



Electronics International Inc.

Data Recorder *BC-5R*

Operating & Installation Instructions

(MUX-8A Replacement)

II 1221991 - 12/21/1999 Rev. D 8/28/2023



Read this manual before installing this data recorder. It contains information that may affect your decision to install this product and/or the safety of your aircraft.

Model #: _____

Serial #: _____



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Important Notice

***** MUST READ *****

If you think it is not important to read this manual, you're wrong! This manual contains important installation information that may affect the safety of your aircraft, delay your installation or affect the operation of your instrument. You Must read this manual prior to installing your instrument.

Read the Warranty / Agreement. There is information in the Warranty / Agreement that may alter your decision to install this product. If you do not accept the terms of the Warranty / Agreement, do not install this product. This product may be returned for a refund. Contact Electronics International Inc. for details.

It is possible for any instrument to fail thereby recording inaccurate high, low or jumpy readings. Therefore, you must be able to recognize inaccurate data. Do not use inaccurate data to evaluate the health of your engine.

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Warranty / Agreement

Electronics International Inc. (EI) warrants this instrument and system components to be free from defects in materials and workmanship for a period of one year from the user invoice date. EI will repair or replace any item under the terms of this Warranty provided the item is returned to the factory prepaid shipping.

1. If you do not agree to and accept ALL the terms of this Warranty/Agreement, DO NOT Install This Product
You may return the product for a refund. Contact Electronics International Inc. for details.

2. Electronics International Inc. is not liable or responsible for a pilot's action or any situation that results in personal injury, property damage, missed commitments, lack of use of an aircraft or any expenses incurred due to: product failure, inaccuracy in displayed data or text files, display or display format issues, software bugs or problems, upgrade or customization issues, misinterpretation of the display, warning and/or limit settings, calibration problems, installation issues (leaks, mis-wiring, obstructions, damage to aircraft or components, incorrect installation of any parts, wrong parts, part that don't fit, etc.) or any other issues related to the installation or operation of this product. All of the above are solely the pilot's and/or installer's responsibility. The pilot **must** understand the operation of this product before flying the aircraft. The pilot will not allow anyone to operate the aircraft that does not know the operation of this product. The pilot will keep the instrument's Operating Instructions in the aircraft at all times.

By installing this product, the aircraft owner/pilot and installer agree to hold Electronics International Inc. harmless and in no way responsible for monetary compensation, including punitive damages for any incident, harm and/or damage associated with this product (including but not limited to the ones listed above). If you do not agree to any part of this Warranty/Agreement, **DO NOT INSTALL THIS PRODUCT.**

3. This Warranty/Agreement shall not apply to any product that has been repaired or altered by any person other than Electronics International Inc., or that has been subjected to misuse, accident, incorrect wiring, negligence, improper or unprofessional assembly or improper installation by any person. **This warranty does not cover any reimbursement for any person's time for installation, removal, assembly or repair.** Electronics International retains the right to solely determine the reason or cause for warranty repair.

4. This warranty does not extend to any machine, vehicle, boat, aircraft or any other device to which the Electronics International Inc. product may be connected, attached, interconnected or used in conjunction with in any way.

5. Personal injury or property damage due to misinterpretation or lack of understanding of this product is solely the pilot's responsibility. The pilot **must** understand all aspects of the operation of this product before flying the aircraft. If he/she does not, he or she agrees to seek training from a knowledgeable instructor. The pilot also agrees that no one will be allowed to operate the aircraft who does not know the operation of this product and will **keep the Operating and Installation Instructions in the aircraft at all times.**

6. The obligation assumed by Electronics International Inc. under this warranty is limited to repair, replacement or refund of the product, at the sole discretion of Electronics International Inc.

7. Electronics International Inc. is not liable for expenses incurred by the customer or installer due to factory updates, modifications, improvements, changes, or any other alterations to the product that may affect the form, fit, function or operation of the product.

8. Electronics International is not responsible for shipping charges or damages incurred under this Warranty.

9. No representative is authorized to assume any other liability for Electronics International Inc. in connection with the sale of Electronics International Inc. products.

10. You must read the entire Operating and Installation Instructions for this instrument. If you do not agree to and accept the terms of this Warranty/Agreement and the responsibilities set forth in these manuals, DO NOT install this product. Contact E.I. for a refund.

This Warranty is made only to the original user. THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES OR OBLIGATIONS: EXPRESS OR IMPLIED. MANUFACTURER EXPRESSLY DISCLAIMS ALL IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. PURCHASER AGREES THAT IN NO EVENT SHALL MANUFACTURER BE LIABLE FOR SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING LOST PROFITS OR LOSS OF USE OR OTHER ECONOMIC LOSS. EXCEPT AS EXPRESSLY PROVIDED HEREIN, MANUFACTURER DISCLAIMS ALL OTHER LIABILITY TO PURCHASER OR ANY OTHER PERSON IN CONNECTION WITH THE USE OR PERFORMANCE OF MANUFACTURER'S PRODUCTS, INCLUDING SPECIFICALLY LIABILITY IN TORT.

1.0 Operating Instructions

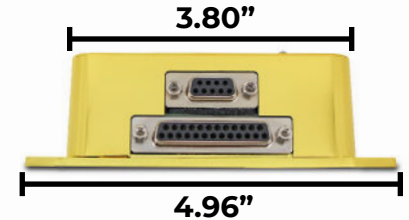
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1.1 General Description:

A. Overview of the BC-5R Data Recorder

The BC-5R is a multifunction Data Recorder, designed to monitor E.I. instruments and record data in five categories. The BC-5R is encased in a 3.80" x 2.64" x 1.6" gold-plated enclosure. The BC-5R can be mounted under the instrument panel or in an equipment bay. It comes equipped with a USB cable and data stick for accessing stored data.



The five recorded categories are as follows:

1. Time Stamps:

- The BC-5R incorporates an internal clock that is used to Time Stamp each row of data as it is recorded.

2. Event Line:

- The BC-5R is capable of monitoring one Event Line. This line has is internally pulled high to 3.3V. When this line is shorted to ground (or pulled below 1.0V) a record in the data base will show "ON." If the line is open (above 2.3V) the record will show "OFF." This Event Line is normally used to mark data for flight testing. Recorded channels from an EDC-33 can be configured to serve the same purpose.

3. Bus Voltage:

- The BC-5R monitors and records bus voltage to the instrument.

4. Engine and Aircraft Data Recording (Channels 1-7):

- The first seven channels of the BC-5R are configured to interface with Electronics International's (E.I.'s) engine/aircraft instruments. In most cases all of the data displayed on the monitored E.I. instruments is recorded at the same rate as it is displayed to the pilot. The data output port for each E.I. instrument must be activated to interface with the BC-5R. This is an option for each E.I. instrument.

5. GPS Information (Channel 8):

- The eighth channel of the BC-5R can be used to monitor GPS data. This is normally Moving Map, Aviation or NMEA data. The data records are Next Waypoint Name, Latitude, Longitude, Ground Speed, Altitude and Track.
- If this channel is not used to monitor GPS, it can be configured to monitor an additional E.I. instrument.

B. Visual Status Indicator (VSI)

The Data Recorder is equipped with a multi-color LED designed to display the system's operational status through various colors. Under normal conditions, this LED should flash slowly. Below is a detailed explanation of what each LED color signifies:

1. Green:

- Status: Normal operation. All serial input channels are actively receiving data, and Auto-Configuration is either complete or not enabled.

2. Blue:

- Status: Normal operation with an issue. Not all serial input channels are receiving data. This can happen right after boot up, especially if Auto-Configuration is turned off and the device is awaiting data from the instruments.



3. Cyan (Light Blue):

- Status: Auto Configuration phase. Indicates that Auto Configuration is in progress during start-up. This may last up to three minutes, and will occur on every boot up if Auto Configuration is enabled.

4. Yellow:

- Status: Cautionary operational status. The unit is functioning correctly but isn't receiving any data through the serial inputs. This can occur briefly after boot up as it awaits initial data packets from the monitored instruments.

5. White:

- Status: Data transfer in progress. Occurs intermittently when data is being downloaded onto a USB stick.

6. Pink:

- Status: Battery issue. The internal battery is depleted and needs attention.

7. Red:

- Status: Critical error. Indicates a hardware malfunction or an internal memory error.

Additional Notes:

- If Auto Configuration is switched off, expect the VSI to display blue or yellow momentarily post boot up. This is because some inputs, like the UBG-16 or the MVP-50, have a delayed data transmission of 5 seconds and 20 seconds respectively.

C. USB Memory Stick & Connector

All configuration and downloading is done through the USB cable & memory stick. The cable is connected to the bottom connector of the unit. The USB connector should be installed where it can be easily accessed for data download.



USB Data Stick



USB Connector

D. Warning Outputs (Option)

The BC-5 has two output lines; each of which can drive an AL-1x LED. One can be configured as an Exceedance Warning that is on only when a value is out of a set range. The other is a Maintenance Warning (Tattletale) that goes on and stays on when a set hard limit is reached. Any function received on one of the serial inputs can be configured to light up an LED connected to these warning outputs. This feature is an option, contact Electronics International more details and price.

1.2 Downloading Data to the USB Data Stick:

A. Download Data:

- With the unit powered on, insert the USB stick into the BC-5R USB connector.
- The light on the USB data stick will blink as the transfer of data is taking place.
- Remove the USB stick 5 seconds after the blinking stops.
- If you are monitoring the VSI LED on the top of the Data Recorder, wait for a change in the LED operation to a slow flashing green, yellow, or blue color before removing the USB stick.



BC-5R with USB Connector & USB Data Stick

C. Number of Files Downloaded:

The number of files downloaded to the USB data stick is determined by settings in the configuration file. The default for the BC-5R is to download the last 30 files.

D. Time Required to Download Data:

The time required to download 30 files depends on the size of the files. A total of 100 hours of data may take around 1 to 1.5 minutes to download.

E. USB Data Stick Storage Capacity:

Ensure that your USB stick has enough free space. If the USB data stick is full, the BC-5R will only copy the files that will fit on the USB Stick.

F. Recording Stopped During a Download:

Before a download occurs, the BC-5R will be in the process of recording data. During the time files are downloaded, the recording will be stopped. When the download is complete, the BC-5R will place “USB_DOWNLOAD_COMPLETE” at the end of the record where the download occurred and the recording will then continue. This file will contain a record of the download, the time and date when it occurred and the time it took to download the data files.

G. USB Data Stick Compatibility:

Your USB stick must be formatted to FAT32, or it will not work. If the LED doesn't blink, check the formatting. Some USB sticks can be plugged in the wrong way. Take care to have the four golden USB pin connections facing upright and touching the USB pin connections in the USB Connector.

1.3 Time and/or Date Adjustments:

The BC-5R has an internal clock that keeps time and date information. This clock can drift over time. The following covers setting the Time and Date on your BC-5R:

1. Factory Settings:

- The BC-5R's time and date are preset to Coordinated Universal Time (UTC) at the E.I. factory. Time and date are maintained by an internal battery with a lifespan of over 20 years.

2. Making Adjustments:

- If your flight logs show a discrepancy in the time stamp, you can correct this with the “TimeAdjust.txt” file. This file corrects the internal clock for any errors in time. The TimeAdjust.txt file can be found on the USB data stick in the BC-5R folder. All the information to set and/or adjust the time and date is located in this file.

1.4 Data Storage:

Overview:

The BC-5R Data Recorder is designed with a 16 GB internal memory. It stores data using a cyclic method and the most recent data is always available.

How Data Storage Works:

Each time the BC-5R is powered on, a new data file is created. The device can hold a maximum of 2000 files. Once this limit is reached, the oldest file is overwritten to make room for the new file. This process secures a minimum of 2000 records which are available at all times. Based on an average flight time of 3 hours, the BC-5R can store approximately 6000 hours of data.

Calculating Storage Capacity

The amount of data the BC-5R can store depends on two factors: the total data byte size from all connected instruments and the set recording interval.

Example Calculation:

Consider five TR-1 instruments (7 bytes each), a 12-byte timestamp, and 53 bytes for GPS data, totaling 100 bytes per record. With a 360ms recording interval, 16,000 hours of data storage is available.

1.5 Configuring the BC-5R:

By modifying the “BC-5R_Config.json” file you can customize the BC-5R for your aircraft and your specific requirements. This file can be edited using any standard text editor. Be sure you save the file in the .json format. Make a copy of the file before you start.

The following configuration setting is what you will see in the BC-5R_Config.json file.

“Status”：“Current”, (Change this field from “Current” to “Update” to get the BC-5R to read this file. When this file is read, the BC-5 will change this field to “Current.”)

“Creation_Time”：“DEC 2 2023 00:28 UTC”, (Time and Date this configuration was created.)

“Aircraft_ID”：“N-A”, (Enter you aircraft ID, Example N3344H.)

“Config_Version”：“1.0”, (You can track your changes with this field. Change the number as desired.)

“Auto_Config”：“Enabled”, (If the BC-5R is reading all the instruments correctly, change this field to “Manual.” The BC-5R will then no longer take the time to look for new connections.)

“Record_Rate_mS”：“360”, (Time in mS between data records. Incoming data from instruments may be slower.)

“Number_Files_To_Download”：“30”, (Maximum number of files to download when installing the USB stick. The more you select the longer it will take.)

“Download_Unit_Power_Ups”：“Yes”, (If flight starts or engine starts are configured, “Yes” downloads BC-5R power ups.)

“Chan_8_Input”：“GPS”, (If you are not monitoring GPS and you want to monitor another E.I. instrument, change this field to “Instrument.”)

“GPS”：“Enabled”, (If you are not monitoring GPS, change this field to “Disabled”)

“GPS_Time_Sync”：“Enabled”, (If you do not want to sync to your NMEA GPS time, change this field to “Disabled.”)

“Bus_Volts_Monitor”：“Enabled”, (If you do not want to monitor the BC-5R Bus Voltage, change this field to “Disabled.”)

“Transmit_Output”：“Disabled”, (If you are Daisy Chaining BC-5R’s, set this field to “Enabled”)

“Event_Line_Info”：[(The following settings are for the Event Lines.)

{

“Line_ID”：“1”, (Event Line 1 Settings.)

“Line_Status”：“Enabled”, (If you are not using this Event Line, set to “Disabled.”)

“Name”：“EV1”, (You can rename this column in the data log. The name here is “EV1”)

“On_Polarity”：“Low”, (If you want a high voltage to read “ON” in the data log, set this field to “High”)

```
    },  
    {  
      "Line_ID": "2", (Event Line 2 Settings.)  
      "Line_Status": "Enabled", (If you are not using this Event Line, set to "Disabled.")  
      "Name": "WOW", (You can rename this column in the data log. The name here is "WOW")  
      "On_Polarity": "Low", (If you want a high voltage to read "ON" in the data log, set this field to "High.")  
      "Engine_Start": "On", (Add this line if you want the data record to be marked with "r" for an On status)  
    },  
    {  
      "Line_ID": "3", (Event Line 3 Settings.)  
      "Line_Status": "Enabled", (If you are not using this Event Line, set to "Disabled.")  
      "Name": "Oil P Swt", (You can rename this column in the data log. The name here is "Oil P Swt")  
      "On_Polarity": "Low", (If you want a high voltage to read :ON", in the data log, set this field to "High.")  
      "Flight_Start": "On", (Add this line if you want the data record to be marked with "f" for an On status)  
    }  
  ]  
  "Chan_Info": [ (The following settings are for the data received from the monitored instruments.)  
  {  
    "Chan_ID": "1", (This is an example for a UBG-16 instrument.)  
    "Chan_Status": "Enabled", (If there is no instrument monitored, set this field to "Disabled.")  
    "Instrument_Name": "UBG1", (This is the instrument name connected to Channel 1. Change as desired.)  
    "Serial_Protocol": "TTL", (Do not change. Auto-Config will update this field.)  
    "BaudRate": "9600", (Do not change. Auto-Config will update this field.)  
    "Polarity": "1", (Do not change. Auto-Config will update this field.)  
    "Number_Transmitted_Values": "16", (Do not change. Auto-Config will update this field.)  
    "Headers": [  
      {  
        "Name": "UBG1-1" (This is an example: Auto-Config generated these headers for the UBG. You  
can change the heading for the function monitored (EGT1, CHT1, etc.))  
      },  
  
      {  
        "Name": "UBG1-2"  
      }, ( ... )  
      {  
        "Name": "UBG1-16"  
      }  
    ]  
  }  
},  
{  
  "Chan_ID": "2", (This is an example for an R-1 instrument.)  
  "Chan_Status": "Enabled",  
  "Instrument_Name": "R-1",  
  "Serial_Protocol": "TTL",  
  "BaudRate": "9600",  
  "Polarity": "1",  
  "Number_Transmitted_Values": "1",  
  "Headers": [  
    {  
      "Name": "R-1-1"  
    }, ( ... )  
    {  
      "Name": "R-1-2"  
    }, ( ... )  
    {  
      "Name": "R-1-3"  
    }, ( ... )  
    {  
      "Name": "R-1-4"  
    }, ( ... )  
    {  
      "Name": "R-1-5"  
    }, ( ... )  
    {  
      "Name": "R-1-6"  
    }, ( ... )  
    {  
      "Name": "R-1-7"  
    }, ( ... )  
    {  
      "Name": "R-1-8"  
    }, ( ... )  
    {  
      "Name": "R-1-9"  
    }, ( ... )  
    {  
      "Name": "R-1-10"  
    }, ( ... )  
    {  
      "Name": "R-1-11"  
    }, ( ... )  
    {  
      "Name": "R-1-12"  
    }, ( ... )  
    {  
      "Name": "R-1-13"  
    }, ( ... )  
    {  
      "Name": "R-1-14"  
    }, ( ... )  
    {  
      "Name": "R-1-15"  
    }, ( ... )  
    {  
      "Name": "R-1-16"  
    }, ( ... )  
  ]  
}
```



```
{  
  "Name": "R-1",  
  "Engine_Start": "400", (Add this line if you want the data record to be marked with "r" when the  
RPM exceeds 400)  
  "Flight_Start": "2000", (Add this line if you want the data record to be marked with "f" when the  
RPM exceeds 2000)  
}  
]  
,
```

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2.0 Installation Instructions

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2.1 Important Information and Initial Check Out:

Before beginning the installation of your Data Recorder, please carefully review the following instructions:

A. Warranty Review:

- Both the Installer and Aircraft Owner must read the Warranty/Agreement. It contains crucial information that could influence your decision to install this device. If the Warranty/Agreement terms are unacceptable, do not install this product. You may return the instrument for a refund.

B. Installation Qualifications:

- The installer must be an FAA Certified Aircraft Mechanic with experience in installing this type of equipment. When installing this product adhere to current aircraft standards and practices, referring to AC 43.13-2A.

C. Installation Classification:

- This product is an accessory to the instruments listed in this manual.

D. Compliance and Quality Assurance:

- The BC-5R Data Recorder is a TSO'd item, complies with DO-160C environmental requirements and was designed to DAL C. It is manufactured in an FAA PMA/TSO certified facility.

E. Pre-installation Planning:

- Read the full Installation Instructions and address any issues before beginning installation in order to avoid delays during the installation.

F. Parts and Fittings:

- Some parts specific to your aircraft may not be included in the kit. Review the Installation Instructions thoroughly and gather all necessary components prior to installation.

2.2 Mount the BC-5R Data Recorder:

Install the BC-5R Data Recorder as follows:

A. Placement of the Data Recorder:

- Choose a location behind the instrument panel or in an equipment bay which allows for routing of wires to the necessary instruments, USB connector location, and GPS unit (if applicable). Be sure that the installation does not obstruct the operation of any controls, cables or equipment.

B. Securing the Recorder:

- Utilize a minimum of two mounting holes to firmly secure the BC-5R Data Recorder.

C. Installation for MUX-8A Upgrades:

- If you are replacing a MUX-8A, you can position the BC-5R using the existing wire bundles and secure it with tie wraps for a tidy installation. There are interface connectors available that allow the BC-5R to replace the MUX-8A with minimal rewiring. Contact Electronics International for more information.

D. Visual Signal Indicator (VSI) Consideration:

- While it's not mandatory, you may choose to install the BC-5R in a location where the VSI is in view. This can help monitor the status of the recorder at a glance.

2.3 Install the USB Connector:

A. Location Selection:

- Choose a location for the USB Connector that allows easy access. The USB Connector can be securely mounted on the instrument panel for direct access or it can be hung just behind and at the bottom of the instrument panel.

B. Route the USB Cable:

- Attach the DB-25 Bottom Connector to the BC-5R. Route the USB Cable to the USB Connector mounting location.

C. Mounting and Connector Orientation:

- Mount the USB connector with the white plastic component facing upwards. This orientation ensures proper visibility of the USB Drive.



2.4 Route the Power and Ground Wires:

A. Route the Red Power Wire:

- Attach the DB-9 Top Connector to the BC-5R. Route the red wire to a 1 to 5 amp breaker. This can be the same breaker that provides power to one of the instruments being monitored.

B. Route the Black Ground Wire:

- Route the black wire to chassis ground.

2.5 (Optional) Install the Event Marker Wires and Switches:

When an Event Marker Line is pulled to ground, "ON" is placed in one of the columns in the recorded data. Markers are most often used during flight testing to mark a specific event. There are three Event Markers available. Connect the Marker Wires and Switches as required. See the BC-5R Wiring Diagram page.

2.6 (Optional) Connect to the GPS:

Connect pin 3 of the DB-9 connector on the BC-5R to the GPS Moving Map, Aviation or NMEA Tx Port. You may need to configure this port in the GPS. If GPS data is not monitored, this channel can be used to monitor an additional EI instrument. See the BC-5R Wiring Diagram page.

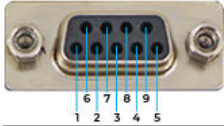
2.7 Connect to the Electronics International Instruments to be Monitored:

The BC-5R is configured to monitor the following EI instruments; MVP-50, CGR-30, TQC-23, TR-1, FP-5L, R-1, M-1, OPT-1, US-8A and the UBG-16. For each of these instruments the Data-Out option is required to activate the data port on the instrument. This allows the BC-5R to monitor and record the data from a specific E.I. instrument.

The wiring for each of these instruments is provided in the BC-5R Wiring Diagram on the following page. Install the wires from the BC-5R to instruments as required. Additional information on each of these instruments is provided at the back of this manual.

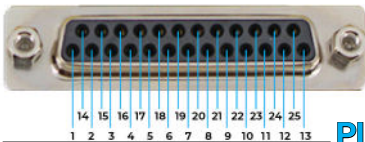
If you are replacing a MUX-8A, an interface cable can be purchased from Electronics International. This cable eliminates all the rewiring required to install the BC-5R.

2.8 BC-5R Wiring Diagram:

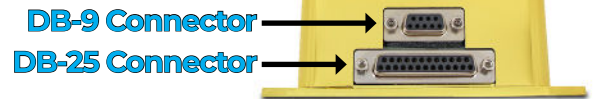


DB-9 Connector

	PINS	
Power In, 7 to 40, 0.025Amps @ 24V	1	To 1 to 5 Amp Breaker used to Power Monitored Instruments.
Gnd (to Chassis Gnd) -----	6	To Chassis Gnd
CH 8 TX Out -----	2	N/C
Gnd -----	7	
CH 8 GPS RX In -----	3	(Option) To GPS RS-232 Moving Map, Aviation Data or NMEA Port.
CAN H -----	8	N/C
CAN L -----	4	N/C
Event Line Input #1 -----	9	(Option) Gnd Event Line, Marks Data
Gnd -----	5	

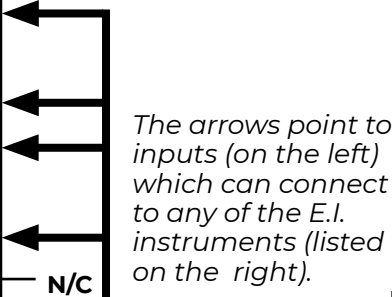


DB-25 Connector



DB-9 Connector

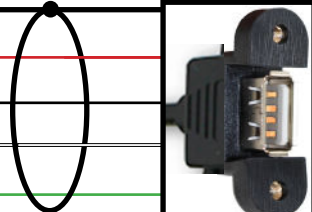
DB-25 Connector

	PINS		
Exceedance Output -----	1	(Option)	
Maintenance Output -----	14	(Option)	
N/C -----	2	N/C	
Gnd -----	15	N/C	
+5V Output -----	3	N/C	
Gnd -----	16		
CH 7 RS-232 RX Input -----	4*		
Gnd -----	17		
CH 6 RS-232 RX Input -----	5*		
CH 5 RS-232 RX Input -----	18*		
Gnd -----	6		
CH 4 RS-232 RX Input -----	19*		
CH 3 RS-232 TX Output -----	7		N/C
Gnd -----	20		
CH 3 RS-232 RX Input -----	8*		
CH 2 RS-232 TX Output -----	21		N/C
Gnd -----	9		
CH 2 RS-232 RX Input -----	22*		
CH 1 RS-232 TX Output -----	10	N/C	
CH 1 RS-232 RX Input -----	11*		
Gnd (USB Shield) -----	23	Shield	
USB +5V (Red) -----	24	Red	
USB Gnd (Black) -----	12	Black	
USB N (White) -----	25	White	
USB P (Green) -----	13	Green	

*** Note**

Any of the BC-5R RS-232 RX inputs can be connected to the following E.I. instruments:

- MVP-50, PIN 10**
- CGR-30, PIN 19**
- TQC-23, Pin 13** Bottom Connector
- TR-1, PIN 2**
- UBG-16, PIN 9,** wht/grn wire
- R-1, PIN 9,** wht/grn wire
- M-1, PIN 9,** wht/grn wire
- OPT-1, PIN 7,** wht/grn wire
- FP-5L, PIN 15** Circular Connector
- FP-5L, PIN 15** D-Sub Connector
- US-8A, PIN 9,** wht/grn wire



2.9 Auto Configuration:

Switch on the aircraft's power and wait 5 minutes or monitor the VSI for a flashing green light, indicating the instruments are online and configuration is complete. During this time the BC-5R is interrogating each of its input (Rx) ports, looking for instrument data.

2.10 Check Data Records:

A. Reboot:

- Turn the aircraft's power off and on again. Wait for 2 minutes or until the VSI flashes green. During this time the BC-5R is storing instrument data to internal memory.

B. Transfer Data to the USB Data Stick:

- Insert the USB stick into the USB connector. It will flash and then become solid. Wait 5 seconds, and then remove the USB Stick.

C. Content Check:

- Look for a folder named "BC-5R" and verify the presence of an "N-A" or aircraft ID sub-folder, along with at least two data records in the "DataRecords" folder and a "BC-5R_Config.json" file in the "Config" folder.
- **Data Record Inspection:** Examine the latest data record (with the highest DR number) to ensure the data displayed is accurate for your setup.

D. Important Note:

- The first data records may have incomplete information at the beginning of the file as the Data Recorder was in the process of scanning the connected instruments. Data records created after the scanning and identification processes are complete will have the correct header information.

E. Configuration Adjustments:

- If necessary, adjust settings according to the "Configuration File" section of the Operating section of this manual.

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3.1 BC-5R Specifications & Operating Features:

Model

BC-5R (Data Recorder)

Dimensions

Box 3.88" x 2.65" x 1.80"

Weight

Box: 0.6 Lbs

Environmental

Meets DO-160C

Power Requirements

7.5 to 40 Volts, .025 Amps at 24 volts

Input Lines 1 through 7

Receives an RS-232 signal at baud rates of 9600, 19200, 38400, and 57600

RS-232 or UART Format: 8 data bits, 1 start bit, no parity, can be either normal or inverted polarity

Data must be terminated with a carriage return (0Dh) line feed (0Ah).

Input Line 8

Receives a GPS RS-232 moving map signal at 9600 bauds, 8 data bits, 1 start bit, no parity.

Receives a GPS RS-232 NMEA at 9600 bauds, 8 data bits, 1 start bit, no parity.

All logic levels must meet the EIA RS-232 specifications.

Event Warning Line

By default, an "open" on the Event Warning Line will generate an "OFF" in the BC-5R record and data will be stored at a rate determined by the Storage Interval setting. A "ground" on an Event Warning Line will generate an "ON" in the BC-5R record. A transition from "open" to "ground" will generate an "(OFF)" and a transition from "ground" to "open" will generate an "(ON)" in the BC-5R record (note the brackets around the words).

Warning Output Lines

The Exceedence Warning line pulls to ground when a 'function' exceeds a set range. Max current is 100 mA. The Maintenance Warning (tattletale) line pulls to ground when a function exceeds a set range for a set time. It can only be released with a special file on the USB data stick. Max current is 100 mA.

3.2 MVP-50 ASCII RTDO Option:

MVP-50 ASCII RTDO Option

1. General Description

You must have an MVP-50 with the ASCII RTDO option to communicate with the BC-5R. For applications in which you are monitoring two or more MVP's (or an MVP and any other unit), the BC-5R will record and time stamp all the data from each unit in one file. This allows you to evaluate a full set of time-stamped data without having to spend time trying to correlate data from multiple units.

The RTDO Option defines what data monitored by the MVP-50 will be transmitted.

The MVP-50 transmits serial RS-232 data on pin 10 of the 25-pin D-Sub connector. The serial data is transmitted every .36 seconds.

2. BC-5R Recorded Format

The BC-5R records the MVP-50 data as follows:

Header: MVP-1, MVP-2, MVP-xx (xx = # for the last function transmitted)
1st Line: The value for each function monitored is recorded.
Last Value: The last value is the checksum which will be recorded in the data files, but can be ignored.

3. Hookup

Connect pin 10 from the MVP-50 to one of the Channel RS-232 inputs on the BC-5R, DB-25 connector.

3.3 CGR-30 RTDO Option:

CGR-30 RTDO Option

1. General Description

You must have the CGR-30 with the RTDO option to communicate with the BC-5R. For applications in which you are monitoring two or more CGR's (or a CGR and any other unit), the BC-5R will record and time stamp all the data from each unit in one file. This allows you to evaluate a full set of time-stamped data without having to spend hours trying to correlate data from multiple units.

The RTDO Option defines what data monitored by the CGR-30 will be transmitted.

The CGR-30 transmits serial RS-232 data on pin 7 of the 25-pin D-Sub connector. The serial data is transmitted every .36 seconds.

2. BC-5R Recorded Format

The BC-5R records the CGR-30 data as follows:

Header: CGR-1, CGR-2, CGR-xx (xx = # for the last function transmitted)
1st Line: The value for each function monitored is recorded.

3. Hookup

Connect pin 7 from the CGR-30 to one of the Channel RS-232 inputs on the BC-5R, DB-25 connector.

3.4 TQC-23 RTDO Option:

TQC-23 RTDO Option

1. General Description

You must have the TQC-23 with the RTDO option to communicate with the BC-5R. For applications in which you are monitoring two or more TQC's (or a TQC and any other unit), the BC-5R will record and time stamp all the data from each unit in one file. This allows you to evaluate a full set of time-stamped data without having to spend hours trying to correlate data from multiple units.

The RTDO Option defines what data monitored by the TQC-23 will be transmitted.

The TQC-23 transmits serial RS-232 data on pin 13 of the 25-pin bottom D-Sub connector. The serial data is transmitted every .36 seconds.

2. BC-5R Recorded Format

The BC-5R records the TQC-23 data as follows:

Header:	TQC-1, TQC-2, TQC-xx (xx = # for the last function transmitted)
1st Line:	The value for each function monitored is recorded.

3. Hookup

Connect pin 13 bottom 15-pin D-Sub connector from the TQC-23 to one of the Channel RS-232 inputs on the BC-5R, DB-25 connector.

3.5 TR-1 Serial Output Option:

TR-1 Serial Output Option

1. General Description

You must have the Premium TR-1 with the serial output option to communicate with the BC-5R. For applications where you are monitoring two or more TR-1's (or a TR-1 and any other unit), the BC-5R will record and time stamp all the data from each unit in one file. This allows you to evaluate a full set of time-stamped data without having to spend hours trying to correlate data from multiple units.

The TR-1 transmits serial RS-232 data on pin 2 of the 15-pin D-Sub connector. The serial data transmitted rate is programmable (0.5 seconds is the default).

2. BC-5R Recorded Format

The BC-5R records the data from a TR-1-N1 gauge as follows:

Header:	TR-1-N1, TR-1-N1_Lim
1st Line:	<N1 Value>, <"ON" or "OFF" for the Red Line Limit exceeded>

3. Hookup

Connect pin 2 from the TR-1 to one of the Channel RS-232 inputs on the BC-5R, DB-25 connector.

3.6 UBG-16 RS-232 (5-volt) Output:

UBG-16 RS-232 (5-volt) Output

1. General Description

The UBG-16 transmits serial RS-232 (5-volt) data on the white/green wire (pin 9). The serial data is transmitted every 5 seconds.

2. BC-5R Recorded Format

The BC-5R records the UBG-16 data as follows:

Header: UBG-1, UBG-2,
1st Line: L1, R1, L2, R2, L3, R3, L4, R4, L5, R5, L6, R6, L7, R7, L8, R8

UBG-1	Instrument identifier / Header for each field.
,	A comma separates data fields.
L1	Left channel 1 reading (-999 to 1999 °F). Other left channels are L2, L3, etc.
R1	Right channel 1 reading (-999 to 1999 °F). Other right channels are R2, R3, etc.

3. Hookup

Connect pin 9 (white/green wire) from the UBG-16 to one of the Channel RS-232 Inputs on the BC-5R, DB-25 connector.

3.7 GPS RS-232 Data Sheet:

GPS RS-232 Data Sheet

1. General Description

If channel 8 on the BC-5R is connected to the RS-232 Moving Map, Aviation Data, or NMEA output from a GPS unit, the following data will be recorded in the BC-5R. The transmission rate is once per second.

2. BC-5R Recorded Format

The BC-5R records the GPS data as follows:

Header: WAYPOINT, LAT, NS, LONG, EW, SPEED, ALT, TRACK
1st Line: Values for each header shown above are display on the following lines.

3. Hookup

Connect the GPS Moving Map, Aviation Data, NMEA Serial Data Out pin on the GPS to pin 3 on the BC-5R, DB-9 connector.

3.8 R-1 RS-232 (5-volt) Option:

R-1 RS-232 (5-volt) Option

1. General Description

This option transmits serial RS-232 (5-volt) data on the white/green wire (pin 9) of the R-1 every .33 seconds. The serial data transmitted is the same as that shown on the digital display of the R-1.

2. BC-5R Recorded Format

The BC-5R records the R-1 data as follows:

Header:	RPM
1st Line:	<RPM Value>

3. Hookup

Connect pin 9 (white/green wire) from the R-1 to one of the Channel RS232 inputs on the BC-5R, DB-25 connector.

3.9 M-1 RS-232 (5-volt) Option:

M-1 RS-232 (5-volt) Option

1. General Description

This option transmits serial RS-232 (5-volt) data on the white/green wire (pin 9) of the M-1 every .33 seconds. The serial data transmitted is the same as that shown on the digital display of the M-1.

2. BC-5R Recorded Format

The BC-5R records the M-1 data as follows:

Header: MP
1st Line: <MP Value>

3. Hookup

Connect pin 9 (white/green wire) from the M-1 to one of the Channel RS232 inputs on the BC-5R, DB-25 connector.

3.10 OPT-1 RS-232 (5-volt) Option:

OPT-1 RS-232 (5-volt) Option

1. General Description

This option transmits serial RS-232 (5-volt) data on the white/green wire (pin 7) of the OPT-1 every .25 seconds. The serial data transmitted is the same as that shown on the digital display when displaying temperature and pressure.

2. BC-5R Recorded Format

The BC-5R records the OPT-1 data as follows:

Header: OPT1, OPT2
1st Line: <Left Channel>, <Right Channel>

3. Hookup

Connect pin 7 (white/green wire) from the OPT-1 to one of the Channel RS232 inputs on the BC-5R, DB-25 connector.

3.11 FP-5L (with Circular Connector) RS-232 (5-volt) Option:

FP-5L (with Circular Connector) RS-232 (5-volt) Option

1. General Description

The RS-232 (5-volt) option transmits serial RS-232 (5-volt) data on the white/green wire (pin 15) of the FP-5L. The serial data transmitted is the same as that shown on the digital display when displaying Fuel Flow (in gal/hr), Fuel Remaining (in gal/hr) and the AUX channel. The transmission rate depends on the Display Update Time programmed into the FP-5L.

Transmit Rate: 1.5 sec. for “Display Update Time” set to “UP1” (see Power-up Programming).
0.5 sec. for “Display Update Time” set to “UP2” (see Power-up Programming).

2. BC-5R Recorded Format

The BC-5R records the FP-5L data as follows:

Header: FP-1, FP-2, FP-3
1st Line: <Fuel Flow>, <Fuel Rem>, <AUX Channel>

3. Transmit Format

The FP-5L transmits the following record:

Header: FP-1, FP-2, FP-3
1st Line: <Fuel Flow>, <Fuel Rem>, <AUX Channel>

,FFF.F,RRR.R,AAAACrLf

FP-1,

Instrument identifier.

, A comma separates data fields.

FFF.F Fuel Flow in gal/hr.

RRR.R Fuel Remaining in gal/hr.

AAAA AUX Channel Data *****no for d-sub

Cr Carriage return (0Dh)

Lf Line feed (0Ah)

4. Hookup

Connect pin 15 (white/green wire) from the FP-5L to one of the Channel RS232 inputs on the BC-5R, DB-25 connector. You lose the GPS connection.

3.12 FP-5L (with D-Sub Connector):

FP-5L (with D-Sub Connector)

1. General Description

This FP-5L with the D-Sub connector transmits serial RS-232 data on pin 15. This is the same line that feeds data to the GPS unit. The transmission rate is once per second.

2. BC-5R Recorded Format

The BC-5R records the FP-5L data as follows:

Header:	FP5-1, FP5-2
1st Line:	<Fuel Flow>, <Fuel Rem>

3. Hookup

Connect pin 15 from the FP-5L to one of the Channel RS-232 inputs on the BC-5R, DB-25 connector.

3.13 US-8A RS-232 (5-volt) Option:

US-8A RS-232 (5-volt) Option

1. General Description

This option transmits serial RS-232 (5-volt) data on the white/green wire (pin 9) of the US-8A. The serial data transmitted is the same as that shown on the digital display as each channel is selected in the “Scan” mode only. The transmission rate is the same as the scan rate (between 2 and 9 seconds).

2. BC-5R Recorded Format

When the “Last Channel” on the US-8A is set to 8, the BC-5R will record the US-8A data as follows:

Header: US-1, US-2, ..., US-16
1st Line: L1,R1,L2,R2,L3,R3,L4,R4,L5,R5,L6,R6,L7,R7,L8,R8

L1 Left channel 1 reading (-999 to 1999 °F). Other left channels are L2, L3, etc.
R1 Right channel 1 reading (-999 to 1999 °F). Other right channels are R2, R3, etc.

3. Hookup

Connect pin 9 (white/green wire) from the FP-5L to one of the Channel RS-232 Inputs on the BC-5R, DB-25 connector.

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