



OPERATION MANUAL

DATATRAC 350H HANDHELD ASCB DATABUS ANALYZER

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

REVISION HISTORY BY DRAWING NUMBER

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1. FEATURES OF THE DATATRAC 350H

This section summarizes operational and physical characteristics of the DATATRAC 350H. Later sections provide more detailed descriptions of the unit's receive, transmit, record, and breakpoint modes.

1.1 OPERATIONAL DESCRIPTION

The DATATRAC 350H is an ASCB databus analyzer supporting all versions of the ASCB bus, including RSB. It is intended for use in a lab/shop environment or on the flight line. The unit may be operated with 110 VAC or 220 VAC adapters or on internal battery. The DATATRAC 350H provides a stub cable interface to the ASCB databus. In receive mode, the user can view all addresses active on the bus and select those wordstrings or individual words he wishes to view. The transmit mode allows a particular avionics unit to be simulated by transmitting the unit's address entered through a menu screen. A general record mode permits the user to store selected words at a pre-defined sample rate into internal battery backed RAM memory. The breakpoint mode is a troubleshooting feature for programming and detecting fault conditions. An RS-232C port is standard for downloading real time or recorded data and also for uploading changes to the address/word definition database or setup tables. The RS-232 port is also used to provide clock synchronization with a DATATRAC 400H during record or transmit.

1.2 PHYSICAL CONFIGURATION

1.2.1 GENERAL

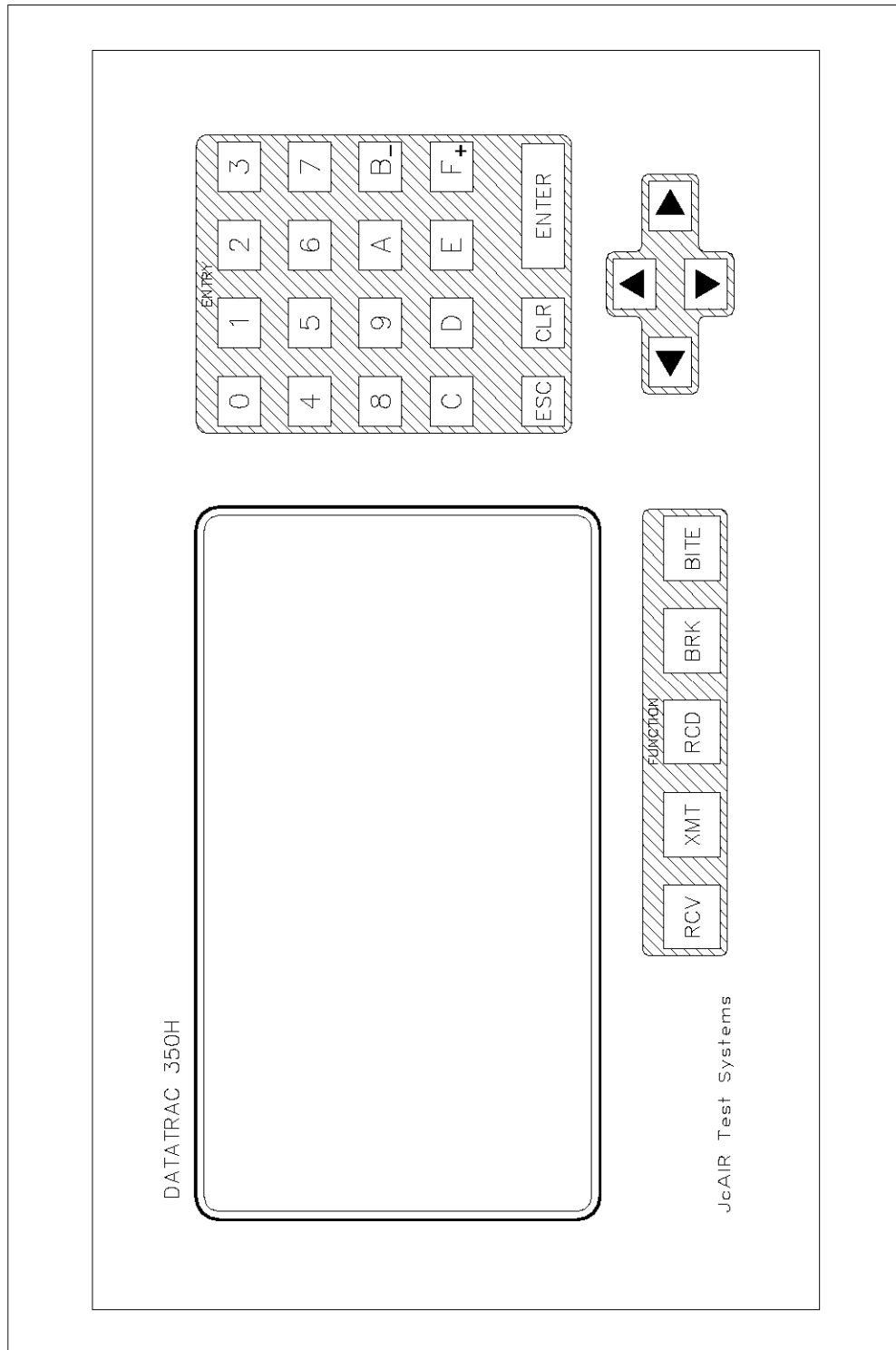
The DATATRAC 350H is packaged in a sand gray colored enclosure composed of aluminum and ABS plastic. An EMI coating has been applied to the enclosure's internal surface to prevent radiated interference. A padded carrying case is available for field use and allows the unit to be viewed and operated through a clear front panel and Velcro secured flaps on each side.

1.2.2 FRONT PANEL DESCRIPTION

The front panel configuration shown in Figure 1 contains an LCD display and keyboard area.

LCD Display

The liquid crystal display (LCD) provides 16 lines x 40 characters in the character mode. It can also be operated in a graphics mode to display time plots of data, with a resolution of 240 dots by 128 dots. A Cold Cathode Fluorescent Lamp (CCFL) is used for improved viewing in low light situations.



DATATRAC 350H Front Panel
FIGURE 1

Key board

Three keyboard areas highlighted in the sand gray color of the enclosure are located below and to the right of the LCD display. The first is a horizontal row of seven function keys: Receive, Transmit, Record, Break, Softkey F1, Softkey F2, and the Gold key. The first four function keys are used to select the basic operating modes of the DATATRAC 350H. The two softkeys are shared for various operations within these modes. The Gold key when pressed causes the gold-colored subscripted ASCII characters on the keyboard to be recognized on the next key entry. The second key area consists of a 4 x 4 hexadecimal keypad for general data entry and three utility keys located directly below the hexadecimal keys. These latter keys consist of an Enter key, a Clear key, and a Help key used for calling help menus. The third key area consists of the four arrow keys. The up, down, left, and right arrows are used for various utility functions dependent on mode. Generally, the up/down keys are used to increment vertically through data lists. The left and right buttons are used to move the cursor laterally and sequence through setup options.

1.2.3 RIGHT SIDE PANEL DESCRIPTION

The right side panel shown in Figure 2 contains the main power switch, the LCD contrast control the On/Off switch for the CCFL backlight, the databus connectors, the DAC port connector, the fast charge indicator, and the DC input power connector.

Power Switch

A master power switch applies power (from either the internal battery or an AC adapter if plugged in) to the display and all electronic circuits. The 'O' indicates the OFF position and the '1' indicates the ON position.

LCD Contrast Control

The contrast control for the display is located below the main power switch on the right side panel. This may be adjusted at any time to optimize the viewing of the display.

CCFL Backlight Switch

An On/Off slide switch for the CCFL Backlight is provided to aid in the viewing of the LCD display in different lighting conditions. The CCFL Backlight is recommended for low ambient light conditions. When the unit is operated from the internal battery, the battery discharge time is reduced by approximately 30% when the backlight is on. To extend discharge time, the CCFL will be automatically turned off if no keyboard entry is made within a five minute period. Pressing any key will re-energize the CCFL.

ASCB Databus Connectors

Since the DATATRAC 350H can operate on all three versions (A, B, and C) of the ASCB bus and the RSB bus, 4 connectors are provided to accomplish this: Bus 1, Bus 2, Backup Bus, and Clock. Each is a two contact push on connector with the socket contact designated as the signal and the pin contact designated as the "-" signal of the respective bus.

DAC Connector

A 2 contact recessed connector provides an interface to the general purpose DAC (digital to analog converter) output. This is a push on type connector similar to the databus connector. The socket contact is the DAC output and the pin contact is signal ground.

DC Power Input

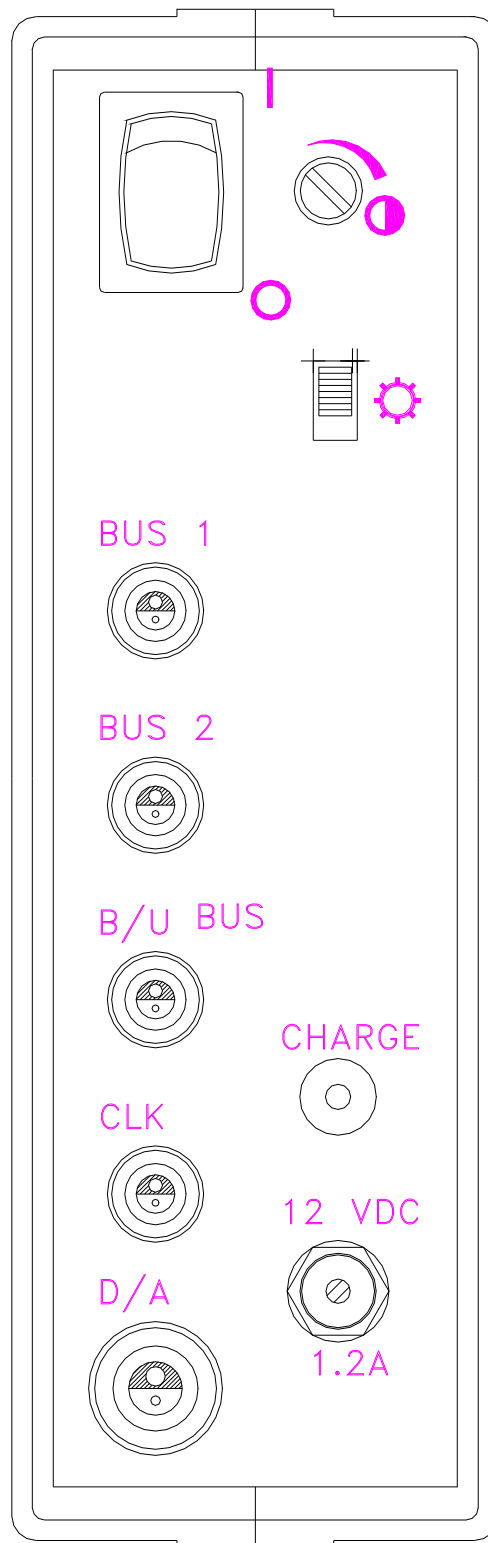
An input jack for applying 12 volt DC power is located on the lower right side panel. An external AC power adapter is provided with each DATATRAC 350H unit. Either a 110 VAC, 60 Hz or a 220 VAC, 50 Hz adapter is available. Both can be operated up to 400 Hz aircraft power. Either adapter will provide a nominal 12 VDC, 1.2 amp (unregulated) power source for unit operation and battery charging. The positive source is connected internally to the center conductor. The ground return is connected to the outer conductor.

*****WARNING*****

There are many different AC adapters provided with different types of electronic equipment. The user should be careful to use only the AC adapter that was provided with the DATATRAC 350H. USING THE WRONG ADAPTER COULD CAUSE DAMAGE TO THE DATATRAC. Replacement or additional spare AC adapters are available from Aeroflex.

Fast Charge Indicator

To indicate when the internal battery is being charged in the "Fast Charge" mode, a red LED has been provided. Whenever the AC adapter is plugged into the unit, this LED will illuminate. Depending on the condition of the battery, the light could stay on from 15 minutes (fully charged) to over 4.5 hours (fully discharged) before extinguishing. When the light is off and the unit is connected to the AC adapter, the battery will be in trickle charge mode.



DATATRAC 350H Right Side Panel

FIGURE 2

1.2.4 LEFT SIDE PANEL

The left side panel shown in Figure 3 contains the RS-232C connector and the unit's nameplate.

RS-232C Connector

A 9 pin D type connector is located on the lower part of the left panel for two way communication with a personal computer (PC). The 9 pin connector may also be used to provide clock synchronization with another DATATRAC unit. The cable provided with the DATATRAC must be used for communication with a PC. This cable provides for the proper signal connection to the PC and jumpers required by the DATATRAC. Pin assignments are as follows:

Definition		Pin
RS-232C DCD	-	1
RS-232C RXD	-	2
RS-232C TXD	-	3
RS-232C DTR	-	4
Ground	-	5
RS-232C DSR	-	6
RS-232C RTS	-	7
RS-232C CTS/SYNC IN	-	8
SYNC OUT	-	9

Nameplate

The unit's model description, DATATRAC 350H appears on the front of the unit and identifies it as an ASCB bus analyzer. A nameplate on the left side panel provides serial number and hardware revision status information. This plate must remain attached to the unit and referred to when reporting problems to Atlantic Instruments personnel.

1.2.5 INTERNAL ARCHITECTURE

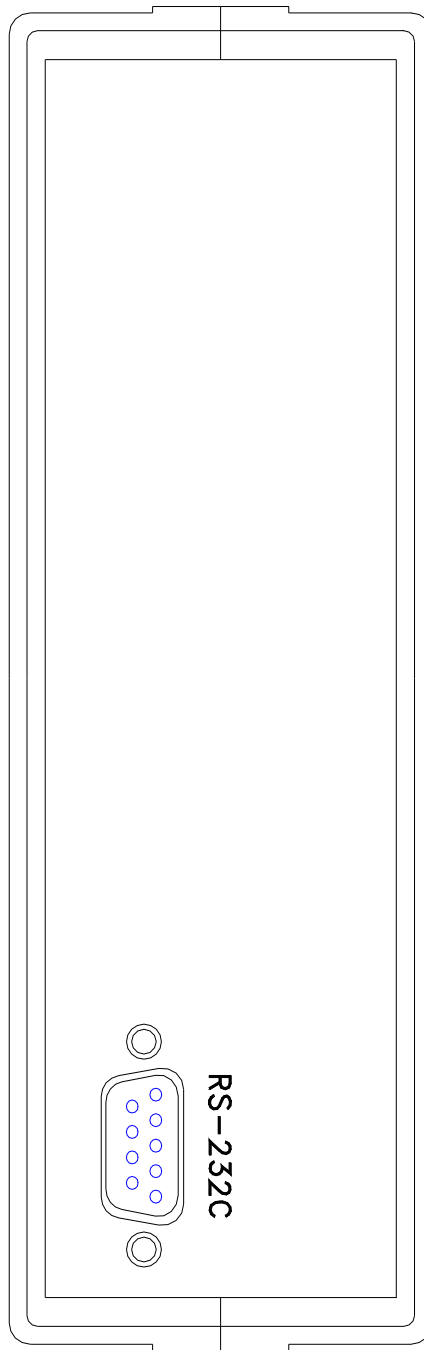
Internally, the DATATRAC 350H unit contains three inter-connecting printed circuit boards, a rechargeable NiCad battery pack, and cable interconnects to the front panel and right side panel.

The internal configuration is illustrated in Figure 4.

1.2.6 PADDED CARRYING CASE

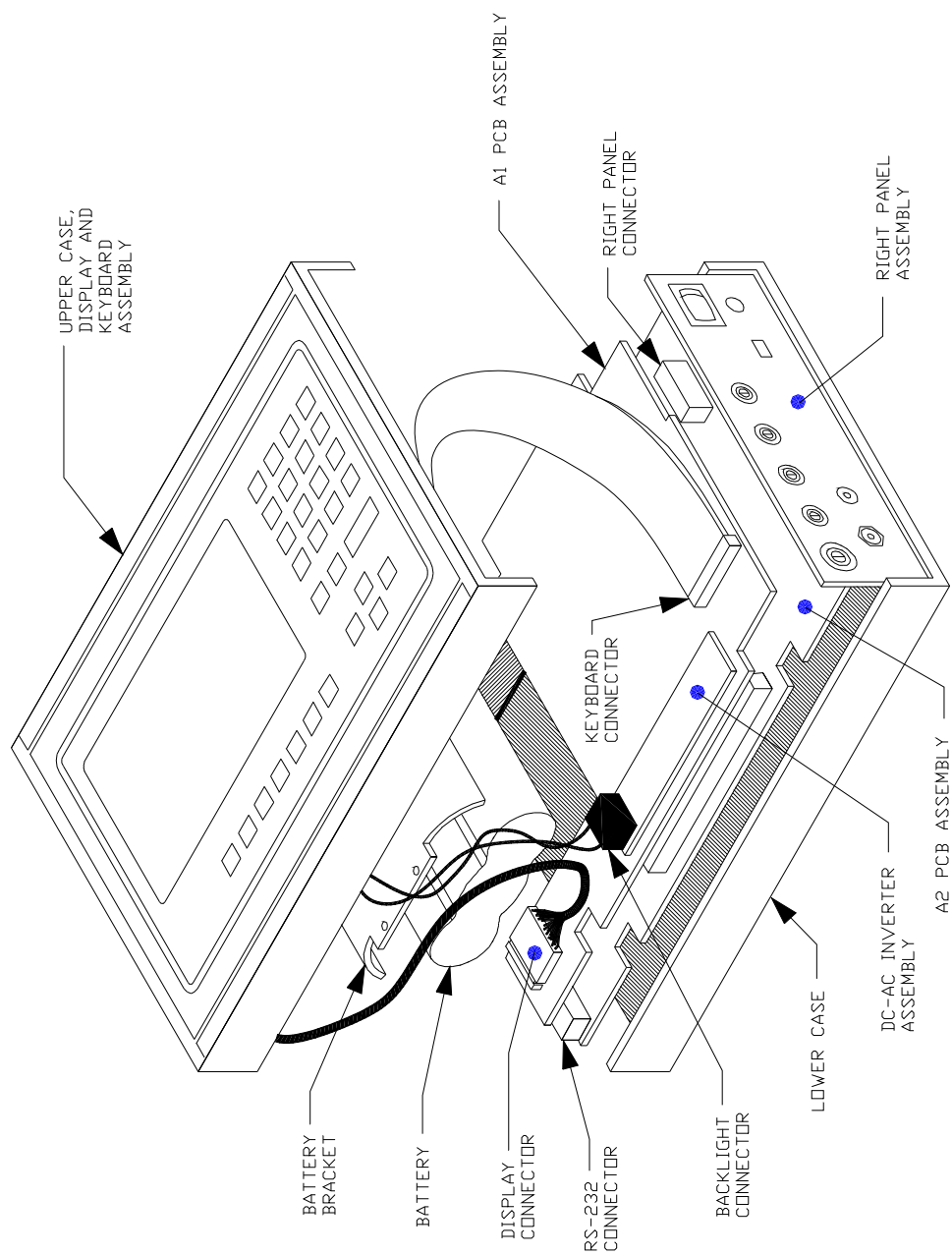
A black padded vinyl carrying case is provided with each DATATRAC 350H. This padded case allows viewing and operation of the unit through a clear front panel and access to the databus ports and RS-232C port via Velcro side flaps. The DATATRAC 350H is kept well protected from the environment and handling during flight-line or various field service activities.

The carrying case is illustrated in Figure 5.



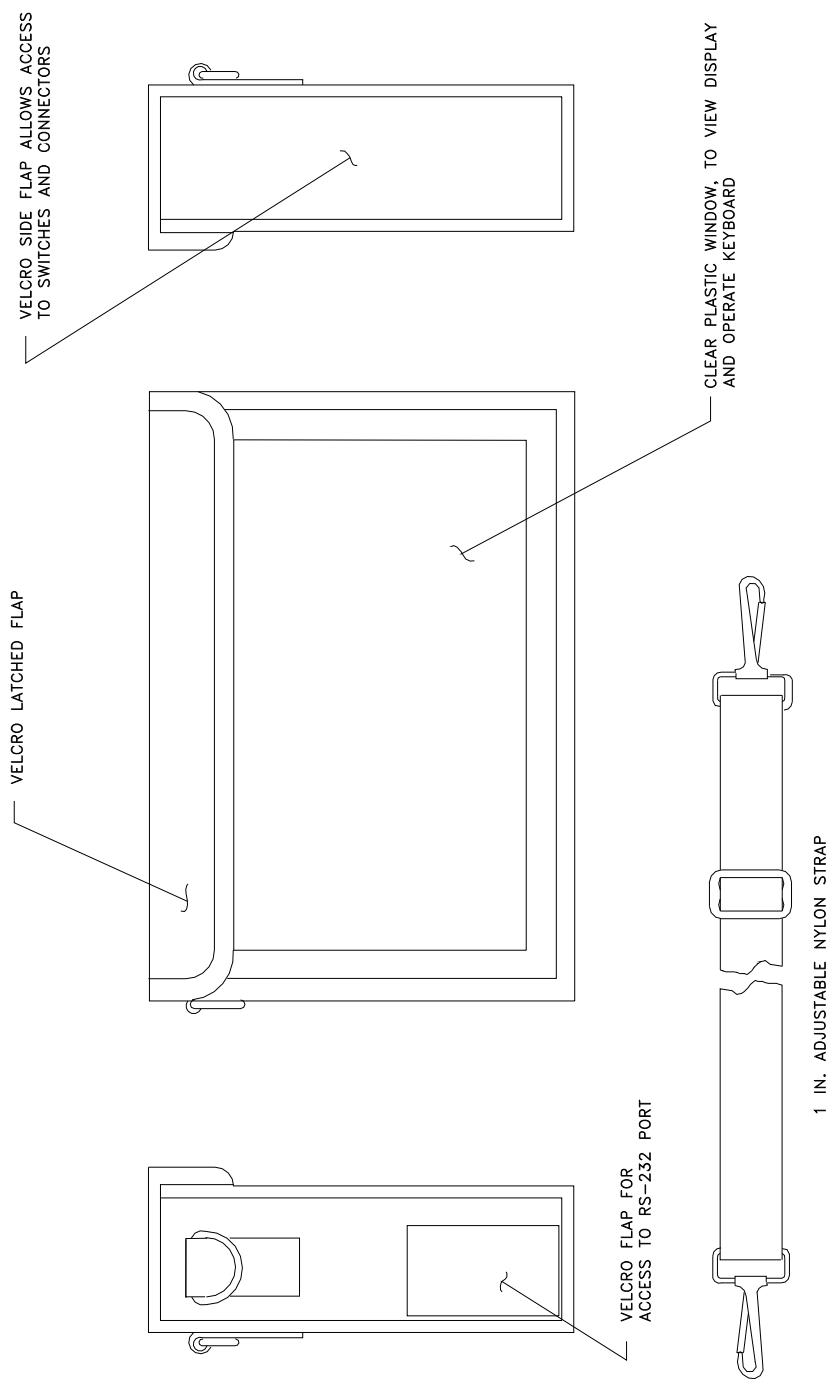
DATATRAC 350H Left Side Panel

FIGURE 3



DATATRAC 350H Internal Architecture

FIGURE 4



DATATRAC 350H Carrying Case

FIGURE 5

1.3 INTERNAL BATTERY POWER

In addition to the external AC adapter, the DATATRAC 350H unit may also be operated from the internal battery. The battery is a 2.4 Amp-Hr rechargeable NiCad battery. A fully charged battery will normally provide over 6 hours of operation. This battery is also used to retain RAM memory for an extended period (approximately 2 months shelf life on RAM memory backup). RAM memory will be retained even when the battery has discharged below the level required to operate the unit.

The DATATRAC 350H is equipped with a low battery indicator located at the top right corner of the LCD display screen. This indicator (BATT) will illuminate and flash when the internal battery needs recharging. Once the indicator has appeared, the user has approximately 15 minutes before the unit will completely power down.

The internal battery can be recharged with the application of DC power from the external adapter (nominal 12 VDC). The charge function employs two modes for rapid and efficient charging. The Fast Charge mode charges at a level of 600 milliamperes for a maximum period of 4.5 hours or until the battery is fully charged. During this time the "Charge" indicator will be illuminated. After the time out or a fully charged condition is attained, the Trickle Charge mode of 75 milliamperes is automatically entered and the "Charge" indicator will extinguish.

The charging circuit is reinitialized and operational whenever 12 VDC power is applied independent of the position of the main power switch.

NiCad batteries can be damaged by over-charging. It is recommended that the 12V adapter not be left plugged into the unit for extended periods of time when the DATATRAC is not in use.

2. INSTALLATION AND OPERATION INFORMATION

2.1 UNPACKING AND INSPECTION

The DATATRAC 350H 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 350H unit
2. 12 VDC/ 1.2 Amp AC adapter (110 VAC or 220 VAC)
3. Black Padded Carrying Case
4. Reference Manual
5. RSREAD PC Software Program (contained inside manual)
6. Cables and other options

Inspect all items thoroughly for physical damage. If no damage is evident, connect the AC adapter to the unit and turn on power. A power on screen should appear on the display (see Section 2.2). If a problem is encountered at this point, contact an Atlantic Instruments representative for assistance. DO NOT OPEN THE UNIT AND ATTEMPT REPAIRS AS THIS WILL VOID THE WARRANTY.

The internal battery should be in a charged state when received, however, as a precaution it is recommended that the unit be connected to the AC adapter until the Fast Charge Indicator extinguishes before attempting to operate from the internal battery.

2.2 GENERAL POWER ON PROCEDURES

External power can be applied from the supplied AC Adapter or the unit can be operated on the internal battery.

After turning the power switch to the ON position, the following screen will appear on the display (a reminder: the contrast control may be adjusted at any time to optimize the viewing of the display).

The version number of the current software packages contained in the DATATRAC 350H unit are always displayed on the power on menu. This information may be useful when reporting problems experienced in the field. At this point the user may wish to reinitialize the unit by pressing CLR and then 0 or CLR and then A. DATATRAC units always retain previously used values for all function setup options.

These may be replaced with a default set of values. CLR 0 completely reinitializes the unit with the exception of setup tables that have been placed in the five designated locations in RAM. CLR A reinitializes these as well. This initialization can only be performed from the power up screen.

**** DATATRAC 350H ****

CPU S/W Version 001 - December 1994
ASCB S/W Version 001

System Configuration:

1 XMT 2 RCV PORTS
Configured for ASCB version: A

Press ENT to continue.
Press F1 to program flash memory
Press F2 to change ASCB version

(Copr. 1998 JcAir Test Systems)

2.3 PROGRAMMING FLASH MEMORY

The DATATRAC 350H contains two flash memory devices. These are programmable ROM devices that can be erased and programmed while installed in the unit. One of the devices contains the DATATRAC's scaling data bases. The other may contain up to 128 setup tables defined by PCMGR300, an optional program that runs on a PC.

Pressing the F1 key in the main power on screen invokes the programming function. CAUTION, selecting this function may erase the scaling database or setup tables! Do not invoke this function unless you are prepared to program the FLASH memory.

When this function is invoked, two choices are presented. A new scaling data base may be downloaded by selecting "1" or setup tables by selecting "2". To abort this function, press 'CLR' at any time. The files to be downloaded must be prepared by the PCMGR-300 program

2.4 SELECTING ASCB VERSIONS

The DATATRAC 350H supports all versions of the ASCB bus, including RSB. The differences between these versions include the scaling data base definitions, requirements for a transmit clock, and the availability of Primary and Backup buses.

In order for the DATATRAC unit to operate properly for a given bus the correct bus must be selected on the main power on screen. Pressing the F2 key causes the unit to scroll through the selections available. The desired bus version must be displayed before proceeding to the Function Selection Menu. All subsequent screens will display the selected version on the top line.

2.4.1 ASCB BUS CONNECTIONS

There are three unique versions of the ASCB bus; A, B and C. Each version has a distinct architecture with respect to the number of Primary and Backup buses and clock requirements. To support these, the DATATRAC has four connectors on the right side panel.

In USER mode, the 'Bus 1' and 'Bus 2' connectors are used to receive data on the DATATRAC's channel 1 and 2 respectively for all versions. 'Bus 1' is also the transmit channel 1 for all versions. For version C the 'B/U Bus' transmits the same data transmitted on 'Bus 1'. The 'CLK Bus' provides a connection to the bus being transmitted on in version A only. It is not necessary for the DATATRAC's receive function.

In Controller mode the same applies except data is transmitted on 'Bus 1', 'Bus 2' and 'B/U Bus'. Note also that in version A there is only one clock connection. This should be connected to the desired primary bus.

2.5 SELECTING THE MAIN FUNCTION MENU

Pressing the ENTER key in the power on screen will produce the following Function Selection Menu screen.

ASCB-A Function Selection Menu

RCV	Receive Data
XMT	Transmit Data
RCD	Record Data
BRK	Break on Receive Data

Select function: RCV

Press ENT to continue

The user selects functions by pressing the appropriate function key and then "entering" his selection by pressing ENTER- Operation of the various modes is described in the following sections.

3. RECEIVE MODE

The DATATRAC 350H has two receive channels which may be operated simultaneously. There are two unique methods of viewing data on the bus. All address data or 'Select' data words may be viewed. The following section describes the setup and operation of the DATATRAC 350H receive mode.

3.1 RECEIVE SETUP MENUS

The DATATRAC 350H provides various features for examining address data present on the received buses and then displaying all or selected data in a number of formats. Setup menus also allow the user to reconfigure the display "windows", turn the monitor function on or off, and download received digital words to the RS-232C or DAC port.

3.1.1 PRIMARY RECEIVE SETUP MENU

After selection of receive mode, the following Receiver Setup screen appears. Most of the setup lines are self explanatory. The user makes selections in most cases by placing the cursor on the desired line using the up/down arrows, and then presses the right arrow to cycle through all available options for that parameter. Where numerical data is the requested setup option, this is usually entered from the hex keypad.

**** ASCB-A RECEIVER SETUP ****

Channel: 1

On/Off : ON	Interval: INST
Setup Mode: KEY	RCV Download: NONE
Select Addr : ALL	Display Lines: 00
Data Format: ENG	Bus Monitor: ON

<> To step through options
 v ^ To move to next/previous line
 HLP To see explanation of options

Press ENT to continue or any
 function key to change functions

Help screens are available for every setup line option. These are invoked by placing the cursor on that line and then pressing the HELP key. When all options are appropriately set, the operator "enters" these selections by pressing the ENTER key. The following paragraphs provide detailed information on the setup options for the above menu.

- a. Channel:
(Options: 1 or 2)

The DATATRAC 350H contains two channels, the user can enter '1' or '2' on this line to select the appropriate channel.

- b. On/Off:
(Options: ON, OFF)

This receiver On/Off selection line allows the following two choices. ON enables the selected channel to receive data. OFF disables the channel.

- C. Setup Mode:
(Options: KEY, RECALL, STORE)

This receiver setup method selection line allows any of the following options: Keyboard Entry (KEY), Recall Setup Table (RECALL), or Store Setup Table (STORE). Up to 5 tables of predefined setup information may be contained in battery backed RAM and 128 tables in FLASH PROM. Each table will contain ASCB bus parameters as well as receive mode address selections and transmit tables. The 5 tables in RAM can be created by storing current setups entered by the keyboard. The 128 FLASH PROM tables are downloaded from a PC on the RS-232C port.

Keyboard Entry (KEY) enables the user to enter the receiver setup options from the keyboard. Recall Setup Table (RECALL) allows the user to load setup table from memory. Store Setup Table (STORE) is used to save the setup table to memory.

- d. Select Addr:
(Options: ALL, SEL, EDIT)

The options for the Select Address line are ALL, SEL, and EDIT referring to the display of all received information, the display of selected words, or the editing of the list of selected words. If ALL is selected, a screen will indicate the word strings presently active on the ASCB bus and allow selection of the data to be received.

ALL displays all incoming address for the current channel, SEL displays previously selected addresses/data for the current channel, and EDIT allows the user to setup/edit selected addresses.

If ALL and SEL options are selected for both channels, the Real-time Receive screen will default to the ALL address display until the data display is selected.

- e. Data Format
(Options: ENG, HEX, BIN, USER, EDIT, GRAPH)

The format of displayed data (i.e. engineering units, hex, binary, etc.) can be selected on this screen or simply cycled to the desired format using the right arrow key while viewing data.

ENG	Engineering units
HEX	Hexadecimal
BIN	Binary
USER	Applies the previously defined user format
EDIT	Define/edit new data format
GRAPH	Real-time graphic plot of data

- f. Interval
(Options: INST, MIN, MAX)

The update interval of data is indicated on data display screens and is selected here. (INST) is selected to display instantaneous interval in msec. (MIN) is selected to display the minimum interval encountered and (MAX) is selected to display the maximum interval encountered. This can be very useful for instance, in trapping data dropouts. The MIN and MAX values are reset when data is cleared by pressing CLR key or exiting the real-time display mode.

- g. RCV Download
(Options: NONE, DAC, RS232)

There are three options in the Receive Data Download Selection line. (NONE) disables data download. (DAC) ASCB receive data is downloaded as analog data on the DAC port as real-time digital to analog conversion of one data word. (RS232) ASCB receive data can be downloaded in real-time to a PC via the RS-232 port. Up to 32 words may be downloaded. (DAC) and (RS232) work only in the selected address mode as defined above in d. Select Addr.

- h. Display Lines
(Options: 2-12 lines may be allocated)

The Display Line Count Selection line allows the user to select the number of data lines to display for the selected channel. This parameter permits the channel display window sizes to be tailored to accommodate special viewing requirements. The total number of lines cannot exceed 12 or 4 for 1 or 2 channels active, respectively.

- i. Bus Monitor
(Options: OFF, ON)

The Bus Activity Monitor Selection line is used to enable the unit to flag an address as overdue. An * appears next to the last rate value when an address is overdue. "Off" disables this feature and "On" enables it.

3.1.2 ASCB RECEIVE SELECT ADDRESS SETUP MENU

If EDIT (rather than ALL or SEL) had been selected from the Receiver Setup menu, the user would be prompted to enter up to 32 Address-Word Position choices on the following screen:

ASCB-A RCV SELECT ADDRESS SETUP

Format: XX-XXX (Address - Word Position)

Channel: 1

— — —	— — —	— — —	— — —
— — —	— — —	— — —	— — —
— — —	— — —	— — —	— — —
— — —	— — —	— — —	— — —
— — —	— — —	— — —	— — —
— — —	— — —	— — —	— — —
— — —	— — —	— — —	— — —
— — —	— — —	— — —	— — —
— — —	— — —	— — —	— — —

Press ENT to continue

By selecting particular orders of words, it is possible to display two words next to one another in order to more conveniently compare their values.

3.1.3 USER DEFINED DATA FORMAT SETUP

In the normal display of real time data in engineering units, scaling characteristics and units are available from a pre-stored database. User mode allows the operator to create custom scaling definitions for up to 16 data words and have these retained in battery backed RAM. Subsequently, when USER (EDIT) format is selected rather than ENG format, the entered scaling will overlay the standard database. The user can define particular data words to be HEX, BCD, Signed Binary, etc. It is even possible to identify embedded discretes and have these displayed separately. The next setup menu illustrates the binary format case. Initially, only the first five setup lines are displayed to the user. After the format is specified, the additional setup options appropriate to that format are then displayed.

ASCB-A USER DEFINED DATA FORMAT

Format Number: 01
 Address: 31
 Word Position: 004
 Format: BNR-SIGNED
 Name: DAT1
 Full Scale Value: 3.2768
 Number of Bits (1 -31) : 13
 Number of Discretes (0-8): 1
 Range: 12345.6
 Units: FPM

Press ENT to return to setup screen

Format number is a value between 01 and 16 to be entered by the user. It serves as an index to the sixteen format definitions. The address and word position identify the particular word for which a new format is being defined.

a. User Format Parameters:

The format line allows the following options to be selected with the right arrow:

BNR-SIGNED	BNR-UNSIGN
BCD	BFPN
BIN	INTEGER
HEX	WORD-2

The following paragraphs discuss each data type option.

Binary and HEX Data Types

In this type, the digits are encoded as Binary or Hexadecimal values, most significant digit first. When these are selected as the data type for a certain address/word position, the only parameter displayed, other than the data, is the field name.

BNR-S Data Type

In this data type, the value is represented as a binary number that is a function of some declared full-scale value. The parameters that must be specified for proper decode of BNR-S type words are the number of bits used, the full-scale value and the range. The full-scale is usually some convenient binary number such as 4, 512, 65536, etc., though some decimal full-scale values such as 180 are also used.

User mode gives the user the ability to set the full-scale value with a combination of the full-scale parameter and the Range parameter. In the sample User Defined Data Format screen, word position 004 is an example of how to encode a BNR-S word for a full-scale value of 32768. The binary number being scaled to is 3.2768, while the decimal point's position (and place-keeping zeroes) is specified by the range parameter. There are 13 significant bits (bit 3 - 14) and one sign bit (bit 15). BNR-S is always left justified in this manner. In operation the data decoded by this scale factor will be a number ranging from -32,768 FPM to 32,767 FPM.

The # discrete bits parameter specifies the number of discrete bits to be displayed with the scaled data. These bits are usually status or data validity indicators. They are always LSB justified. For instance, if there is one discrete bit it is assumed to be in bit 0 of the word. The first discrete bit is always assumed to be bit 0, the second bit 1, etc.

BNR-U Data Type

As with the BNR-S data type, the value is represented as a binary number that is a function of some declared full-scale value. The parameters that must be specified for proper decode of BNR-U type words are the number of bits used and the full-scale value. The full-scale is usually some convenient binary number such as 4, 512, 65536, etc., though some decimal full-scale values such as 180 are also used.

Just like BNR-S, BNR-U data is msb justified where bit 15 is the most significant bit. Any discrete bits are lsb justified.

Integer Data Type

This data type is identical to the BNR-U data type except the data is lsb justified. Discrete bits are msb justified.

BCD Data Type

In this type, the digits are encoded as BCD values. When BCD is selected as the data type for a certain address/word position, all of the parameters are displayed but have unique functions. Note that BCD changes the 'number of bits' field to the number of digits' field. The number of Discrete Bits, Range and Units fields function as they do for other types. The Full Scale field can not be edited.

BFPN Data Type

This data type represents Binary Floating Point Numbers. These are 32 bit numbers encoded per IEEE-754. The only parameter displayed is the name field.

Word-2 Data Type

This data type must always follow any data types that may require more than 16 bits; BNR-S, BNR-U, BFPN, etc. It serves as a place holder for the least significant bits of those words. For example, a BNR-S data type that requires 17 significant bits (plus one sign bit) would have BNR-S encoded for the word that contained the 15 most significant bits and the sign bit. The following word would have Word-2 has its data type. The only parameter displayed is the name field. Just like BNR-S, BNR-U data is msb justified where bit 15 is the most significant bit. Any discrete bits are lsb justified.

b. User Name Parameter:

The name parameter allows the user to define a unique name to identify this word. The name can be four characters long. Alpha-numeric characters are entered using the keypad and the 'Gold' functions.

There is one Word Name that the DATATRAC treats differently from an other names, CRC. If this word name is found in a wordstring, the DATATRAC will transmit the special information required of these words. The DATATRAC checks the last word of every wordstring for a "CRC" name. If found, it will calculate and transmit a CRC in this word position. Appending any other character to CRC, CRC 1 for example, will defeat this feature.

C. Full Scale Value Parameter:

Full Scale Value specifies the magnitude (+ and -) of the decoded value. The full scale values are discrete values that are predefined in the DATATRAC. They include all the full scale values commonly used. The > key is used to step through the options until the desired full scale value is displayed. The choices currently defined are (in the order they are stored):

1.0	1.019	1.0039	1.023	1.024	1.0485	1.061
1.0707	1.2282	1.27	1.273	1.27875	1.28	1.30863
1.31068	1.31584	1.35318	1.4	1.42787	1.4936	1.50509
1.53065	1.59375	1.6235	1.63066	1.6383	1.6384	1.64702
1.67527	1.728	1.80	1.867	1.97728	1.99787	2.0
2.03478	2.047	2.048	2.05727	2.09326	2.09424	2.10478
2.1662	2.272	2.4	2.4888	2.5	2.55	2.56
2.561	2.56125	2.7414	2.989	3.0	3.0451	3.1
3.2	3.2767	3.2768	3.6	3.7367	3.74	3.76477
3.992	4.0	4.01621	4.095	4.096	4.1301	4.1596
4.2667	4.37286	4.95289	4.9711	5.0	5.096	5.09661
5.09955	5.1047	5.11	5.12	5.24272	6.0	6.4
6.5535	6.5536	7.659	6.75	7.79619	8.0	8.191
8.192	8.56751	9.0	1.5	6.3969	5.1175	6.3
1.50163	2.553	9.99999				

d. Number of Bits Parameter:

This defines the number of significant bits encoded for a data word or words, excluding the sign bit. If the number is greater than 15 (16 for unsigned) the DATATRAC assumes this is a two word value and the following word must be defined as a Vord-2' data type.

e. Number of Discretes Parameter:

This allows for the display of discrete status data along with scaled data. The total of this parameter and the number of bits parameter (including a sign bit) should be less than 16. Otherwise, the following word must be defined as a Vord-2'.

f. Range Parameter:

The range parameter is used in conjunction with the Full Scale value. It determines the decimal point position of a scaled word.

g. Units Parameter:

Several data types require a specification of Units. This is a three character field. The desired value is selected by scrolling through a list using the right and left arrow keys. The following table shows these values and the order in which they are displayed:

NM	Min	Ft	Deg
Kts	FPM	RPM	m
MB	Hrs	%	DgC
HZ	Lbs	v	cc
Pnt	in	Kg	Amp
IPS	PSI	DDM	Dot
PPH	G	pF	A4Hz
KHz	mm	D/s	uA
FtL	Qt	BPA	GPM
Fps	MA	PPS	DgF
CFM	PPM	EPR	VAC
PPG	Gal	PU	mV
Vrm	BtM	Sec	NM
I/D	ILb	IN	mB

3.1.4 ASCB RECEIVE DATA DAC OUTPUT

When operating in the Selected Address mode, received digital words may be converted to an analog signal and output with user applied scaling changes and offsets. When DAC download is specified in the Receiver Setup screen, the following additional menu associated with this conversion is presented to the user.

*** ASCB-A DAC OUTPUT SETUP ***

Channel : 1 Data Offset : +00%
 Address-WP : 01-001 Scaling : 1

< > To step through options
 v ^ To move to next/previous line
 HLP To see help screen for each line

Press ENT to continue

The channel address and word position entries identify the digital word to be converted to an analog signal. An offset value between +/-99% may be entered and will move the zero point of the 16 bit word appropriately within the +/-5 volt output range. A +50% entry, for example, would mean that a word value of zero would be output as +2.5 volts.

The digital word can also be scaled by factors of 1, 2, 4, 8, 16, 32, 64, and 128 so that the +/-5 volt range represents a magnification (about the specified zero point).

3.2 REALTIME ASCB RECEIVE DATA DISPLAY

3.2.1 ALL ADDRESSES MODE

If the ALL Address selection is entered in the Receiver Setup menu, the entire contents of the ASCB bus will be presented to the user as shown below.

----- ASCB-A RCV CHANNEL 1 (ALL) -----	
Total Addresses Received =	00035
-->80	81.....
82	83.....
86	87.....
88	89.....
8A	8B
8C	80.....
8F	90.....
92	94.....
96	98.....
9A	9B
9c	9E
A3	AB....
RCV Stat: 00 00	XMT Stat: * 00

The above screen may contain up to 24 addresses. Additional addresses may be viewed by scrolling with the up/down arrow keys. The user may move the display arrow symbol to select various addresses with the right/left arrow keys. With the cursor next to a particular address, the user may press the F1 key to "bracket" an address causing the addresses entire contents along with receive rate, to be displayed after the ENTER key is pressed.

Possible keystrokes and options for this menu are as follows:

CLR: Clear out old addresses/Error flags
F1 Select/Deselect address (toggle) –Brackets (<..>) are placed around an address when it is selected. Up to 32 addresses per channel may be selected.
HELP Display Help menu
ENT: Go to Data Display Screen
-> Move cursor to next address on screen
v Scroll addresses up
<- Move cursor to previous address on screen
^ Scroll addresses down

3.2.2 REAL TIME RECEIVED DATA DISPLAY SCREENS

After selecting addresses for display, the user is immediately presented with the following Word Count Setup screen. The DATATRAC needs the correct word count to display received data correctly for the selected addresses. This count is obtained from the internal database and normally the user simply passes through this screen. It is possible to alter the word count, however, and the user can step through all selected addresses to review the assumed word counts.

---- ASCB-A RCV WORD COUNT SETUP---

Channel : I
Word Str Index : 001 Word Count: 000
Address : 01 Address Name:

Press ENT to continue

----- ASCB-A RCV CHANNEL 1 (ALL) ----- S8 -----				
ADDR-WP	----- Eng -----			Name msec
ADDR=83				AHRS-R 0025
83-001	0083			----- 0025
ADDR=03				AHRS-R 0025
03-001	0000	0000	0000 0011	CNTL 0025
03-002		+0.00000	Deg	SPA 0025
03-003		+0.00000	Deg	CPA 0025
03-004		+0.00000	Deg	SRA 0025
03-005		+0.00000	Deg	CRA 0025
03-006	00 00			SPAR 0025
03-007	00 00			SPAR 0025
03-008 0		+00.0000	Deg	PA 0025
03-009 0		+000.000	Deg	RA 0025

Note in the above display the appearance of the S8 message in the header line. In normal operation, the data update rate for the display will be real time with each newly received word presented. An adaptive controller, however, senses when an excessive amount of very high speed data is being received and overloading the DATATRAC's ability to compute update rates correctly. In this case, the receiver processor notifies the display processor that every second, fourth, or eighth sample will be transferred and this information is in turn displayed to the user as the S2, S4, or S8 message. This will not involve any real loss of capability since it only occurs when data is being received at high update rates where there is very little change between samples. The user can also reduce the amount of information on the display which will return the system to real time.

Pressing the HELP key from any of the above real time data screens will produce a help menu containing the following definitions:

- The [] symbol at the header indicates the current active channel.
- 1,2 : Change the active RCV channel.
- v^ : Scrolls data in the active channel.
- > : Steps through data formats in the active channel.
- ENT: Holds (or freezes) data in the active channel. The "freeze" option is a convenient way to view data with noise or jitter. Toggle to release the hold.
- CLR: Clears the receive buffer data and the errors for the active channel.

3.2.3 REAL-TIME RECEIVE MODE GRAPHIC PLOTS

Another format available to the user involves a strip chart like time plot of data values as shown on the following screens:

One trace active:

TR1	
CH1	
A 03	
WP001	
X1	
+00%	
<hr/>	
TR2	
CH0	

Two traces active:

TR1	
CH1	
A03	
WP001	
x1	
+00%	
<hr/>	
TR2	
CH2	
A 03	
WP021	
x8	
+00%	

This format must be selected from the Receiver Setup screen. It can be used to view one or two words from different strings. In addition to the user option of selecting different Address-Word positions, the user can vary the magnification of the data between 1 and 128 times and shift the zero offset. These selections can be made by using the arrow keys to move the cursor among the parameters in TRACE 1 or TRACE 2, then entering the desired value or selection numerically or with the arrow key.

Graphic plots are a powerful development or troubleshooting feature. Occasional data transients are more easily observed and knowledge of their shape and frequency may help identify their source. Oscillation frequencies buried in noisy data can also more easily be identified with graphic plots.

3.2.4 RECEIVE STATUS

The current status of the ASCB Transceiver register is decoded and displayed on the bottom line of each channel's window. There are two bytes displayed. The format for each byte is hexadecimal most significant bit first. Status definitions are as follows:

Most Significant Byte (left most byte)

msb	7	N/U	0
	6	N/U	0
	5	N/U	0
	4	N/U	0
	3	N/U	0
	2	N/U	0
	1	1 = Output buffer overflow	

lsb 0 1 = RCV DMA Buffer overflow

Least Significant Byte (right most byte)

Msb	7	N/U	0
	6	1 = Receive FIFO empty	
	5	1 = RCV DMA terminal count	
	4	1 = abort received	
	3	1 = Manchester error	
	2	1 = CRC error	
	1	1 = RCV FIFO overrun	
lsb	0	1 = end of RCV	

4. TRANSMIT MODE

A variety of data transmission options are available to the user and described in this section. After pressing the transmit key, the initial setup menu below appears.

ASCB-A TRANSMITTER SETUP

XMT Mode: USER

Channel:	1	Setup Mode:	KEY
On/Off:	OFF	Data Format:	ENG

Transmitter Status: * 00

< > To step through options
 v ^ To move to next/previous option
 HLP To see explanation of options

Press ENT to continue or any
 function key to change functions

The setup mode involves the following options:

- a. XMT Mode:
 (Options: USER, CONTROLLER)

This option sets up the unit as either a Bus Controller or a user. Bus Controller and User modes are mutually exclusive. Both cannot be operational at the same time.

The User mode allows the DATATRAC 350H to simulate an LRU on an ASCB bus. In this mode the DATATRAC 350H can be programmed to send the response address wordstring for up to 64 different LRU'S. The response address will be transmitted when the user request is received from the bus controller.

The Bus Controller mode allows the DATATRAC 350H to simulate an ASCB bus controller for the purposes of bench testing and development. IT IS NOT INTENDED TO TAKE THE PLACE OF THE ACTUAL BUS CONTROLLER ON AN AIRCRAFT OR IN ANY OTHER SITUATION OTHER THAN BENCH TESTING OR LABORATORY DEVELOPMENT.

- b. Channel:
 (Options: 1)

Note: There is only 1 transmit channel in the DATATRAC 350H.

- c. On/Off:
(Options : ON, OFF)

'ON' enables the channel for transmitting data. 'OFF' disables the channel.

- d. Setup Mode:
(Options : KEYBOARD, RECALL, STORE)

KEYBOARD -Enter transmit data from the keyboard.
RECALL SETUP -Select from 128 transmit setup tables stored in Flash PROM or 5
setup tables stored in battery backed RAM.

- e. Data Format :
(Options : ENG, HEX, BIN, USER, EDIT)

ENG -Engineering units
HEX -Hexadecimal
BIN -Binary
USER -Apply previously defined user format
EDIT -Define/edit new data format

4.1 USER MODE TRANSMIT DATA ENTRY

Keyboard data entry involves the definition of one or more wordstrings. Address data is entered on the following screen.

```

- - - - ASCB-A XMT WORD STRING SETUP - - - -
      Channel :    1
Word Str Index : 001   Word Count :   021
      Address :   04   A Addr Name :  AHRS-C
- - - - DATA ENTRY - - - - Format : ENG - - - -
WP - - - - ENG - - - - Data Name
001      00 04      CNTL
002      +0.00000Deg  SPA
003      +0.00000Deg  CPA
004      +0.00000Deg  SRA
005      +0.00000Deg  CRA
006      00 00      SPAR
007      00 00      SPAR

      Press F1 to move to data header,
      ENT to begin transmitting
    
```

Wordstrings are assigned a sequential index number, and then the address and the number of words are entered. A descriptive name associated with that address will be displayed to the user. Pressing F1 moves the cursor to the data header line. At this point, the user may press the right arrow to select any of the standard data formats (engineering, hex, binary, ect,). Pressing F1 again moves the cursor to the data fields where the up/down and right/left arrows moves the cursor as needed to edit the list of zero default values. The units and word names are obtained from the scale table data base within the DATATRAC 350H. Once a particular word string is set up, pressing F1 moves control to the upper half of the screen where the next index/address/word count can be set up. When all word strings have been setup, pressing ENTER enables transmission of the data entered.

4.1.1 DYNAMIC DATA SETUP

In the previous section, the setup static words was described. Another option available to the user is dynamic data where the user selects levels between +/- full scale and time segments between 0 and 999.999 seconds to create a variety of patterns. (Note that the time segments should be in multiples of 25 msec due to the ASCB frame timing). Up to ten words may be defined as dynamic types. To enter the dynamic setup screen (see previous section). The setup screen shown below then appears.

DYNAMIC DATA TRANSMIT SETUP *

Setup Number:	0	Word String Index:	
XMT Channel:	1	Address:	
XMT On/Off:	OFF	Word Position:	

|TR|<--T2-->|

AI :	+1.000	A2 :	
T1 (sec) :	001.000	T2 (sec) :	
TR (sec) :	000.000	TF (sec) :	

While in this screen, the user can define as many as ten dynamic words identified by wordstring index and word position.

4.2 CONTROLLER TRANSMIT MESSAGE SCHEDULER

The Controller Transmit Message Scheduler allows the user to specify a sequence of ASCB request addresses and the time to transmit a request relative to the start of a frame. The Frame Definition screen is shown below.

ASCB-A XMT FRAME DEFINITION		
Frame Number: 0		
Index	Request Addr.	Time (in usec)
00	80	00140
01	81	00370
02	9B	00620
03	B0	01590
04	86	03690
05	82	04910
06	83	06000
07	8A	07090
Press ENT to save and exit.		

The Controller Transmit Message Scheduler allows the entry of up to 16 request addresses in each of 8 frames. The transmit time for a request address is specified relative to the start of the frame and can range from 0 to 25000 usec. with a resolution of 10 usec. It is the user's responsibility to ensure that the time between request addresses is sufficient to account for the transmit time of the response; the minimum time allowed between request addresses is 100 usec (any request address that is not at least 100 usec from the previous request will not be transmitted).

The Message Scheduler provides the user with the flexibility to create a variety of transmit schedules : the scheduler will allow empty frames and does not require the presence of the normal ASCB Frame START and CONTROL requests to operate. At minimum, a schedule can contain just one request address.

After "entering" the complete message schedule, the display returns to the transmit setup screen or the real time data display screen if received mode had been previously set up.

4.3 STORING TRANSMIT AND RECEIVE SETUP TABLES

The currently entered and active setup of transmit wordstrings and receive setup parameters can be entered into one of the five available tables located in battery backed RAM. The following setup screen, called by selecting STORE in the Setup Mode field of the Transmitter of Receiver Setup menu, permits the assignment of a table index and descriptor.

*** RCV/XMT TABLE STORE SETUP ***

Setup Index : 1
 Channel : 1
 Descriptor : TEST01

Use keys 0-f directly or "GOLD" then
 The appropriate character to enter G-Z.

Press F1 to load selected table,
 Press ENT to continue

4.4 RECALLING TRANSMIT AND RECEIVE SETUP TABLES

In the Transmitter or Receiver Setup menu, selecting RECALL in the Setup Mode field permits the recalling of stored transmit and receive setups rather than entering this data from the keyboard. Tables are reviewed and selected from the following screen that presents the five RAM tables in the first five locations followed by the remaining FLASH PROM stored 128 tables. The list may be scrolled to place the selected table at the top, and then loaded with the F1 key.

RCV/XMT TABLE RECALL SELECTION

Selected Index: 006 Channel: 1

Setup Index	Default Channel	Descriptor	Type
006	1	ASCB-A	ROM
007	1	ASCB-B	ROM
008	1	CITX-C	ROM

Press F1 to load selected table,
 Press ENT to continue

4.5 TRANSMIT STATUS

A transmit status field is available on the Transmitter Setup menu and the Real-time Receive display. The status consists of a flashing activity indicator and a Hex code. A flashing asterisk indicates transmission activity. In the event of an error, an 'E' will flash and the code is updated.

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Least Significant Byte (right most byte)

Msb	7	1 = DET stuck enabled
	6	1 = XMT FIFO full
	5	1 = XMT DMA terminal count error
	4	1 = DET without XMT enabled
	3	1 = XMT enable without DET
	2	1 = DET truncates message
	1	1 = XMT enable truncates message
Isb	0	1 = end of XMT

5. RECORD MODE

This mode allows the DATATRAC 350H to function as a general purpose data recorder storing information in RAM for later review or download on the RS-232C port. Approximately 55,000 data words can be stored with this function.

5.1 RECORD MODE SETUP MENU

The initial setup menu for record mode is shown below.

ASCB-A DATA RECORD SETUP

Channel: 1
 Function: RECORD
 Rcd Interval : 0050
 Sync Mode: OFF

< > To step through options
 v ^ To move to next/previous line
 HLP To see explanation of options

Press ENT to continue or any
 function key to change functions.

- a. Channel:
 (Options: 1, 2)

There are two channels available to record. Enter 1 or 2 for the desired channel.

- b. Function:
 (Options: RECORD, REVIEW, DAC, RS232)

RECORD	- The memory is cleared and new data is acquired.
REVIEW	- Directly goes to display the data previously acquired.
DAC	- Ports the data in the buffer to the digital to analog (D-to-A) Converter.
RS232	- Ports the data in the buffer to the RS-232 port.

- c. Rcd Interval:
 (Options: 2-9999 ms)

This parameter specifies (in msec) the time period to wait between sampling the RCV buffers for new data. The minimum value is 2 msec.

- d. Sync Mode Selection:
(Options: OFF, MASTER, SLAVE)

The Sync Mode Selection determines if the unit will transmit (MASTER) or receive (SLAVE) a sync pulse before starting the RECORD function. This allows two units to synchronize their timers before recording data.

5.2 RECORDED DATA DISPLAY

If the record function is selected the following setup screen will be presented in order for the user to enter up to 32 words (identified by Address-Word Position) to be saved.

ASCB-A RCD / BRK SELECT ADDRESS SETUP

Format: XX-XXX (Address - Word Position)

Channel: 1

— — —	— — —	— — —	— — —
— — —	— — —	— — —	— — —
— — —	— — —	— — —	— — —
— — —	— — —	— — —	— — —
— — —	— — —	— — —	— — —
— — —	— — —	— — —	— — —
— — —	— — —	— — —	— — —
— — —	— — —	— — —	— — —
— — —	— — —	— — —	— — —

Press ENT to continue

After entering the desired address/word combinations to be recorded, the user presses the ENTER key to begin recording. The ASCB RCD/BRK word count setup screens are actually presented before the user reaches the record screen.

While data is being recorded, the user is able to review the selected data words in real time on the following screen. Record count progress is shown on the screen, and the user may temporarily halt recording by toggling the F1 key. Again, as with all data display screens, the display format may be changed with the right arrow key.


```

*RECORDING*
..... Record Count:  xxxxxxxxxx
..... Record Interval:  0050

Ch Address-WP 1 ----- Eng ----- Name
1   Xi-001           00 00

Press FI to toggle RECORD/STOP status
Press ENT to stop RECORD & review data

```

The user can stop recording at any time and review data by pressing ENTER whereupon the following data display will be available.

```

---- ASCB-A RECORD DATA SELECT ----
Channel: 1           Display: NUMERIC
ADDRESS-WP: 1-001    Count: 00000

----- ASCB-A RECORD DATA REVIEW -----
Count  ----- Eng ----- Name
00000      0000
00001      0000
00002      0000
00003      0000
00004      0000
00005      0000
00006      0000
00007      0000
.....

Press ENT to toggle SELECT/REVIEW

```

Pressing ENTER selects the RECORD DATA REVIEW section of the display. All recorded words can be selected for review, and the data can be cycled through all the standard formats. Use the F or B keys to advance forward or backward through the data a screen at a time. Use the E or 0 keys to go to the end or 0 count of recorded data.

5.3 RECORDED DATA GRAPHIC PLOTS

In addition to numeric display formats, it is possible for the user to review one or two data words simultaneously as graphic time plots by selecting GRAPHIC in the Display field of the RECORD DATA SELECT section of the display.

2 Traces active:

TR1	
CH1	
A 01	
WP001	
XI	
+00%	
C0000	
0.050s	
<hr/>	
TR2	
CH1	
A01	
WPOO2	
x4	
+50%	
C0000	

The recorded data may be scrolled horizontally to see any time segment, and scales and offsets adjusted (1 to 128 magnification and +/- full scale offset adjustment). The traces are moved horizontally by placing the cursor on a count line (C0000) and pressing F (forward) or B (back), for a count change of 200, or by entering a count value.

5.4 RECORDED DATA DOWNLOAD

Recorded data words may be output on the DAC port or files may be downloaded on the RS-232C port to a PC. The RSREAD program provided by Atlantic Instruments, which runs on a PC, supports this download (See Appendix A). The following setup screens and status screens are associated with these output functions.

DAC OUTPUT OF RECORDED DATA

ASCB-A DAC OUTPUT SETUP

Channel : 1
Address-WP: 01-100
Data Offset: +00%
Scaling : 1

< > To step through options
v ^ To move to next/previous line
HLP To see help screen for each line

Press FI to begin DAC download,
ENT to return to RECORD setup menu.

RS-232 DOWNLOAD OF RECORDED DATA

*** RS 232 DOWNLOAD ***

Make sure the RS232 port is connected properly and that the RS232 receive port is ready to accept data. Press ENTER to begin download or any other key to abort the transfer...

RS-232 DOWNLOAD STATUS SCREEN

*** RS232 Download ***

TRANSMITTING... Please wait while the data is being downloaded on the RS232

Records remaining to transmit: 01000000

Press CLR to abort download

5.5 SYNCHRONIZATION WITH OTHER DATATRACS

The synchronization feature allows two DATATRAC units to begin the recording process simultaneously. A sync signal is provided on the RS232 connector. When using the sync feature, one unit is set up to be the Master and the other unit the Slave. The Slave unit must be set up to record first. It will wait to begin the record operation until it receives a signal from the Master. When the Master is set up, it sends a signal to the Slave and both units begin the Record function. If the record intervals are set to the same value on both units, the recorded data buffers will be filled at the same time and rate, to within the tolerances of the clock crystals of the units. The differences in the clocks may cause a drift of as much as 2 msec per minute of record time.

6. BREAKPOINT MODE

Breakpoint mode represents a powerful tool allowing the user to monitor avionics equipment for intermittent faults. Multilevel label and data-word combinations may be programmed, and a moving history window may be defined to save both pre and post condition data.

6.1 BREAKPOINT CONDITION SETUP

The setup menu for the breakpoint mode is:

ASCB-A BREAK MODE/TRIGGER PULSE SETUP			
Function: BREAK			
Sync Mode :	OFF	Time Stamp :	lms
Brk Sequence :	A	History :	SEL
Brk Position :	--*--	Event Cnt :	01
A> Ch: 1	Address: 01	WP: 001	Cond: EQ
Data (MSB-LSB): XXXX XXXX XXXX XXXX			
B> Ch: 1	Address: 01	WP: 001	Cond: EQ
Data (MSB-LSB): XXXX XXXX XXXX XXXX			
Data = 0, 1, or X (D-don't care)			
Press ENT to continue			

Setup options for each of the fines are explained in the help screens that are displayed when selected from the respective setup lines. The data value is entered as 0 and 1 patterns or as an X for "don't care" bits. Pressing ENTER causes incoming data to be monitored for the programmed conditions. The data that is saved as a part of the history window is the 32 selected Address-word position combinations defined as a part of the Receive Select Mode. After the above setup screen is "entered", the RCB/BRK Select Address Setup screen appears with any previously setup words appearing as defaults. The user can then modify this data list as desired before beginning the breakpoint monitor process.

a: Function Selections:
(Options: BREAK., REVIEW, TRIGGER, RS232)

BREAK	:To setup a break condition and save history data.
REVIEW	:To review previously collected history data.
TRIGGER	:To setup a condition for a trigger pulse output on received data. Data is not saved in this mode.
RS-232	:Enables RS232 history data download.

- b. Sync Mode Selections:
(Options: OFF, MASTER, SLAVE)

Determines if the unit will transmit (MASTER) or receive (SLAVE) a sync pulse before starting the Break function. This allows two units to synchronize their timers before recording data.

- C. Break Sequence Selections:
(Options: A, B, A or B, A then B)

A: Break only on condition A

B: Break only on condition B

A or B: Break on either condition A or condition B

A then B: Break on condition B after condition A has occurred

- d. Break Position Selections:
This defines the relative location of the break condition in the available memory.

* - - - : Beginning of memory
- * - - : First quarter of memory
- - * - : Middle of memory
- - - * : Third quarter of memory
- - - - * : End of memory

- e. Time Stamp Selections:
(Options: 1ms, 10u, OFF)

1ms The time stamp resolution of each data point will be 1 msec.

10u The time stamp resolution of each data point will be 10 us.

OFF No time information will be saved in the history data. Twice as much history memory will be available for data.

- f. History Selections:
(Options: SEL, EDIT)

SEL :Save history on all previously selected Address-Word Positions and channel combinations. (Up to 32 selections may be made.)

EDIT Setup/edit selected Address-Word Positions and channels for history data collection.

- g. Event Counter Selections:
(Options: A number from 01 to 99 should be entered)

This is the number of times that the break sequence will occur before performing a break and collecting history data.

h. Condition Selections:

(Options: EQ, NEQ, OR, GT, LT, /GT/, /LT/)

EQ All defined bits are equal

NEQ Any defined bit is not equal.

OR Any defined bit is equal.

GT The received word is greater than the defined word.

LT The received word is less than the defined word.

/GT/ The absolute value of the received word is greater than the defined word.

/LT/ The absolute value of the received word is less than the defined word.

After turning on the breakpoint monitoring function, the following sequence of messages will appear at the top of the screen:

```

* * Waiting on Break condition... * *
* * Press ENT for manual break * *
* * or CLR to abort acquisition.* *
    
```

```

* * Break detected. Wait for history * *
* * data to fill. Press ENT to stop, * *
* * or CLR to abort acquisition * *
    
```

6.2 HISTORY DATA REVIEW

Pressing ENTER will cause the following Break History Data Select screen to be presented to the user:

```

--- ASCB-A BREAK HISTORY DATA SELECT ---
      Channel :   ALL      Time :   ELAPSED
ADDRESS-WP :   xx-xxx   Count :   000002

----- ASCB-A BREAK HISTORY DATA REVIEW -----
  Cnt  Ch  Name      Adr-WP ----- Eng Data -----
000002  1  SPA      02-002      +0.45010 Deg
000004  1  SPA      02-002      +0.40012 Deg
000006  1  SPA      02-002      +0.35013 Deg
000008  1  SPA      02-002      +0.30014 Deg
000010  1  SPA      02-002      +0.25015 Deg
000012  1  SPA      02-002      +0.20016 Deg
000014  1  SPA      02-002      +0.15018 Deg

      Press GOLD key to display time stamp.
      Press ENT to toggle SELECT/REVIEW
    
```

It is possible for the user to view all selected words as they were received, or display only the time sequences of particular data words. Timing information for each word may be displayed as elapsed time and absolute or delta time. The user will be able to scroll through the list with the up/down arrows or jump to locations by entering a count value. As with all data display screens, the user will be able to cycle through any of the standard data formats. An arrow and TRIG prompt will appear next to the count value in the list at which the breakpoint occurred. The user will be able to jump to that point at any time by pressing 1. He may also jump to the beginning of the history file by pressing 0 or the end by pressing E. Scrolling through the data a screen at a time is accomplished using the F (forward) and B (back) keys.

As was described in the Receive Mode section, an adaptive feature automatically switches to a sample mode when a receive data overload condition is sensed. Typically the selected word list will result in a real time display of history data, but if a sampling condition exists, it will be indicated next to the channel setup line. Irregardless of sample mode, the exact received word causing the break condition will always be displayed.

If the operator wishes to investigate a hardware anomaly associated with the programmed condition, a trigger pulse that accompanies the breakpoint is available via the DAC connector. This may be useful for triggering a storage scope or other instrument to monitor a hardware event occurring simultaneously with the programmed condition. The output pulses are provided continuously when the TRIGGER rather than the BREAK function is selected.

6.3 SYNCHRONIZATION WITH OTHER DATATRACS

The synchronization feature allows two DATATRAC units to begin the Break mode recording process simultaneously. A sync signal is provided on the RS232 connector. When using the sync feature, one unit is set up to be the Master and the other unit the Slave. The Slave unit must be set up to Break first. It will wait to begin the Break record operation until it receives a signal from the Master. When the Master is set up, it sends a signal to the Slave and both units begin the Break.

As both units start the Break function, their clocks are synchronized to within 50 usec of each other. This allows correlation of the time stamp between the two units. Note that there are differences in the clocks between the two units and this may cause a drift of as much as 2 msec per minute of record time.

APPENDIX A

RS-232C INTERFACE DEFINITION

APPENDIX A RS-232C INTERFACE DEFINITION

RS232 Cable Schematic

The schematic for the RS232 cable supplied with the DATATRAC 350H is shown below. The DT350IT's RS232 interface uses a 9-pin female D connector. The schematic shows the wiring a standard 9-pin, as found on most PC's.

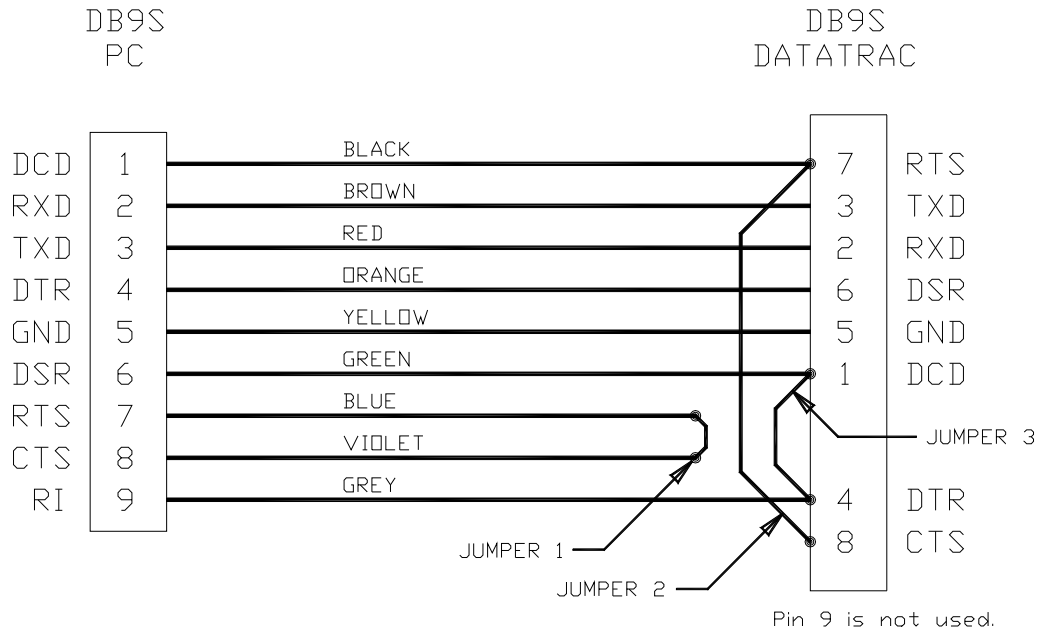


Figure A1. R-S232C Cable Schematic

This connector is also used for synchronizing the clocks of a DT350H with another DT350H or with a DT400H. The cable required for this is shown below:

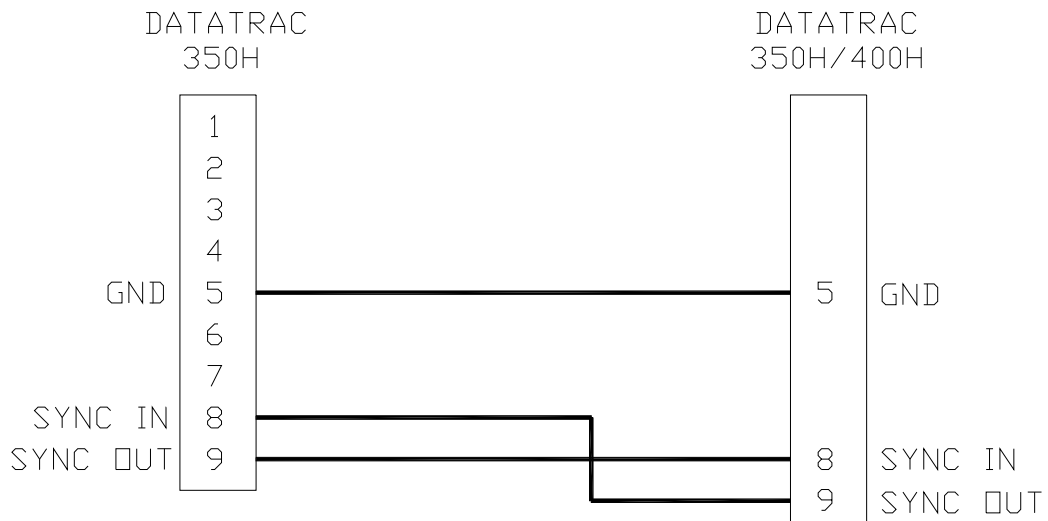


Figure A2. Sync Cable Schematic

The PC's DTR (Data Terminal Ready) line is a modem output line that can be used to temporarily disable the DATATRAC 650H download. Setting this pin high will enable the download, while clearing it will disable it. The download will resume uninterrupted after a disable then a re-enable of the DTR line. This is useful if the receiving computer cannot keep up with the download and must periodically freeze it to process the data. Refer to the computer's serial port documentation for information on toggling this bit. Note that for real-time data download, freezing the DATATRAC 350H download will cause data to be missed. Record and Break data downloads are unaffected by periodic DTR disables.

RSREAD Download Program

A program is provided on diskette for MM PC or compatible that can be used for reading the data downloaded by the DATATRAC over the RS-232C interface. The program, called RSREAD, reads the stream of bytes and assembles them to produce an ASCII text file with the data organized in table fashion. The output file can then be printed out or used as an input file to some other data processing program.

The program is invoked by typing RSREAD. It will first initialize the COM1 serial port on the PC to the proper baud rate, parity, etc. The main menu will then appear as follows:

The RSREAD Version 2.02 supports both ARINC 429 data download from DATATRAC 400, 400K and 600 units and also ARINC 629 data from DATATRAC 600, 650, and 650H units. Support for ASCB data download is identical to the ARINC 629 data.

There are four general types of data download covered in this document and two types specific to the Williamsburg Protocol Analyzer which are covered in the manual for that product. The four general download modes are: real-time download of received data, download of recorded data, download of break history data, and the download of BITE screens. For any selection, the program will return and ask for an output file name. After the user provides a file name, the program asks whether ARINC 629 or ARINC 429 data is being downloaded. At this point the program begins "listening" over the COM1 port for data. It is at this time that the DATATRAC download should be initiated. At any time during the download, the operator can press any key on the computer's keyboard to terminate the download. Note that the DATATRAC will continue downloading data even though the computer is no longer recording it.

Source Code

Also contained on the disk is the source code and bat file for compiling the RSREAD program. The program is compatible with Microsoft C version 6.0. Users are free to modify the program to suit their needs.

Real-time Data Download

Due to timing restrictions involving the real-time download, the program will buffer the data being downloaded in the computer's RAM before accessing the disk. The program is capable of buffering up to 1000 label records. When the buffer becomes full or the operator aborts the data collection, the program will write the data to the file and return to the main menu. The following are examples of ARINC 429 and ARINC 629 real time data downloads.

ARINC 429

DATATRAC 400 Receive Data Download Fri Jul 09 08:29:08 1993

Count	Chan	Lbl	SDI	32-Hex Data- 1	Time Stamp
00000	1	123	1	E6 B7 59 CA	296736
00001	1	123	1	67 09 41 CA	296858
00002	1	123	1	67 5B 29 CA	296936
00003	1	123	1	E7 AD 11 CA	297036
00004	1	123	1	E7 FE F9 CA	297136
00005	1	123	1	68 50 E1 CA	297236

ARINC 629

DATATRAC 600 Receive Data Download Fri Jul 09 08:21:01 1993

Count	Chan	Lbl	CID	Pos	16-Hex Data- 1	Time Stamp
00000	1	123	1	001	50 FF	313442
00001	1	123	1	001	50 DF	313492
00002	1	123	1	001	50 BF	13542
00003	1	123	1	001	50 9F	313592
00004	1	123	1	001	50 7F	313642
00005	1	123	1	001	50 5F	313692

The count is just an index to the record and is generated by the program for bookkeeping. It is not transmitted by the DATATRAC. The data is presented in hexadecimal format. The time stamp marks the relative time that the label was received. The timer is a count down timer that begins at 999999 msec and is decremented each millisecond. Observe in the ARINC 429 example that the transmit interval for the labels was 100 msec.

Record Data Download

As with the real-time download, the program asks the user for a file name and whether the download involves ARINC 429 or ARINC 629 data. Since downloading of recorded data is not a real-time event, the program can perform the disk access while data is being received.

Therefore, the program will continue collecting data until either the user aborts the acquisition or the DATATRAC completes the download. While the data is being downloaded, the program will display the number of records collected so far. Examples follow for ARINC 429 and ARINC 629 recorded data downloads.

Aeroflex Operation Manual

ARINC 429

DATATRAC 400 Recorded Data Download Wed Jun 13 15:59:47 1991

Record Interval = 0050 Number of Samples = 4

Count	Chan	Lbl	SDI 32-Hex Data- 1
0000	1	100	0 ...
0000	1	130	1 ...
0000	2	210	0 ...
0001	1	100	0 00 00 00 02
0001	1	130	1 90 00 01 1A
0001	2	210	0 11 99 00 11
0002	1	100	0 ...
0002	1	130	1 ...
0002	2	210	0 ...
0003	1	100	0 00 00 00 02
0003	1	130	1 90 00 23 E4
0003	2	210	0 45 D4 6F EE

ARINC 629

DATATRAC 600 Recorded Data Download Fri 09 08:21:45 1993

Record Interval = 0050 Number of Samples = 53

Count	Chan	Lbl	CID Pos 16-Hex Data- 1
0000	1	123	01 001 00 00
0001	1	123	01 001 11 34
0002	1	123	01 001 34 23
0003	1	123	01 001 12 6F
0004	1	123	01 001 03 46
0005	1	123	01 001 26 C3

The record interval is displayed in milliseconds. The number of samples tells how many sample counts were recorded. The count is the sample number for that line. Note in the ARINC 429 example that there are three labels per sample in the example. The dots indicate that no data was received for that label during that sample interval.

Break History Data Download

As with recorded data download, the program can perform the disk access while break history data is being received. Therefore, the program will continue collecting data until either the user aborts the acquisition or the DATATRAC completes the download. While the data is being downloaded, the program will display the number of records collected so far. The following is a sample of the ASCII output file generated (with time stamp downloaded) for the ARINC 429 and ARINC 629 cases.

Aeroflex Operation Manual

ARINC 429

DATATRAC 400 Break History Data Download Fri Oct 12 15:23:54 1991

Number of Samples = 1541 Trigger Location = 4

Count	Chan	Lbl	SDI 32-HexData-1	Time
0000	0	210 0	11 99 00 11	618306
0001	0	100 0	00 00 00 02	618309
0002	0	130 1	90 00 01 1A	618405
0003	0	210 0	11 99 00 11	618406
0004	1	100 0	00 00 00 02	618409 **TRIGGER**
0005	1	130 1	90 00 01 1A	618505

ARINC 629

DATATRAC 600 Break History Data Download Fri Jul 09 08:40:25 1993

Number of Samples = 34 Trigger location = 11

Count	Chan	Lbl	CID Pos 16-Hex Data- 1	Time Stamp
0000	1	123 1	001 C5 BB	066066
0001	1	123 1	001 C5 E5	066131
0002	1	123 1	001 C6 0F	066195
0003	1	123 1	001 C6 39	066259
0004	1	123 1	001 C6 63	066323 ** TRIGGER
0005	1	123 1	001 C6 8D	066387
0006	1	123 1	001 C6 B7	066451

The data is presented in hexadecimal format. The time stamp marks the relative time that the label was received.

BITE Screen Download

The BITE download is an ARINC 429 function only. The program requests a file name before beginning the download. As with recorded data and break data downloads, the program can perform the disk access while the BITE screens are being received. Therefore, the program will continue collecting data until either the user aborts the acquisition or the DATATRAC completes the download. The following is a sample of the ASCII output file generated.

APPENDIX B

DATATRAC 350H SPECIFICATIONS

APPENDIX B
DATATRAC 350H Specifications

Mechanical:

Size	6.5" H, 9.75" W, 2" D
weight	3.8 lb.
Construction	Gray ABS, with EMI Shielding
Display.....	Supertwist, backlit LCD; 16 lines X 40 char.
Environmental.....	0' - 50' C Operating, -10' - 60' C Storage
EMI	Class A computing device per FCC Part 15
Power	110-220VAC Adapter, Internal NiCad battery (6 hours)

General:

Compatibility	ASCB-A, B & C 'USER' Compatible for receive and transmit, Controller compatible transmit mode
Database	Preprogrammed ASCB-A, B C and RSB Applications Specifications and custom upload capable via PCMGR-300
Setup storage	5 RAM Tables, 128 FLASH Tables (FLASH tables require pcmgr-300)

Receive Mode:

Modes.....	Select, All
Ports	2 Independent
Time Stamp	1 msec/10 usec resolution
Word Display Format	Binary, HEX, Eng Units, BCD, User, Graph
Select Word Positions	32
Bus Activity Monitor	Monitor loss of Address/Word
Real-time Download	RS232 or 12 bit D/A

Breakpoints:

Sequences.....	2; A, B, A or B, A then B
Conditions.....	EQ, NF-Q, OR, GT, LT
Trigger Output	5 V, 20 usec via A/D
Record History	Up to 35,000 programmable about the breakpoint, 210,000 with memory upgrade option
Event Count.....	1 to 99 before break or trigger
Review/Playback	Data display, RS232, Graph, D/A

Record:

Record History	Up to 55,000 data words, 315,000, with memory Upgrade option
Sample Interval.....	2 msec to 10 sec
Review/Playback	Data display, RS232, Graph, D/A

Aeroflex Operation Manual

Transmit Mode:

Ports 1 configurable: Version A xmt data and clock on 1 only; Version B xmt data on I only; Version C xmt data on I Primary and 1 Backup

Modes..... USER, Controller

Unique Addresses 64

Dynamic Data 10 Words

Fresh Counter..... 3 or 4 bit in version A or B/C

Software Checksum/CRC..... calculated if required