIT | 1 1 | #3 UNIT |

NOTE (2): MARKER BEACON BITS (2,1,0) BYTE (2)

THESE 1-BIT MESSAGES ARE TRANSMITTED UPON MARKER RECEPTION INDEPENDENTLY OF THE STATE OF THE FLAG BITS (7,6) BYTE (1)

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TITLE: ILS DATA

ADDRESS 22

| BYTE (#) | BIT 7 | BIT 6 | BIT 5 | BIT 4 | BIT 3 | BIT 2 | BIT 1 | BIT 0 |
|---|---|---|---|---|---|---|---|---|
| (0) | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| | *---------- HEX 2 ----------*---------- HEX 2 ----------* | | | | | | | |
| | *---------- ADDRESS ----------BYTE----------* | | | | | | | |
| (1) | GS VALID 1=VAL | LOC VALID 1=VAL | D'LYD ILS 1=ILS | MKR SENS 1=LOW | GLS /NO 1=ON | TEST 1=ON | SI SOURCE IDENT | |
| (2) | <----------LSB | | | | PAD | MARKER INN 1=ON | MDL 1=ON | BEACONS OUT 1=ON |
| | <----------* | | | | | | | |
| | <----------* | | | | | | | |
| (3) | MSB----------2'S COMPLEMENT, 12-BIT----------> | | | | | | | |
| | -0.80----------DDM,%/100----------> | | | | | | | |
| | FLY DWN----------GLIDESLOPE DEVIATION----------> | | | | | | | |
| (4) | <----------LBS | | | | PAD | PAD | PAD | PAD |
| | <----------* | | | | | | | |
| | <----------* | | | | | | | |
| (5) | MSB----------2'S COMPLEMENT, 12-BIT----------> | | | | | | | |
| | -0.40----------DDM,%/100----------> | | | | | | | |
| | FLY LEFT----------LOCALIZER DEVIATION----------> | | | | | | | |

NOTE (1): SOURCE IDENT BITS (1,0) BYTE (1)

| | | | |
|---|---|---|---|
| 0 0 | NOT USED | 1 0 | #2 UNIT |
| 0 1 | #1 UNIT | 1 1 | #3 UNIT |

NOTE (2): MARKER BEACON BITS (2,1,0) BYTE (2)

THESE 1-BIT MESSAGES ARE TRANSMITTED UPON MARKER RECEPTION INDEPENDENTLY OF THE STATE OF THE FLAG BITS (7,6) BYTE (1)

NOTE (3): DELAYED ILS IS NOW AVAILABLE IN CURRENT PRODUCTION RADIOS.

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TITLE: DME FREQUENCY

ADDRESS 24

| BYTE (#) | BIT 7 | BIT 6 | BIT 5 | BIT 4 | BIT 3 | BIT 2 | BIT 1 | BIT 0 |
|---|---|---|---|---|---|---|---|---|
| | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| (0) | *---------- HEX 2 ----------* | | | | *---------- HEX 4 ----------* | | | |
| | *---------- ADDRESS ----------BYTE----------* | | | | | | | |
| (1) | FREQ VALID 1=VAL | PAD | PAD | PAD | DME HOLD 1-ON | TEST 1=ON | SI CHANNEL IDENT | SI |
| | 8 | 4 | 2 | 1 | 8 | 4 | 2 | 1 |
| (2) | *---------- BCD----------* | | | | *---------- BCD ----------* | | | |
| | *----------0.1 MHZ----------* | | | | *----------0.01 MHZ----------* | | | |
| | PAD | 4 | 2 | 1 | 8 | 4 | 2 | 1 |
| (3) | *---------- BCD----------* | | | | *---------- BCD ----------* | | | |
| | *----------10.0 MHZ----------* | | | | *----------1.0 MHZ----------* | | | |
| | PAD | PAD | PAD | PAD | PAD | PAD | PAD | PAD |
| (4) | *----------* | | | | *----------* | | | |
| | *----------* | | | | *----------* | | | |
| | PAD | PAD | PAD | PAD | PAD | PAD | PAD | PAD |
| (5) | *----------* | | | | *----------* | | | |
| | *----------* | | | | *----------* | | | |

NOTE (1): CHANNEL IDENT BITS (1,0) BYTE (1)

| | | | |
|---|---|---|---|
| 0 0 | #1 PRESET (OR REMOTE) | 1 0 | #2 ACTIVE |
| 0 1 | #1 ACTIVE | 1 1 | REMOTE ONLY |

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TITLE: DME FREQQENCY & DISTANCE

ADDRESS 25

| BYTE (#) | BIT 7 | BIT 6 | BIT 5 | BIT 4 | BIT 3 | BIT 2 | BIT 1 | BIT 0 |
|---|---|---|---|---|---|---|---|---|
| (0) | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 |
| | *---------- HEX 2 ----------*---------- HEX 5 ----------* | | | | | | | |
| | *---------- ADDRESS ----------BYTE----------* | | | | | | | |
| (1) | FREQ VALID 1=VAL | DIST VALID 1=VAL | SRCH/ TRCK * | SRCH/ TRCK * | DME HOLD 1-ON | TEST 1=ON | SI CHANNEL IDENT | SI |
| (2) | 8 | 4 | 2 | 1 | 8 | 4 | 2 | 1 |
| | *---------- BCD----------*---------- BCD ----------* | | | | | | | |
| | *----------0.1 MHZ----------*----------0.01 MHZ----------* | | | | | | | |
| (3) | PAD | 4 | 2 | 1 | 8 | 4 | 2 | 1 |
| | *---------- BCD----------*---------- BCD ----------* | | | | | | | |
| | *----------10.0 MHZ----------*----------1.0 MHZ----------* | | | | | | | |
| (4) | <----------BINARY, 16 BIT ----------LBS | | | | | | | |
| | <----------NAUTICAL MILES----------* | | | | | | | |
| | <----------DME DISTANCE----------* | | | | | | | |
| (5) | MSB----------BINARY, 16 BIT ----------> | | | | | | | |
| | 256----------NAUTICAL MILES----------> | | | | | | | |
| | *----------DME DISTANCE----------> | | | | | | | |

NOTE (1): *SRCH/TRCK: (BITS 5,4)

| | |
|---|---|
| 0 0 | NO SQUITTER |
| 0 1 | SEARCH |
| 1 0 | PRE-TRACK |
| 1 1 | TRACK |

CHANNEL INDENT: (BITS 1,0)

| | |
|---|---|
| 0 0 | #1 PRESET (OR REMOTE) |
| 0 1 | #1 ACTIVE |
| 1 0 | #2 ACTIVE |
| 1 1 | REMOTE ONLY |

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TITLE: DME TIME-TO-STATION & VELOCITY

ADDRESS 26

| BYTE (#) | BIT 7 | BIT 6 | BIT 5 | BIT 4 | BIT 3 | BIT 2 | BIT 1 | BIT 0 |
|---|---|---|---|---|---|---|---|---|
| | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 |
| (0) | HEX 2 | | | | HEX 6 | | | |
| | ADDRESS | | | | BYTE | | | |
| | TTS & VEL 1=VAL | PAD | SRCH/ TRCK * | SRCH/ TRCK * | PAD | TEST 1=ON | SI CHANNEL IDENT | SI |
| | 8 | 4 | 2 | 1 | 8 | 4 | 2 | 1 |
| (2) | BCD 1.0 MIN | | | | BCD 0.10 MIN | | | |
| | PAD | PAD | PAD | 1 | 8 | 4 | 2 | 1 |
| (3) | BCD 100 MIN | | | | BCD 10 MIN | | | |
| | 8 | 4 | 2 | 1 | 8 | 4 | 2 | 1 |
| (4) | BCD 10 KNOTS | | | | BCD 1.0 KNOTS | | | |
| | PAD | PAD | PAD | PAD | 8 | 4 | 2 | 1 |
| (5) | | | | | BCD 100 KNOTS | | | |

NOTE (1): *SRCH/TRCK: (BITS 5,4)

| | |
|---|---|
| 0 0 | NO SQUITTER |
| 0 1 | SEARCH |
| 1 0 | PRE-TRACK |
| 1 1 | TRACK |

CHANNEL IDENTS: (BIT 1,0)

| | |
|---|---|
| 0 0 | #1 PRESET (OR REMOTE) |
| 0 1 | #1 ACTIVE |
| 1 0 | #2 ACTIVE |
| 1 1 | REMOTE ONLY |

NOTE (2): TIME-TO-STATION & VELOCITY BOTH ARE COMPUTED AND PRESENT ON OUTPUT BUS WITHOUT REGAURD TO SIGN.

COMMERCIAL STANDARD DIGITAL BUS------CSDB---------STANDARD 523-0772774

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TITLE: DME IDENT

ADDRESS 27

| BYTE (#) | BIT 7 | BIT 6 | BIT 5 | BIT 4 | BIT 3 | BIT 2 | BIT 1 | BIT 0 |
|---|---|---|---|---|---|---|---|---|
| (0) | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 |
| | *---------- HEX 2 ----------*---------- HEX 7 ----------* | | | | | | | |
| | *---------- ADDRESS ----------BYTE----------* | | | | | | | |
| (1) | IDENT VALID 1=VAL | ANALG & 568 DATA | SRCH/ TRCK * | SRCH/ TRCK * | PAD | TEST 1=ON | SI CHANNEL IDENT | SI |
| (2) | 0=VOL | 1 | 0 | 0 | 1 | 0 | 0 | 1 |
| | CHAR----------7-BIT ASCII---------- EXAMPLE=I----------* | | | | | | | |
| | VALID ----------FIRST CHARACTER----------* | | | | | | | |
| (3) | 0=VAL | 1 | 0 | 0 | 1 | 1 | 0 | 0 |
| | CHAR----------7-BIT ASCII---------- EXAMPLE=L----------* | | | | | | | |
| | VALID ----------SECOND CHARACTER----------* | | | | | | | |
| (4) | 0=VAL | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| | CHAR----------7-BIT ASCII---------- EXAMPLE=A----------* | | | | | | | |
| | VALID ----------THIRD CHARACTER----------* | | | | | | | |
| (5) | 0=VAL | 1 | 0 | 1 | 1 | 0 | 0 | 0 |
| | VALID----------7-BIT ASCII---------- EXAMPLE=X----------* | | | | | | | |
| | *----------FOURTH CHARACTER----------* | | | | | | | |

NOTE (1): *SRCH/TRCK: (BITS 5,4)

| | | | |
|---|---|---|---|
| 0 0 | NO SQUITTER | 0 0 | #1 PRESET (OR REMOTE) |
| 0 1 | SEARCH | 0 1 | #1 ACTIVE |
| 1 0 | PRE-TRACK | 1 0 | #2 ACTIVE |
| 1 1 | TRACK | 1 1 | REMOTE ONLY |

CHANNEL IDENTS: (BIT 1,0)

NOTE (2): ANALOG AND 568 DATA (BIT 6 BYTE 1)

A “1” IN THIS BIT IDENTIFIES THE CHANNEL WHICH IS THE SOURCE OF DATA FOR THE ANALOG AND 568 6-WIRE OUTPUTS.

NOTE (3): A 3-LETTER IDENT OCCUPIES THE $2^{ND}$, $3^{RD}$, & $4^{TH}$ CHARATER BYTES, WITH THE $1^{ST}$ CHARACTER BYTE (2), BIT (7) SET INVALID.

COMMERCIAL STANDARD DIGITAL BUS------CSDB---------STANDARD 523-0772774

25 Jan 86

TITLE: ADF DATA

ADDRESS 2B

| BYTE (#) | BIT 7 | BIT 6 | BIT 5 | BIT 4 | BIT 3 | BIT 2 | BIT 1 | BIT 0 |
|---|---|---|---|---|---|---|---|---|
| (0) | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 1 |
| | *---------- HEX 2 ----------*---------- HEX B ----------* | | | | | | | |
| | *---------- ADDRESS ----------BYTE----------* | | | | | | | |
| (1) | ADF BRNG 1=VAL | FREQ VALID 1=VAL | BFO 1=ON | ADF/ ANT 1=ADF | FREQ LIMIT 1=ON | TEST 1=ON | SI | SI SOURCE IDENT |
| (2) | <----------2'S COMPLEMENT, 12-BIT----------LBS | | | | | | | |
| | <----------DEGREES----------* | | | | | | | |
| | <----------ADF BEARING----------* | | | | | | | |
| (3) | 8 | 4 | 2 | 1 | MSB----------> | | | |
| | BCD | | | | -180----------> | | | |
| | *----------0.1 KHZ----------* | | | | *---------- ADF BEARING----------> | | | |
| (4) | 8 | 4 | 2 | 1 | 8 | 4 | 2 | 1 |
| | *----------BCD----------*----------BCD----------* | | | | | | | |
| | *----------10 KHZ----------*----------1.0 KHZ----------* | | | | | | | |
| (5) | PAD | PAD | 2 | 1 | 8 | 4 | 2 | 1 |
| | | | *---------BCD--------*----------BCD----------* | | | | | |
| | | | *-1000 KHZ--------*----------100 KHZ----------* | | | | | |

NOTE (1): SOURCE IDENT BITS (1,0) BYTE (1)

| | | | |
|---|---|---|---|
| 0 0 | NOT USED | 1 0 | #2 UNIT |
| 0 1 | #1 UNIT | 1 1 | #3 UNIT |

NOTE (2): FREQUENCY LIMIT BIT (3) BYTE (1)

1=1750 KHZ MAX

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25 Jan 86

TITLE: ADF FREQUENCY

ADDRESS 2C

| BYTE (#) | BIT 7 | BIT 6 | BIT 5 | BIT 4 | BIT 3 | BIT 2 | BIT 1 | BIT 0 |
|---|---|---|---|---|---|---|---|---|
| (0) | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 |
| | HEX 2 | | | | HEX C | | | |
| | ADDRESS | | | | BYTE | | | |
| (1) | FREQ VALID 1=VAL | PAD | BFO 1=ON | ADF/ ANT 1=ADF | PAD | TEST 1=ON | SI SOURCE IDENT | SI |
| (2) | PAD | PAD | PAD | PAD | PAD | PAD | PAD | PAD |
| (3) | 8 | 4 | 2 | 1 | PAD | PAD | PAD | PAD |
| | BCD | | | | | | | |
| | 0.1 KHZ | | | | | | | |
| (4) | 8 | 4 | 2 | 1 | 8 | 4 | 2 | 1 |
| | BCD | | | | BCD | | | |
| | 10 KHZ | | | | 1.0 KHZ | | | |
| (5) | PAD | PAD | 2 | 1 | 8 | 4 | 2 | 1 |
| | | | BCD | | BCD | | | |
| | | | 1000 KHZ | | 100 KHZ | | | |

NOTE (1): SOURCE IDENT BITS (1,0) BYTE (1)

| | | | |
|---|---|---|---|
| 0 0 | NOT USED | 1 0 | #2 UNIT |
| 0 1 | #1 UNIT | 1 1 | #3 UNIT |

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TITLE: ADF FREQUENCY

ADDRESS 30

| BYTE (#) | BIT 7 | BIT 6 | BIT 5 | BIT 4 | BIT 3 | BIT 2 | BIT 1 | BIT 0 |
|---|---|---|---|---|---|---|---|---|
| (0) | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |
| | *---------- HEX 3 ----------*---------- HEX 0 ----------* | | | | | | | |
| | *---------- ADDRESS ----------BYTE----------* | | | | | | | |
| (1) | REM TUNE 1=VAL | PAD | ACT /PRE 1=XFR | REM MEM 1=RCL | PAD | TEST 1=ON | SI SOURCE IDENT | SI |
| (2) | 8 | 4 | 2 | 1 | 8 | 4 | 2 | 1 |
| | *----------BCD----------*----------BCD----------* | | | | | | | |
| | *----------0.1 MHZ----------*----------0.01 MHZ----------* | | | | | | | |
| (3) | PAD | 4 | 2 | 1 | 8 | 4 | 2 | 1 |
| | *----------BCD----------*----------BCD----------* | | | | | | | |
| | *----------10.0 MHZ----------*----------1.0 MHZ----------* | | | | | | | |
| (4) | PAD | PAD | PAD | PAD | PAD | PAD | PAD | PAD |
| | *----------*----------* | | | | | | | |
| | *----------*----------* | | | | | | | |
| (5) | *----------2'S COMPLEMENT----------* | | | | | | | |
| | *----------MODULO 256----------* | | | | | | | |
| | *----------CHECKSUM----------* | | | | | | | |

NOTE (1): SOURCE IDENT BITS (1,0) BYTE (1)

| | | | |
|---|---|---|---|
| 0 0 | SET #1 PRESET | 1 0 | SET #2 ACTIVE |
| 0 1 | SET #1 ACTIVE | 1 1 | SET #2 PRESET |

NOTE (2): CONTROL BITS (5,4,2) BYTE (1)

THESE ARE MOMENTARY ACTION CONTROL BITS, AND REQUIRE BOTH SET AND RESET STATES TO BE TRANSMITTED EACH TIME. SEE COMMENTS UNDER BUS OPERATIONS PARAGRAPH ABOVE.

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TITLE: REMOTE COM TUNE

ADDRESS 31

| BYTE (#) | BIT 7 | BIT 6 | BIT 5 | BIT 4 | BIT 3 | BIT 2 | BIT 1 | BIT 0 |
|---|---|---|---|---|---|---|---|---|
| (0) | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 |
| | *---------- HEX 3 ----------*---------- HEX 1 ----------* | | | | | | | |
| | *---------- ADDRESS ----------BYTE----------* | | | | | | | |
| (1) | REM TUNE 1=VAL | PAD | ACT /PRE 1=XFR | REM MEM 1=RCL | SI | TEST 1=ON | SI | SI SOURCE IDENT |
| (2) | 8 | 4 | 2 | 1 | PAD | PAD | PAD | PAD |
| | *----------BCD----------*----------* | | | | | | | |
| | *----------0.001 MHZ----------*----------* | | | | | | | |
| (3) | 8 | 4 | 2 | 1 | 8 | 4 | 2 | 1 |
| | *----------BCD----------*----------BCD----------* | | | | | | | |
| | *----------0.1 MHZ----------*----------0.01 MHZ----------* | | | | | | | |
| (4) | PAD | 4 | 2 | 1 | 8 | 4 | 2 | 1 |
| | *----------BCD----------*----------BCD----------* | | | | | | | |
| | *----------10.0 MHZ----------*----------1.0 MHZ----------* | | | | | | | |
| (5) | *----------2'S COMPLEMENT----------* | | | | | | | |
| | *----------MODULO 256----------* | | | | | | | |
| | *----------CHECKSUM----------* | | | | | | | |

NOTE (1): SOURCE IDENT BITS (3,1,0) BYTE (1)

| | | | |
|---|---|---|---|
| 0..0 0 | NOT USED | 1 0 0 | NOT USED |
| 0 0 1 | #1 ACTIVE | 1 0 1 | #1 PRESET |
| 0 1 0 | #2 ACTIVE | 1 1 0 | #2 PRESET |
| 0 1 1 | #3 ACTIVE | 1 1 1 | #3 PRESET |

NOTE (2): CONTROL BITS (5,4,2) BYTE (1)

THESE ARE MOMENTARY ACTION CONTROL BITS, AND REQUIRE BOTH SET AND RESET STATES TO BE TRANSMITTED EACH TIME. SEE COMMENTS UNDER BUS OPERATIONS PARAGRAPH ABOVE.

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TITLE: REMOTE ADF TUNE

ADDRESS 32

| BYTE (#) | BIT 7 | BIT 6 | BIT 5 | BIT 4 | BIT 3 | BIT 2 | BIT 1 | BIT 0 |
|---|---|---|---|---|---|---|---|---|
| (0) | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 |
| | *---------- HEX 3 ----------*---------- HEX 2 ----------* | | | | | | | |
| | *---------- ADDRESS ----------BYTE----------* | | | | | | | |
| (1) | REM TUNE 1=VAL | PAD | ACT /PRE 1=XFR | REM MEM 1=RCL | PAD | TEST 1=ON | SI SOURCE IDENT | SI |
| (2) | 8 | 4 | 2 | 1 | PAD | PAD | PAD | PAD |
| | *----------BCD----------* | | | | | | | |
| | *----------0.1 KHZ----------* | | | | | | | |
| (3) | 8 | 4 | 2 | 1 | 8 | 4 | 2 | 1 |
| | *----------BCD----------*----------BCD----------* | | | | | | | |
| | *----------10 KHZ----------*----------1.0 KHZ----------* | | | | | | | |
| (4) | PAD | PAD | 2 | 1 | 8 | 4 | 2 | 1 |
| | | | *-----BCD----------*----------BCD----------* | | | | | |
| | | | *-1000 KHZ-------*----------100 KHZ----------* | | | | | |
| (5) | *----------2'S COMPLEMENT----------* | | | | | | | |
| | *----------MODULO 256----------* | | | | | | | |
| | *----------CHECKSUM----------* | | | | | | | |

NOTE (1): SOURCE IDENT BITS (1,0) BYTE (1)

| | | | |
|---|---|---|---|
| 0 0 | SET #1 PRESET | 1 0 | SET #2 ACTIVE |
| 0 1 | SET #1 ACTIVE | 1 1 | SET #2 PRESET |

NOTE (2): CONTROL BITS (5,4,2) BYTE (1)

THESE ARE MOMENTARY ACTION CONTROL BITS, AND REQUIRE BOTH SET AND RESET STATES TO BE TRANSMITTED EACH TIME. SEE COMMENTS UNDER BUS OPERATIONS PARAGRAPH ABOVE.

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TITLE: REMOTE ATC TUNE

ADDRESS 33

| BYTE (#) | BIT 7 | BIT 6 | BIT 5 | BIT 4 | BIT 3 | BIT 2 | BIT 1 | BIT 0 |
|---|---|---|---|---|---|---|---|---|
| (0) | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 |
| | HEX 3 | | | | HEX 3 | | | |
| | ADDRESS | | | | BYTE | | | |
| (1) | CODE VALID 1=VAL | PAD | PAD | PAD | PAD | TEST 1=ON | SI | SI SOURCE IDENT |
| (2) | PAD | 4 | 2 | 1 | * | PAD | 4 | 2 1 |
| | ATC CODE C | | | | | ATC CODE D | | |
| | BCD, (0-7 ONLY) | | | | | | | |
| (3) | PAD | 4 | 2 | 1 | * | PAD | 4 | 2 1 |
| | ATC CODE A | | | | | ATC CODE B | | |
| | BCD, (0-7 ONLY) | | | | | | | |
| (4) | PAD | PAD | PAD | PAD | PAD | PAD | PAD | PAD |
| (5) | 2'S COMPLEMENT | | | | | | | |
| | MODULO 256 | | | | | | | |
| | CHECKSUM | | | | | | | |

NOTE (1): SOURCE IDENT BITS (1,0) BYTE (1)

| | | | |
|---|---|---|---|
| 0 0 | NOT USED | 1 0 | #2 UNIT |
| 0 1 | #1 UNIT | 1 1 | NOT USED |

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TITLE: REMOTE DME TUNE

ADDRESS 34

| BYTE (#) | BIT 7 | BIT 6 | BIT 5 | BIT 4 | BIT 3 | BIT 2 | BIT 1 | BIT 0 |
|---|---|---|---|---|---|---|---|---|
| (0) | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 |
| | HEX 3 | | | | HEX 4 | | | |
| | ADDRESS | | | | BYTE | | | |
| (1) | REM TUNE 1=VAL | PAD | PAD | PAD | PAD | RSVD 1=ON | SI CHANNEL IDENT | SI |
| (2) | 8 | 4 | 2 | 1 | 8 | 4 | 2 | 1 |
| | BCD | | | | BCD | | | |
| | 0.1 MHZ | | | | 0.01 MHZ | | | |
| (3) | PAD | 4 | 2 | 1 | 8 | 4 | 2 | 1 |
| | BCD | | | | BCD | | | |
| | 10.0 MHZ | | | | 1.0 MHZ | | | |
| (4) | PAD | PAD | PAD | PAD | PAD | PAD | PAD | PAD |
| (5) | 2'S COMPLEMENT | | | | | | | |
| | MODULO 256 | | | | | | | |
| | CHECKSUM | | | | | | | |

NOTE (1): CHANNEL IDENT BITS (1,0) BYTE (1)

| | | | |
|---|---|---|---|
| 0 0 | #1 PRE-EMPT | 1 0 | #2 REMOTE |
| 0 1 | #1 REMOTE | 1 1 | PRE-EMPT |

PURPOSE:

THIS ADDRESS IS TO BE USED ONLY TO TUNE A DME CHANNEL TO A FREQUENCY INDEPENDENT OF THE ACTIVE, ASSOCIATED NAV CHANNEL. AVAILABLE CHANNELS ARE AS DESCRIBED BELOW:

DUAL DME INSTALLATIONS:

ONE DME CHANNEL IN EACH DME RECEIVER IS DEDICATED TO ITS ASSOCIATED ACTIVE NAV CHANNEL, AND IN ADDITION, A SECOND CHANNEL IN EACH DME IS ASSIGNED TO ITS ASSOCIATED PRESET NAV CHANNEL, LEAVING TWO DME CHANNELS AVAILABLE FOR FULL-TIME, REMOTE USE. THESE TWO CHANNELS ARE TUNED USING ADDRESS 34 AND SOURCE IDENT BITS (0,1) FOR #1 DME AND (1,0) FOR #2 DME. IN ADDITION, TUNING VIA THIS ADDRESS IS ALLOWED TO "PREEMPT" THE TWO CHANNELS NORMALLY TUNED TO THE PRESET NAV CHANNELS, BY USING IDENT BITS (0,0) FOR #1 DME AND (1,1) FOR #2 DME. NOTE THAT THE REMOTE BUS THEN REMAINS IN CONTROL OF THAT CHANNEL UNTIL A NEW BURST IS SENT WITH THE 34 LABEL, THE SAME IDENT BITS, (0,0 OR 1,1), & THE REM TUNE VALID, BIT (7) = 0, OR UNTIL THE SYSTEM IS POWERED DOWN. THIS OPERATION IS NEARLY TRANSPARENT TO THE PILOT.

SINGLE DME ON THE #1 SIDE:

TWO DME CHANNELS ARE DEDICATED TO THE TWO ACTIVE NAV CHANNELS, AND ONLY CHANNEL (0,0) IS AVAILABLE FOR REMOTE TUNING. IT OPERATES BY PRE-EMPTING THE #1 PRESET CHANNEL AS DESCRIBED ABOVE. IF THE OTHER REMOTE SOURCE IDENT CODES (1,0), (0,1), (1,1) ARE SENT, THEY WILL BE IGNORED.

SINGLE DME ON THE #2 SIDE:

NOT A RECOMMENDED INSTALLATION.