

# CommLogger™ BBR

Digital Serial "Black-Box" Recorder

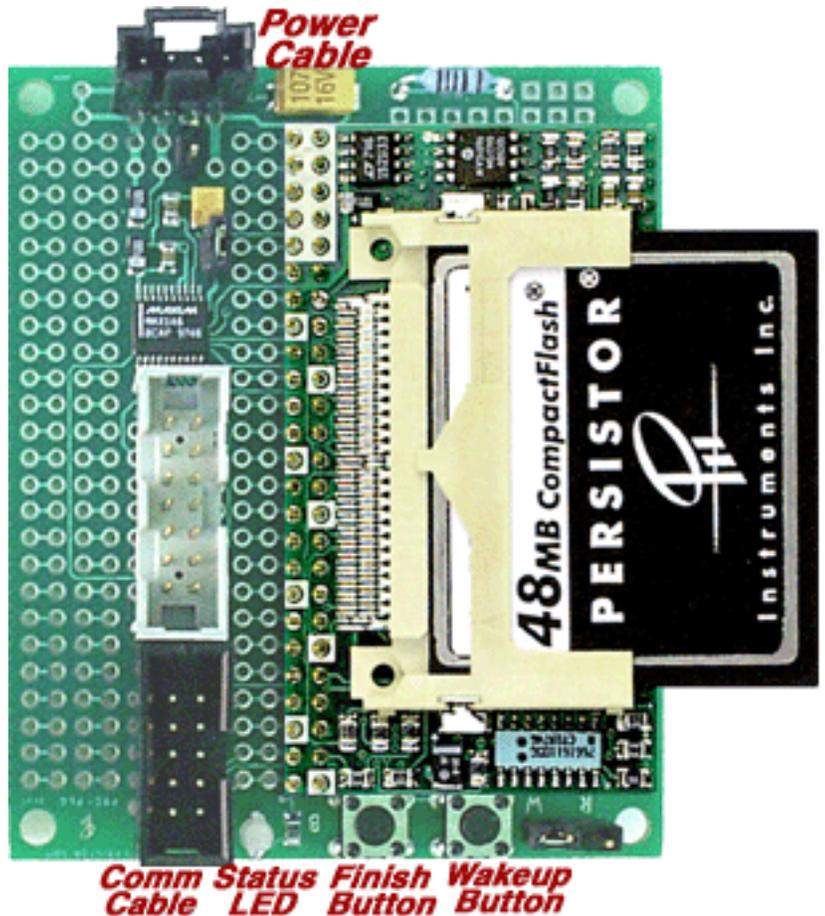
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## Features

- Supports BAUD Rates to 230,400
- Supports streaming data to 1KB/s
- CompactFlash™ Data Storage
- Tiny Package (5.7"×3"×0.8")
- \$495 in Small Quantities
- Simple Playback from Windows
- No Programming Required

## Applications

- "Black-Box" Event Recorder
- Crash and Impact Testing
- Troubleshoot Communications Lines
- Shirt Pocket Data Transporter
- Long Term Environmental Studies
- Performance Athletics Logger
- Sensor to Remote Logger Converter
- Spillover Storage for Legacy Loggers



## Introduction

CommLoggers are miniature, robust, high capacity, digital data loggers that record serial RS-232 data onto removable CompactFlash (digital film) memory cards. Their small size and minimal power requirements, make them ideal for all kinds of remote data logging and for capturing spurious, unexpected, or anomalous events.

CommLoggers record onto industry standard, nonvolatile, and extremely rugged CompactFlash memory cards. These are best known as the tiny digital film cartridges used in many new digital cameras, and they are readily available in a variety of sizes, all offering plug and play compatibility with modern Windows and MacOS computers.

CommLoggers work by listening to the RS-232 comm port and recording everything they hear to files on the CompactFlash card.

You setup the various recording options with simple text files that specify Baud rates, time-stamping, wrap modes, and stimulus or nudge timings for certain types of sensors.

CommLoggers work from DC supplies in the range of 4V to 16V and feature sophisticated power management that allows a single 9V alkaline battery to fuel about a dozen 96MByte sessions at the highest data rates, or a one-month mission at slower rates.

When it's time to harvest your data, push the Finish button, pull out the CompactFlash card, pop it into your PC, and drag the files to your workspace.



**PERSISTOR**  
Instruments Inc.

Data Acquisition and Storage Solutions for Industry and Science

254-J Shore Road, Bourne, MA, 02532 USA  
Tel: 508-759-6434 Fax: 508-759-6436  
www.persistor.com info@persistor.com

## Basic Operation

The first four pages of this document provide all the information needed by a field operator to launch or harvest data from a CommLogger mission.

This section begins by describing the key components of the CommLogger and how these interact with other pieces of the logging system from the perspective of a field operator charged with the setup and recovery tasks. It does not describe how to tailor the CommLogger's basic operating modes which is covered in detail further ahead in the "Configuration" section.

The annotated CommLogger picture on the first page identifies the six key parts of the CommLogger that you will need to know about to setup and run the system. These are:

### CompactFlash and Socket

The CommLogger records its data to rugged little CompactFlash memory cards (standard digital camera film) that you install by pushing them into the socket (it will only go one way) until you feel a little bit of resistance, then about another tenth of an inch further, where you'll feel a fair bit of resistance followed by a strong feeling that it's in as far as it will go. The operations section ahead gives some important guidelines on when you may and may not remove the memory cards.

### Power Cable and Connector

The CommLogger uses a polarized and locking 4-pin Molex C-Grid connector to bring in power from a battery pack or AC adapter. Squeezing the tab at the top of the black connector frees it from its socket. The cable is most likely pre-wired, but if not, the black wire goes to the negative (-) terminal and the red wire goes to the positive (+) terminal. The CommLogger will work from any DC voltage between 4 and 16 volts.

### RS-232 DB-9 Cable and Header

The CommLogger has a standard DB9F connector with DCE wiring for attaching to RS-232 DTE devices either directly (to talk to a PC for example), through a Null Modem adapter (to talk to another DCE device), or with a 9-pin to 25-pin adapter (to talk to devices with DB25 connectors). The plastic end of the cable connects to a polarized connector on the CommLogger, while the metal end connects to device you want to monitor.

### Status Lamp

This tricolor LED is adjacent to the RS-232 header and reveals the status of the CommLogger at any given time. It's use is detailed ahead, but basically, green or blinking green is a good sign, red or blinking red is a bad sign, and orange means the CommLogger is busy doing something critical, so leave it alone for a few seconds.

### Finish Button

This button is located right next to the status LED, and you push it in preparation for removing the CompactFlash card so that the CommLogger can make sure everything is safely stored and buttoned down. Any time you want to remove or insert a memory card, you should first push the Finish button, then wait until the Status LED is not glowing orange.

### Wakeup Button

The CommLogger is pretty smart about turning itself off to save battery life when nothing needs doing. In the unlikely event that it outsmarts itself and you can't get it respond at all, try pushing this button. In normal operation, this button does nothing when pushed.



## Deployment

The CommLogger's job is to record any and all incoming RS-232 data to files on standard memory cards. CommLogger performs this task with little or no operator interaction asking only that you insert a CompactFlash card, apply power, and feed it some RS-232 data. Its only demand is that you give it a few seconds to clean up before pulling out the CompactFlash card to get at the recorded data.

You can tell right away if the CommLogger is working correctly by looking at the status LED which will blink green once every two seconds when no RS-232 data is coming in, and once again for each received RS-232 byte. With data continuously streaming in, the LED will appear as a constant green glow. At slower rates, it will appear to flicker. And with no data coming in, you'll only see a quick green flash once each second.

### What else might you see?

**Nothing...** This most likely means that the battery pack has run out or that the power has otherwise been disconnected. No LED activity is not a normal state for the CommLogger and you should proceed with the standard card recovery procedure (which may not respond as expected) and take out the card for recovery of whatever data was recorded. You should also arrange for a technician to come and troubleshoot the problem.

**Slow blinking red...** The once per second green blink changes to a red blink once the card fills up. This indicates that it's time to perform the standard card recovery procedure and get the data to the researcher. Any data received after the card fills has no place to go and so will be lost. If this happens regularly, you should purchase higher capacity card.

**Fast blinking red...** If the LED blinks red four times a second, this means something is seriously wrong with the CommLogger and it's not going to be able to complete it's recording task. If possible, try to have an experienced technician troubleshoot the system before disturbing it. If that's not possible, attempt the standard recovery procedure and inform the researcher of the odd behavior.

**Alternating red and green blinks...** You should only see this when there's no CompactFlash card inserted in the CommLogger. If a card appears to be inserted when you see this, it's either defective (quite rare) or the card is not fully inserted.

## Data Harvest

Ideally, you'll find the status LED blinking green (working) or slowly blinking red (full). Whatever you observe, you should note it in the deployment logbook for future mission refinements.

For reasons of efficiency and card endurance, the CommLogger does not place the incoming data directly on the card, but instead waits until it has accumulated a good sized block of several KBytes of data. Because of this, you must give the CommLogger a few seconds warning before pulling out the memory card. You do this by pushing the "Finish" button and waiting for a go-ahead signal.

When you push the "Finish" button, the LED will change from a slowly flashing green to steady orange glow for up to five seconds which is CommLogger's polite way of telling you to wait while it finishes moving any and all data to the memory card along with a final entry time stamping this recovery session. When it's ready, the LED will change to a steady green glow. Now it's safe to pull out the card.

A few seconds after you pull out the card, the LED will change to a slow alternating red and green blink once each second as its way of pleading with you to insert a fresh CompactFlash card and let it get on with its work.



## Troubleshooting

This sections describes several techniques for diagnosing and dealing with a misbehaving CommLogger by catagorizing these by the symptoms you may be seeing.

### LED Slowly Flashing RED

The memory card is full when you see the status LED emit a red flash every two seconds. You will have to run the standard card swap procedure and install a new or freshly prepared card.

### LED Rapidly Flashing RED

Four red flashes per second should only happen after you first launch, relaunch, or change the memory card. It means that the CommLogger cannot access necessary files on the CompactFlash card. This could either be a temporary problem, perhaps related to a "dirty" power up, or it could mean that the card was not properly setup for use with the CommLogger.

The first thing to try is removing the power, waiting a few seconds, and trying again. If it works, blame it on a "dirty" power-up and let it do it's work - though make a note of it should this become anything but a rare occurrence. If it instead just repeats the flashing RED symptom, something is wrong with the CompactFlash card or its contents.

If you have a spare card, try powering down the system, inserting the replacement card, and trying again. If you don't have a spare, or if it still gives the same results, there's not much you can do but bring the CommLogger back for troubleshooting by the researcher or the factory.

### LED Always Off

This could happen either because the CommLogger power source is gone (like a dead battery), or it could have experienced a severe program failure. If you peek at the underside of CompactFlash and see both a red and green LED lit, it's the latter, and you can correct this by powering down the CommLogger and trying it again. You should make a note of this and report it to the researcher to pass along to the factory. If it's a dead battery or bad power connection, replace the battery or repair the connection.

## Cleaning Up

The CompactFlash memory cards used with your CommLogger will eventually fill up with old data since the CommLogger never throws away files. That so, you should delete the files on the memory card from your PC after you have them safely copied to local storage on your computer.

One thing to be aware of with Windows PCs is that when you drag files to the Recycle Bin, they aren't necessarily truly deleted until you explicitly choose "Empty Recycle Bin" by right-clicking the bin's icon. Failing to do that may drastically limit the amount of data that will be recorded on the next CommLogger mission.

## Checklists

### Deployment

- Fresh battery
- Fresh memory card
- Green LED blinks

### Harvest

- LED status noted
- Finish button pressed
- Wait while LED is orange
- Remove the memory card



## Configuration

This sections describes how to tailor the CommLogger's operation to fit your mission requirements. It begins by describing the two methods used to get CommLogger to recognize custom options, then finishes by detailing what these configurable options are, and how they affect CommLogger's performance.

CommLogger ships from the factory with default settings pre-programmed into its permanent memory. These defaults are fully described ahead, but basically, they allow the CommLogger to immediately start logging at 9600 Baud and balancing system performance with maximum battery life. This is terrific if that's your mission's goal, but not everything talks at 9600 Baud, and not every deployment depends on battery power. So CommLogger's design makes provisions for you to easily override these defaults.

If you create a text file named "COMMLOGR.CFG" which conforms to some simple rules described ahead copy the file to a CompactFlash card, the next time you insert that card, CommLogger will adopt those settings as its new defaults. Even after you remove the card with the "COMMLOGR.CFG" file, CommLogger will retain the new settings until you explicitly change them with a new "COMMLOGR.CFG" file.

Any settings not specified in "COMMLOGR.CFG" will default to the most recent settings. A good rule of thumb is to specify all of the settings if you make a change to any settings. This ensures that you won't get surprise behaviors from incorrect assumptions about what has gone before.

### Factory Defaults

Here's what that file looks like with the factory default settings. Don't worry, we'll describe each in detail ahead.

```
SET CMLG.BAUD=9600
SET CMLG.CLOCK=14720
SET CMLG.VERBOSE=0
SET CMLG.LPMODE=0
SET CMLG.PPBSIZE=65536
```

```
SET CMLG.XMITON=0
SET CMLG.NEWSECS=-1
SET CMLG.PLATFORM=PRCPDAQ
SET CMLG.PMIRROR=1.15.16.17.18.19.21.
22.23.24.25.26.27.28.29.30.31.32.33.34
```

### COMMLOGR.CFG Rules

The rules for creating the configuration file are pretty simple:

1. The name must be "COMMLOGR.CFG"
2. Each setting must be on a separate line
3. All text must be in upper case
4. Each entry must (with no added spaces) ...
  - A. begin with "SET CMLG."
  - B. followed with a valid option name
  - C. followed by an equals sign ('=')
  - D. end with a valid option (see details)

### BAUD - Baud Rate

This is the most likely target for customization. The CommLogger can only successfully record RS-232 data when it speaks the same language as the transmitting sensor. In this case, that just means they must talk at the same speed. The CommLogger's default baud rate is 9600, but it can listen at any standard baud rate (300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, and 230400) plus most non-standard rates.

The CommLogger-CF2 is specified for continuous data stream recording up to 57,600 baud. The CommLogger can actually record data at up to 230,400 Baud when the data is not a continuous stream. The particular characteristics of the specific memory card also affect the CommLogger's ability to record at high baud rates. If you wish to use the CommLogger-CF2 to record spurts of data at a high baud rate, it will probably work just fine, but you should test that the logger and CF card can keep up with your specific application.



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## **CLOCK - System Clock Speed**

This setting controls CommLogger's basic system clock which can affect power usage, Baud rate matching, and for some very sensitive systems, even susceptibility to electrical noise. The value specified is in kilohertz and the setting can range from 640 to 16000 in steps of 640. Because of the CommLogger's smart power management, the lowest clock settings do not necessarily offer the lowest power. A good rule of thumb is to use 3680 for Baud rates below 9600, 7360 for 9600 to 38400, and 14720 above 38400 Baud.

## **LPMODE - Low Power Mode**

This setting controls the power management strategy and has two possible settings. In general, you should choose "0" (digit zero) for Baud rates less or equal to 9600, and "1" (digit one) for Baud rates above that. The former gives the best battery life, while the latter guarantees no missing characters at the very high data rates.

## **PPBSIZE - RAM Buffer Size**

This setting controls the amount of data that CommLogger stores in volatile RAM memory before committing it to the non-volatile memory card. At any given time, some received data will likely be holding in RAM, and should the CommLogger's power be cut off, or the memory card pulled from the CommLogger without first hitting the Finish button, that data held in RAM will be lost. The actual maximum amount in RAM is one half of the value set for this option. In general, the higher the value, the lower the battery drain and better the performance at high data rates.

Use only one of the following values for this setting:

2048, 4096, 8192, 16384, 32768, 65536, 131072

## **XMITON - RS-232 Transmitter State**

This setting determines the state of the CommLoggers RS-232 TXD (Transmit Data) and RTS (Ready To Send) lines while it's listening to the sensors RXD (Receive Data) line. The "0" (digit zero) setting turns this line off saving several milliamps of current and causes the transmit line to appear disconnected. Some systems and sensors will not like having their receive lines appear disconnected, either because they use them to steal transmitting power (which will affect the CommLogger's battery life), or they use them to detect a valid listener, and may refuse to transmit. The "1" (digit one) setting cause the CommLogger's TXD line to "mark" or idle, and its RTS line to "space" or signal ready.

## **VERBOSE - Transmit status**

This setting tells the CommLogger to transmit additional operating information during startup and shutdown - primarily for bench testing. Most sensors that connect to CommLogger will probably not want to hear any of this information.

## **PMIRROR - Auxiliary Pin Mirroring**

This setting is provided for future expansion. Do not change the default value without contacting the factory for assistance.

## **PLATFORM - Platform Selection**

This setting is provided for future expansion. Do not change the default value without contacting the factory for assistance.

