For in-line testing, recording, and analysis of voltage, amperage, and temperature for troubleshooting vehicle electrical systems

INSTRUCTION MANUAL
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The DDR-10 / DAS Diagnostic System is two interrelated tools: the inGEN™ Diagnostic Data Recorder (DDR-10) and the inGEN Diagnostic Analysis Software (DAS).

The DDR-10 is an under-hood monitor for vehicle electrical systems that collects information on current drain, stalling, and no-start conditions—problems that would require time-consuming and costly trial-and-error troubleshooting without the benefits of the Diagnostic System. The DDR-10 connects to the battery and the vehicle ground to provide in-line testing, display, and recording of voltage, amperage, and temperature. The Diagnostic System includes accessories for monitoring additional current and voltage channels.

At the heart of the Diagnostic System is the Diagnostic Analysis Software. The software directs how the DDR-10 measures and records data according to your specifications and enables you to upload data via a data card to your computer for display and analysis. The DAS runs on a PC with Windows® XP, and a data card reader is included that connects to a USB port.

1.1 - Where Does the DDR-10 Collect Data?

The DDR-10 can measure and record or log voltage at five different sources. Battery voltage is measured through the BATT + connection, which also supplies power to the DDR-10. You can connect up to four auxiliary test leads to determine when electrical components are switched on or off. Charge and discharge current is measured through the DDR-10’s series connection. An auxiliary current source is measured at the AUX A connection through which you can isolate a vehicle system by connecting to a fuse holder or other source. This channel has a maximum current capability of 30 A. The DDR-10 also has a built-in sensor that approximates system temperature, which is logged with the voltage and current measurements.

1.2 - How Does the DAS Work With the DDR-10?

The DAS does much more than its name indicates. The DAS gives you the ability to determine at what point in the vehicle electrical system the DDR-10 collects data and when it collects it. The configuration file you edit using the DAS works with the DDR-10’s firmware, hardware, and cable connections. The configuration file specifies conditions or triggers, such as changes in voltage and current, that control at what intervals the DDR-10 collects and logs data on its removable data card. Additionally, in the configuration file you can regulate the DDR-10’s power consumption by adjusting the transition thresholds of its three power modes: Full Power, Low Power, and Deep Sleep Mode.

The DAS graphs data with measurements along the vertical axis and time along the horizontal axis. The measurements are labeled with the channel name and color coded to match the DDR-10’s connectors and cables. Data can be scaled, panned, and zoomed for clarity. To highlight specific events, such as a reached set point or a change in one or more graphed measurements, you use Boolean operators (AND, OR) and mathematical symbols, and save the formula to be used again. The DAS also enables you to compare the graph to a reference graph of benchmark measurements. Graphs can be printed or exported to spreadsheets and databases.
2 - Technical Specifications

2.1 - Measurement

Current Consumption (approximate):
Full Power Mode: 150 mA
Low Power Mode: 20 mA (with auxiliary current disabled)
Deep Sleep Mode: less than 5 mA

Current Measurements at 25°C:
Main: -350A to +350A, +/- 1% plus 1A
0 A to 7.5 A, +/- 20 mA
7.5 A to 350 A, +/-1%
Charge and discharge current:
Aux: -30 to 30 A max (fused), +/- 40 mA, connected in line with vehicle fuse

Voltage Measurements at 25°C:
Main: 9 to 16 Vdc, +/- 20 mV
Aux 1: On / off with adjustable threshold (triggerable)
Aux 2: On / off with adjustable threshold
Aux 3: On / off with adjustable threshold
Aux 4: On / off with adjustable threshold

Temperature Sensor:
Located in DDR-10 housing to approximate battery temperature.
Measurement Range/Operating Temperature:
-4 °F to 158 °F
(-20 °C to 70 °C)

Operating Voltage:
7 to 16 Vdc

2.2 - Data Recording

Full Power Mode:
Data is sampled every 50 millisecond with each 50-millisecond sample averaged over a 30-second period and saved to the data card.

Low Power Mode:
Data is recorded every 30 seconds. Checks for current and voltage triggers every second.

Deep Sleep Mode:
Data is recorded every 5 minutes. Checks for current and voltage triggers every minute.

Triggered Data Capture:
In Full Power Mode: Stores 60 seconds of data centered on the trigger event at 50-millisecond intervals.
In other modes: Stores 60 seconds of data after the trigger event.

Triggers are set in DAS PC software and loaded into DDR-10 with a data card.

Triggerable Channels:
Main Current Measurement
Auxiliary Voltage Channel 1

2.3 - Physical Dimensions:
Length: 9 in (22.86 cm)
Width: 3.875 in (9.84 cm)
Height: 1.5 in (3.81 cm)
Weight: 1.6 lb (703 g)

Optional AC Adapter:
Output: 12 Vdc, 1000 mA (1A)
2.4 - DDR-10 Accessories

Test cables are color coded to correspond to the DDR-10 connectors as well as to data displayed in the DAS graphs. Alligator clips, wire clips, and fuse adapters expand the range of components to which the test cables connect.
2.5 - DAS and Accessories

The Diagnostic Analysis Software comes with a data card and a card reader that inserts into a USB port on your computer. The card is pre-loaded with a default configuration file having the recommended settings for troubleshooting electrical system problems. You can easily customize the settings using the DAS on your personal computer or laptop.

2.6 - Cases

The kit comes in a carrying case with a compartment for cable storage. To protect the DDR-10 from oil and dirt when installed in a vehicle engine, a wrap-around installation case is included.
3 - Installing The DDR-10

3.1 - Connections And Data Ports

**TOP**
- 40-Amp ATC Fuse
- Slot for 32 MB to 1 GB Data Card
- Connector for Optional AC Adapter
- To Positive (+) Battery Post (Primary Voltage and Power Source)
- Auxiliary Voltage Channel 2
- Auxiliary Voltage Channel 1 (triggerable)
- Auxiliary Current Channel (AUX A)

**FRONT**
- Control Panel with Recessed Push Buttons
- To Chassis Ground
- To Negative (–) Battery Post

**BOTTOM**
- Auxiliary Voltage Channel 3
- Auxiliary Voltage Channel 4

**NOTE**: Before using your DDR-10, we recommend that you register it online at www.midtronics.com to activate your warranty. When registering, use the serial number on the back of the DDR-10.
3.2 – Power Connections

The basic connections for the DDR-10 are to the battery and chassis ground through the cables on each end, forming a circuit. Power is supplied by the BATT + connection, which connects to the positive battery post. The DDR-10 provides a connection for an optional AC power adapter to use when the battery is below 9 V. See page 2 for adapter specifications.

For illustrations of cables and their connectors on the DDR-10, refer to the “Connections And Data Ports” section of this manual.

3.2.1 – Preparations

Before connecting the DDR-10 visually inspect the battery for:

• Cracked, buckled, or leaking case. If you see any of these defects, replace the battery.
• Corroded, loose, or damaged cables and connections. Repair or replace them as needed.
• Corroded or loose battery tray and hold-down fixture. Tighten or replace as needed.
• Corrosion on the battery terminals and dirt or acid on the case top. Disconnect the battery cables and clean the case and terminals using a thin wire brush and a mixture of water and baking soda. Use a clean cloth to dry before connecting the DDR-10.

3.3 - Warnings

Before installing the DDR-10, carefully read and follow instructions and safety messages on equipment and in this instruction manual. Failure to follow instructions, cautions, and warnings provided here as well as those provided by the equipment and vehicle manufacturers can result in explosion, fire, bodily injury, and equipment damage.

CAUTION: Because of the possibility of personal injury, always use extreme caution when working with batteries. Follow all Battery Council International (BCI) safety recommendations.

PROP 65 WARNING: Battery posts, terminals, and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and birth defects or other reproductive harm. Wash hands after handling.
To install the DDR-10 in a vehicle engine:

1. Disconnect the battery ground and chassis ground connections.
2. Connect the DDR-10 chassis ground cable.
3. Connect the DDR-10 to the NEGATIVE (–) battery terminal to complete the circuit.
4. Connect the BATT + ring terminal to the POSITIVE (+) battery terminal.
5. Insert the red BATT + cable connector into its connector on the DDR-10.
6. Connect auxiliary cables, if needed.
7. Secure and insulate all connections with electrical tape.

**NOTE:** To preserve the vehicle’s computer memory and programmed electronic settings, use a memory saver that plugs into the dashboard cigarette lighter.

**NOTE:** Make sure all cable connectors are pushed all the way into the DDR-10 (see the FRONT illustration on page 5).
### 3.4 - DDR-10 Front Panel

<table>
<thead>
<tr>
<th>Screen Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>▲▼</td>
<td>This symbol means that you can press the <strong>UP</strong> or <strong>DOWN</strong> button to display the next screen or selection.</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>▼</td>
<td>This symbol means that you can press the <strong>ENTER</strong> button to confirm your selection.</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Button</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FORMAT CARD</strong></td>
<td>The <strong>FORMAT CARD</strong> button formats the data card, overwrites all previous data, and creates a default configuration file on the card.</td>
</tr>
<tr>
<td>▲</td>
<td>The <strong>UP ARROW</strong> button increases values and displays screens located above the current screen.</td>
</tr>
<tr>
<td>▼</td>
<td>The <strong>DOWN ARROW</strong> button decreases values and displays screens located below the current screen.</td>
</tr>
<tr>
<td><strong>ENTER</strong></td>
<td>The <strong>ENTER</strong> button confirms your selections and exits the options menu.</td>
</tr>
<tr>
<td><strong>EXIT</strong></td>
<td>The <strong>EXIT</strong> button returns you to the menu from a setting or function. You also press <strong>EXIT</strong> to stop the logging cycle.</td>
</tr>
</tbody>
</table>

### 3.5 - DDR-10 Startup

Once the connection to the battery or to an auxiliary power supply is completed, the DDR-10 powers up in Full Power Mode. After displaying two software startup screens, the date and time appear on the LCD panel. The date and time screen is the entry point to the DDR-10 menu, which can be accessed by using the included stylus to press the recessed buttons in the front of the control panel. To help you move from one menu function to the next, the DDR-10 displays symbols that correspond to the buttons that are active and can be used to make selections.

#### 3.5.1 - Setting the Date and Time

The date and time screen is the entry point for the Options menu. This screen enables you to make sure the date and time are set correctly before the DDR-10 begins to log data.

**NOTE:** The function most critical to correctly dating and identifying your log files is **SET DATE & TIME**. Although the date and time have been set at the factory, you may need to make adjustments based on your time zone or Daylight Saving Time.
1. Press the **UP** or **DOWN ARROW** button to display the option SET DATE & TIME. Press **ENTER** to display the time setting.

![Select Set Data & Time](image)

2. The first screen has selections for the hour, minutes, and AM or PM. Press **ENTER** to move to the setting you want to change. To increase or decrease a setting, press the **UP** or **DOWN ARROW** button.

![Set 12:59 PM](image)

To confirm the change, press **ENTER**. To display the date, press **ENTER** when the cursor is under the AM/PM selection.

3. Press **ENTER** to move to the setting you want to change. To increase or decrease a setting, press the **UP** or **DOWN ARROW** button. Press **ENTER** to confirm the change.

![Set 12/21/06](image)

4. To save your settings, press **ENTER** when the cursor is under the setting for the year. To exit the SET DATE & TIME function without saving your changes, press **EXIT**.

### 3.5.2 - DDR-10 Menu

There are six options in the DDR-10 menu, which are described in the table.

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log Data</td>
<td>Verifies that the data card is inserted and capable of accepting data. Initializes the configuration file and begins logging test data.</td>
</tr>
<tr>
<td>Multimeter</td>
<td>Displays real-time voltages, currents, and net amp-hours that are updated every ½ second.</td>
</tr>
<tr>
<td>Format Card</td>
<td>Used with the FORMAT button, this function formats the data card, overwrites all previous data, and creates a default configuration file on the card.</td>
</tr>
<tr>
<td>Set Date &amp; Time</td>
<td>Adjusts the date and time.</td>
</tr>
<tr>
<td>View Description</td>
<td>Displays the description of the configuration file the DDR-10 is using to control data logging. The description is an identifier that you create using the DAS.</td>
</tr>
<tr>
<td>Clear Amp Hours</td>
<td>Resets the net amp-hour total to zero.</td>
</tr>
</tbody>
</table>
3.6 - Inserting the Data Card

The DDR-10 comes with a data card that contains a default configuration file. Before the DDR-10 can begin logging data, the card must be inserted into the spring-loaded card slot on the top of the unit.

1. Insert the card into the data card slot on the top of the DDR-10.
2. Use the stylus to gently push the card into the slot until it locks into place. The card is correctly inserted when it is not protruding from the slot.

**NOTE:** The data card must be inserted all the way into the slot on the DDR-10 for it to log and save data.

3.7 - Formatting the Data Card

This function formats the data card and overwrites any saved data with a default configuration file.

1. Press the **UP** or **DOWN** arrow buttons to display **FORMAT CARD**, and press **ENTER**.

2. When ERASE ALL DATA? appears, press the **FORMAT** button. To exit without formatting, press any button except **FORMAT**. When the formatting is complete, press any button to exit.

3.8 - Removing the Data Card

To remove the data card from the DDR-10:

**NOTE:** Before removing the data card, stop the logging cycle by pressing **EXIT**, then **ENTER** to confirm.

1. Insert the stylus into the data card slot and press the data card until it unlocks and protrudes from the DDR-10.
2. Remove the data card.
3.9 - Auxiliary Voltage Cable Connections

The DDR-10 features four auxiliary voltage channels you can use for monitoring circuits and triggering events. Each channel plugs into the unit using an insulated right-angle banana connector and color-coded cable.

![Connection at Dashboard Fuse Panel](image1)

![Connection at Fuse Panel on Battery](image2)

3.10 - Auxiliary Current Cable Connections

The auxiliary current cable (AUX A) is connected through a fuse adapter to fuse holders inside the vehicle and under the hood. Secure the connection between the auxiliary current cable and the fuse adapter with a nylon strap or electrical tape.

To safeguard the vehicle electrical system as well as the auxiliary current cable:

- Monitor the auxiliary current only when the vehicle is not being driven.
- Keep the auxiliary current cable away from door and hood hinges and from the fenders.
- Do not let unconnected wires touch metal on the vehicle or anything that can conduct electricity.
- Make sure all connections are fused.
- Secure all wiring with cable clamps or electrical tape.
- Insulate all wires and do not allow any bare wiring to remain exposed.
3.11 - Custom Wire Harness Connection

It may be necessary to make a custom wire connection to adapt into the existing vehicle wiring. Wires to and from the vehicle harness must be fused (30 A maximum) to prevent damage. Use quick-disconnect female terminals to plug into the AUX A connector on the DDR-10.

1. Disconnect the OEM harness at the connector. Polarity does not matter when connecting through the AUX A connector. The DDR-10 displays the auxiliary current as a negative value.

2. Insert the custom wire connections in series with the vehicle harness as shown.

3. Secure and insulate all wiring and make sure there are no loose connections before testing.

---

**NOTE:** Only one wire can be monitored at a time.
3.12 - Using the Installation Case

After connecting the DDR-10 under the hood and inserting the data card, enclose the DDR-10 in the protective installation case included with the unit. This case folds around the DDR-10 and stays in place with Velcro fasteners with the cables extending through the openings in the case. When properly enclosed the units’ LCD screen should be visible through the clear window in the case.

1. Place the open case over the front of the DDR-10 with the rounded flap (B) at the top.
2. Center the two black cables on each end of the DDR-10 in the slots in the side flaps.
3. Arrange the auxiliary and main voltage cables so that when the case is closed they extend from the corners as shown in the photos.
4. Fold the bottom flap (A) with the Velcro hooks over the DDR-10.
5. Pull the side flaps (C) over the bottom flap and firmly press them against the Velcro hooks.
6. Pull the top flap over the bottom flap and firmly press it against the Velcro hooks.
7. Make sure the display is fully visible through the clear window.
4 - Logging Data with the DDR-10

Before the DDR-10 can begin logging data, make sure the data card has been properly inserted into the unit.

4.1 - Log Data

1. Press the **UP** or **DOWN** arrow buttons to display the option LOG DATA and press **ENTER**.

   ![Select Log Data](image1)

2. The DDR-10 takes a few seconds to access the data card and then displays the amount of recording time available on the card.

   ![Over 1000 Hours Available](image2)

3. The starting date and time of the log session appears for 2 seconds. You can always return to this screen by pressing the **UP** or **DOWN** arrow buttons.

   The DDR-10 displays the names of the data to be monitored, then displays battery voltage, amp-hours, main current, and auxiliary current. The negative (−) sign next to the amperage measurements indicates discharge current. For a graph and explanation of charge and discharge current as measured by the DDR-10, see the graph on page 15. To see the auxiliary voltages press the **UP** or **DOWN** arrow buttons. The Multimeter option, described in the following section, has a similar screen layout.

   The DDR-10 updates the data at intervals determined by the DAS configuration file settings. The DDR-10 displays symbols and messages to indicate power mode transitions and triggers. For more information on these configuration settings, see “Using the Diagnostic Analysis Software” on page 19.

4. To stop the logging cycle, press **EXIT** and then **ENTER** to confirm.

2.2 - Screen Symbols

The symbols listed below are displayed when the DDR-10 collects data.

- ![Low Power Mode](image3)
- ![Deep Sleep Mode](image4)
- ![Trigger in progress](image5)
- ![Logging Mode](image6)
The DDR-10 displays the discharged main current as a negative number. It displays the auxiliary current as a negative number regardless of connection polarity.

**Logging Screens and Activities**

- **Entering Low Power Mode**
- **Entering Deep Sleep Mode**
- **Saving Trigger**

**Charge/Discharge Current**

The (-) sign on the number only signifies that the current is discharge. It is otherwise an absolute number. Examples: -5 = 5A discharge, .10 = 10A discharge, 5 = 5A charge, 10 = 10A charge

**NOTE:**

The DDR-10 displays the discharged main current as a negative number. It displays the auxiliary current as a negative number regardless of connection polarity.
4.3 - Multimeter

The Multimeter screens show live values that are updated every ½ second.

1. Press the UP or DOWN ARROW button to display the MULTIMETER, and press ENTER.

   Select
   Multimeter

2. The first screen displays the names of the data to be monitored.

   BATT +V  Ah
   MAIN A  AUX A

3. To see the measured battery voltage (BATT +V), amp-hours, main and auxiliary currents, if available, wait two seconds or press the DOWN ARROW button.

   13.08V +5.80Ah
   -0.22A -0.0A

4. Press the DOWN ARROW button to see the voltage measurements at auxiliary channels 1 through 4, if available.

   1:12.5V 2:0.0V
   3:0.0V 4:0.0V

5. To review any screen, press the UP or DOWN ARROW button. To exit, press the EXIT button.

4.4 - Format Card

This function formats the data card and overwrites any saved data with a default configuration file.

1. Press the UP or DOWN arrow buttons to display FORMAT CARD, and press ENTER.

   Select
   Format Card

2. When ERASE ALL DATA? appears, press the FORMAT button. To exit without formatting, press any button except FORMAT. When the formatting is complete, press any button to exit.
4.5 - Error Messages

Although most warning messages alert you when you format a data card or begin logging, some messages may appear during a logging cycle. It is recommended that you check the DDR-10 regularly, including its cable connections.

NOTE: Make sure the correct configuration file has been placed on data card before beginning a new logging cycle.

<table>
<thead>
<tr>
<th>Message</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Card Full</td>
<td>The data card is full and cannot accept more data. Replace it with a card with enough recording time.</td>
</tr>
<tr>
<td>Not Enough Space on Card</td>
<td>The data card has less than 10 hours of recording time.</td>
</tr>
<tr>
<td>Data Card Error</td>
<td>The data card is damaged or its file structure is corrupt. Replace the card.</td>
</tr>
<tr>
<td>Data Card is Faulty</td>
<td>The data card is damaged or corrupt. Replace the card.</td>
</tr>
<tr>
<td>Data Card Size Is Incompatible</td>
<td>The acceptable size is 32 MB to 1 GB. Refer to page 50 in the Appendix for approved data cards.</td>
</tr>
<tr>
<td>Card Has Invalid Format</td>
<td>The data card has an invalid format. Replace the card.</td>
</tr>
<tr>
<td>Data Card is Locked</td>
<td>The file is locked by a third-party file-lock software and cannot be unlocked using Windows Explorer.</td>
</tr>
<tr>
<td>Format Failed</td>
<td>The data card is damaged or corrupt and cannot be formatted. Replace the card.</td>
</tr>
<tr>
<td>No Config. File Use Default?</td>
<td>The data card does not contain a configuration file. Use the DAS to place a configuration file on the card or press ENTER to allow the DDR-10 to use a default configuration file.</td>
</tr>
<tr>
<td>LOW VOLTAGE WARNING</td>
<td>The voltage powering the DDR-10 is below 6 volts and logging has stopped. Logging will resume when voltage rises above 7 volts.</td>
</tr>
<tr>
<td>Logging Aborted</td>
<td>The data card was ejected during logging.</td>
</tr>
</tbody>
</table>
5 - Installing the Diagnostic Analysis Software

The Diagnostic Analysis Software (DAS) displays and graphs the data that the DDR-10 has logged. With this software you can set voltage triggers and thresholds to monitor and measure various circuits in a vehicle’s electrical system. You can also set the parameters that determine how much power is consumed by the DDR-10 itself.

NOTE: Quit any open applications including anti-virus and screen savers before installing the Diagnostic Analysis Software.

5.1 - Minimum System Requirements

- 600 Mhz Intel Pentium III processor or equivalent
- Windows XP (Service Pack 2)
- 275 MB of uncompressed free disk space
- 1024 x 768 monitor resolution (1280 x 1024 recommended)
- CD-ROM drive
- USB port

5.1.1 - With AutoRun Enabled
Insert the DAS CD into your CD-ROM or DVD-ROM drive. The installation begins automatically. Follow the displayed directions.

5.1.2 - Without AutoRun Enabled
1. Insert the DAS CD into your CD-ROM or DVD-ROM drive.
2. From the task bar select Start > My Computer.
3. Right click the drive containing the CD and select Explore.
4. Double click the file Setup.msi and follow the directions displayed. By default, the DAS is installed in C:\Program Files\Midtronics, Inc\inGEN DAS\.
6 - Using the Diagnostic Analysis Software

6.1 - The DAS Interface

The DAS main screen is the first window that appears when you double click the inGEN DAS icon on your desktop. This screen is your point of entry to the options and controls in the software. The menu buttons and menu bar remain visible in every screen except when you view graphed data.

6.2 - Menu Bar

On the menu bar at the top of the window are two options, File and Help, and a Close [X] button.

The Help menu has two options, About and Adobe Reader. Adobe Reader 6.0 or later is required to open a pdf version of the inGEN DDR-10/DAS Instruction Manual installed with the DAS. To download the latest version of the free Adobe® Reader® available on the Adobe web site an Internet connection is required. Click Help and select Adobe Reader from the drop-down list to be directed to the site.

To see the DAS software version, click Help, and select About from the drop-down list.

In addition to the Exit button in the lower right corner of the window, the menu has two ways for you to quit the program: Click File and select Exit, or click the Close button in the upper right corner.
6.3 - Manual Button
If you have Adobe Reader 6.0 or later, click the Manual button to display or print the full-color pdf copy of the Instruction Manual. To jump from a topic in the Table of Contents to its location in the manual, click the topic’s page number.

6.4 - Process Data Button
To decode and transform a logged data file into a graph, click the Process Data button.

6.4.1 - Decode Data
The Decode Data window is divided into three sections: Decode Data File, File Name, and Decode Status.

Decode Data File Window
In the Decode Data File section you can select a drive to access your data.

Open/Decode
You can also select the option to decode the data manually or automatically. To manually decode a data file, click the Open/Decode button. Select the file named INGEN000.DDR, which is the name the DAS assigns to data files.

Enable Automatic Decode
Check this option to allow the DAS to search the selected drive for data files.

Refresh Drive List
Click this button to update the list of available drives on your system.
**Drive Letter**
This drop-down box displays the available drives. Click the drive letter of your data card. If the card contains an INGEN000.DDR data file, FILE FOUND appears, and the DAS decodes and displays the data in a graph. The title of the graph is the same as the Comment field in the configuration file.

**File Name**
This box displays the name of the selected data file.

**Decode Status**
This window displays the decoding status of the selected data file, which is a Record Count and a Decode Complete message.

### 6.4.2 - Display Data Tab
In the Display Data Window you can import and export decoded data files, and refresh the list of available drives that contain data.

**Import Previous Decode Files**
Click this button to select and open a saved data file with a .gls extension. A .gls file contains multiple files (.evt, csv) associated with a graph. To display a graph, double click on a data range in the list box. Importing enables you to review saved data without decoding the files again.

**Export Decode Files**
Click this button to rename and save all files associated with your current graphing session as one file with a .gls extension in a location of your choice. Because decoding creates files with the same default name and extension, exporting helps you avoid overwriting files.
**Refresh**
Click this button to update the list of decoded data files.

### 6.5 - Data Card Button
Click the **Data Card** button to select the drive that contains your data card to explore and format, the card. You can also place configuration or application files on the data card.

![Data Card Button Image]

**6.5.1 - Select Drive Letter**

**Drive Selection List**
Click the Down Arrow next to the list box to select a drive containing a data card.

**Refresh**
Click **Refresh** to update the selection of available drives.

### 6.5.2 - Drive Options

**Explore Drive**
Click **Explore Drive** to explore the selected drive using Windows Explorer.
**Format Drive**
Click [Format Drive](#) to format the selected card. Always select [FAT](#). Do not select [FAT 32](#) or [Quick Format](#).

![Format Drive Window]

- **Select FAT only**
- **Do not select Quick Format**

**Place Configuration File on Card**
Click this button to select and place a configuration file on your data card.

**Place Application File on Card**
Click this button to select and place an application file on your data card that upgrades the DDR-10 firmware. When you insert the card into the DDR-10, it automatically detects and loads the application file when it boots up. To prevent the application file from reloading the next time the DDR-10 boots up, remove the card.
6.6 - Configuration Button

When you click the **Configuration** button, the first window that appears gives you access to the default configuration file, a ready-made set of instructions for the DDR-10.

**NOTE:** Buttons are dimmed until they are applicable.
6.6.1 - Configuration File Address Bar
The file name and path of the open configuration file is displayed here.

![Configuration File Address Bar](image)

6.6.2 - Configuration File Buttons

**New**
Click New to create a new configuration file using the default values. If a configuration file is open when you click the New button, the DAS prompts you to save it before the new file is created.

**Open**
Click Open to select and open a configuration file. The file’s settings are displayed in the List Box.

**Save**
Click Save to save the configuration file as INGENDDR.CFG in its original location.

**Save As**
Click Save As to save the configuration file as INGENDDR.CFG in a new location. The default name INGENDDR.CFG cannot be changed.

**Close**
Click Close to close a configuration file without saving it.

6.6.3 - Configuration Variable
In this section you can view the setting of a open Configuration File, edit the file’s parameters, and export it as a text file.

![Configuration Variable](image)
**Edit Configuration**
Click **Edit Configuration** to display the Configuration Settings Window, which has six selectable tabs across the top. Click the tabs to select triggers, mode transition conditions, voltage threshold parameters, and add comments within a configuration file. For more information, see the “6.7 Configuration Settings Window” below.

**Export List**
Click **Export List** to name and save the contents of the List Box as a text file for reference in a location of your choice.

**List Box**
When you click **New** to open a configuration file, the List Box is blank to indicate the file is new and unedited. When you **Open** a saved configuration file, a list of settings appear in the box.

### 6.7 - Configuration Settings Window
The **Configuration Settings** Window is a series of six tabbed windows, one behind the other. The first window that appears when you click the Configuration button is tabbed **Trig** and has settings for the **V1** voltage and **Main Current** triggers. To select a window, click its tab.
6.7.1 - Using The Configuration Settings Controls

The only setting that allows direct entry of text and numbers is the **Comment** field in the **Miscellaneous** window. To speed the process of editing your configuration file and help you avoid selecting values outside allowable ranges, there are three kinds of controls for editing. The controls are generally used in order: The **Check Box** turns on the setting, the **Option Button**, if available, selects the setting for editing the setting, and the **Knob**, if available, select from a range of values. Some settings are dimmed because they are not selectable.

To change all settings in the window to their default values, click the **Set Defaults** button.

![Configuration Settings Controls](image)

**Check Box**
To enable a setting, click the setting’s **Check Box** to insert a check mark. To disable, remove the check by clicking check box.

**Option Button**
To select a setting, click the associated **Option Button** to insert a dot. To deselect the button, click it to remove the dot. Only one button in a group of buttons can be selected at one time.

**Knob**
To edit a value once a setting is enabled for editing, click and hold your left mouse button on the knob. The dot on the knob changes from red to blue. Turn the knob right to increase a value; turn the knob left to decrease a value.

You can also use your mouse or shortcut keys to select a value. This feature is especially useful if your monitor resolution is 800 x 600 pixels, which does not display the numbers around the knob.

First click the knob to activate it, then use the:

- mouse wheel to increase or decrease a value
- **Page Up** or **Up Arrow** key to increase a value and the **Page Down** or **Down Arrow** key to decrease a value
- **Home** key to start at the lowest number in the range and the **End** key to start at the highest number in the range
6.7.2 - Triggers (Trig) Tab
During normal logging (Full Power Mode), the DDR-10 samples data every 50 milliseconds. It then averages the data over a 30-second period and saves the averaged data to the data card as one record. When graphed in the DAS, the data appears as points placed at 30-second intervals.

In contrast, a trigger captures all of the 50-millisecond data over a short period of time. Instead of averaging the data, the DDR-10 saves the 50-millisecond triggered data as individual records. When graphed, the data appears as points placed at 50-millisecond intervals, which creates a high-resolution snapshot of a specific event. The event, for example, could be an engine starting, an ignition shutting off, or a car door opening. In most cases, you can see the data up to a specific event as well as the data after an event. For more information on triggers relative to different power modes, see page 48 in the Appendix.

There are two selectable triggers: the Starter Current (MAIN A) and V1 Auxiliary Voltage. The V1 channel is monitored through the white Auxiliary Voltage cable.

**Starter Current Trigger**
This negative-edge trigger occurs when the starter discharge is greater than the selected value.

1. **Edit** is enabled. To change the setting, move the mouse cursor over the knob.

2. Click and hold the left mouse button, and move the knob until required setting appears.

**Default Settings**
- **Starter Current**
  - Range: –100 to –350 ADC
  - Default: –150 ADC
6.7.3 - Data Communications (Data Comm) Tab

The Data Comm settings are for a wireless communication option available in the future.

6.7.4 - Mode Transition Conditions (Mode Tran Cond) Tab

This window has settings that enable you to control the DDR-10’s consumption of battery power by setting conditions for the transitions from Full Power, Low Power and Deep Sleep Modes.

To operate, the DDR-10 draws power from the vehicle battery. To conserve power when logging, the DDR-10 can operate in reduced power modes when certain conditions occur. Although the DDR-10 displays voltage and current measurements in all modes, it records and writes data less frequently in its reduced power modes.
The DDR-10 / DAS Dagnostc System

Enable Low Power Transition

The DDR-10 transitions from Full Power to Low Power Mode (point A in the diagram below) when three things occur:

- **Voltage**: The measured battery voltage (BATT + V) falls below the shown threshold.
- **Current**: The measured discharge current is below the preset threshold of –0.90 ADC, indicating that the vehicle has not started and there is limited activity to monitor.
- **Timer**: When the battery voltage reaches the threshold and the discharge current is below –0.90 ADC, the timer starts. If the values are still below the thresholds when the timer cycle ends, the DDR-10 goes into Low Power Mode.

The DDR-10 transitions from Low Power to Full Power Mode (point B in the diagram below) when either of the following two conditions occur:

- **Current**: The measured discharge current is greater than or equal to –1.00 ADC, indicating that the vehicle has started and there is more activity to monitor.
- **Low to Full VDC**: the measured battery voltage (BATT + V) is greater than or equal to the threshold.

Other conditions that cause the DDR-10 to transition out of Low Power to Full Power Mode include the occurrence of a trigger or a measured change in current that is equal to or greater than 100 mA (0.1A). The DDR-10 also transitions to Full Power Mode when it experiences a brief interruption in power, its data card is removed, or one of its buttons is pressed.

Full Power / Low Power Mode Transitions
**Full to Low Timer**
The timer starts when the voltage and current are below the thresholds.

**Default Settings**
- Range: 20 to 120 minutes
- Default: 60 minutes

1. To edit, click **Full to Low Timer**.
2. Move the mouse cursor over the knob.
3. Click and hold the left mouse button, and move the knob until the required setting appears.

**Full to Low ADC**
This setting is one of the conditions that determine the transition from Full Power to Low Power Mode.

**Default Settings**
- Not adjustable
- Default: -0.90 ADC

**NOTE:** If the measured discharge current rises above -0.90 ADC, the Full to Low Power timer resets to 0 minutes. The timer waits until the discharge current measures less than -0.90 ADC before it restarts.

**Low to Full VDC**
This setting is one of the conditions that determine the transition from Full Power to Low Power Mode.

**Default Settings**
- Enabled
- Range: 9.00 to 16.00 VDC
- Default: 13.50 VDC

1. To edit, click **Low to Full VDC**.
2. Move the mouse cursor over the knob.
3. Click and hold the left mouse button, and move the knob until the required setting appears.
**Low to Full ADC**

This setting is one of the conditions that determine the end of Low Power Mode. When the measured current exceeds the threshold the DDR-10 returns to Full Power Mode.

**Default Settings**

Not selectable  
Default: –1.00 ADC

---

**Enable Deep Sleep Transition**

The transition from **Low Power** to **Deep Sleep Power** (A in the diagram) occurs when **both** of these conditions are met:

- the hours the DDR-10 operates in Low Power Mode is equal to or greater than the selected time limit.  
- the measured discharge current is less than –0.70 ADC, indicating that there are few if any loads on the vehicle electrical system and limited activity to monitor.

The transition from **Deep Sleep** back to **Low Power Mode** (B in the diagram) occurs when **any** of these conditions are met:

- the measured battery voltage (BATT + V) increases or decreases 0.10 V or  
- the measured discharge current is greater than –0.80 ADC.

Other conditions that cause the DDR-10 to transition out of Deep Sleep to Full Power Mode (C in the diagram) include the occurrence of a trigger or a measured change in current that is equal to or greater than 100 mA. The DDR-10 also transitions to Full Power Mode when it experiences a brief interruption in power, its data card is removed, or one of its buttons is pressed.

**Low to Full ADC**

This setting is one of the conditions that determine the end of Low Power Mode. When the measured current exceeds the threshold the DDR-10 returns to Full Power Mode.
**Low to Deep Sleep Timer**

This setting is one of the conditions that determine the transition from Low Power to Deep Sleep Mode. It is the measured amount of time in hours that the DDR-10 operates in Low Power before entering Deep Sleep Mode.

![Low to Deep Sleep Timer](image)

**Default Settings**
- Range: 48 to 180 hours
- Default: 72 hours

1. To edit, click **Low to Deep Sleep Timer**.
2. Move the mouse cursor over the knob.
3. Click and hold the left mouse button, and move the knob until the required setting appears.

**NOTE:** In the Low Power to Deep Sleep transition, if the primary current transition condition is not met, the timer resets to 0 minutes and waits until the current transition condition is met before restarting.

**Deep Sleep to Low VDC**

This setting is a measured change (Delta or ∆) in battery voltage. The DDR-10 monitors for this change or a rise in the current level above –0.80 ADC before entering Low Power Mode.

![Deep Sleep to Low VDC](image)

**Default Settings**
- Enabled
- Range: 0.05 to 0.50 VDC
- Default: 0.10 VDC

1. To edit, click **Full to Low Timer**.
2. Move the mouse cursor over the knob.
3. Click and hold the left mouse button, and move the knob until the required setting appears.

**6.7.5 - Miscellaneous (Misc) Tab**

The Miscellaneous Window has two options: a **Comment** field and **Metric Display Enable**.
**Comment**
You can add comments with up to 127 characters to configuration file. To display the comments in the DDR-10, select **View Description** in the DDR-10 menu. The comments scroll across the screen from right to left.

**Metric Display Enable**
Select this option to change:
- the format of the date displayed in the DDR-10 from month/day/year to day/month/year
- and the temperature displayed in the DAS from Fahrenheit to Celsius.

**6.7.6 - Voltage Thresholds (Volt Thresh) Tab**
Settings under the Voltage Thresholds tab allows you to adjust the threshold levels for the four auxiliary voltage inputs on the DDR-10. The adjustment range is between 1.00 VDC and 16.00 VDC in increments of 0.5 VDC. Each setting can be used to indicate whether a specific input wire (V1 – V4) is above or below the defined threshold. The resultant “1” above the threshold or “0” below the threshold can then be graphed.

**Edit V1–V4 Buttons**
Active when checked. Use the knob to set the voltage thresholds for Auxiliary Voltage Channels V1 through V4. The parameter voltages are displayed in the edit box.

**6.7.7 - Back Tab**
Selecting this tab returns you to the main configuration interface.

**6.8 - Exit Button**
To close the DAS, save your changes and click the **Exit** button in the lower right corner.
7 - Graphing the Data

In this part of the software you can graph all the parameters you have captured with your DDR-10. You can enable individual traces for each parameter. You can scale, range, and zoom in on any data in the graph by clicking and dragging.

**NOTE:** The data points V (voltage) and A (amperes) in the illustration denote triggers. For information on triggers, see section 6.7.2 on page 28, and page 48 in the Appendix.
7.1 - **Menu Bar**

Selections in the Menu Bar lets you control the display, view files and graphs, edit and view events, or export a graph to a .csv file.

### 7.1.1 - Display Controls

To display the traces of measurements in the graph in addition to BATT+ (battery voltage) and MAIN A (main current), select **Display Controls > Trace Enable Dialog** from the graph menu.

**Trace Enable Dialog**

The BATT+ and MAIN A traces are dimmed because they are graphed by default. However, you can set the high and low limits of their traces. The settings in this window let you enable and disable the traces. You can also set the high and low parameters for certain selected functions.
Enable BATT+
This option enables the trace to display the graph of the BATT+ data. This function is enabled by default. You can set the high and low limits for this parameter using the boxes to the right.

Enable MAIN A
This option enables the trace to display the graph of the MAIN A data. By default this function is always enabled. You can set the high and low limits for this parameter using the boxes to the right.

Enable AUX A
This option displays available data for the AUX A input. You can set the high and low limits for this parameter using the boxes to the right.

Enable V:1–4
Enabling one or more of these options graphs the enabled auxiliary voltages. There are no user definable high and low parameters. Because the V1 through V4 are threshold detectors, the limits are the logic levels 0 (FALSE) and 1 (TRUE).

Enable Temperature
This option displays temperature data. You can set the high and low limits for this parameter using the boxes to the right.

Enable Event (1–3)
You can display data for up to three events by selecting the Enable Event option. There are no user-definable upper and lower limit options. Because Events 1 through 3 are the results of a logic formula, the limits for the event traces are 0 (FALSE) and 1 (TRUE).

Enable Amp Hours
This option displays all available Amp Hour data. You can set the high and low limits for this parameter using the boxes to the right.

Enable Powered By AUX
Choose this option to enable an event showing when auxiliary power was in use. The logic limits are 0 (FALSE) and 1 (TRUE).

Enable All And Disable All Buttons
Click these buttons to select and deselect all of the trace options available.
7.1.2 - Data Marker Dialog

In this window you can select a connecting line, data point displays, and the size of the data points used. You can also invert the background color of the graph from black to gray.

Connect the data points with a line

Selecting this option connects the displayed data with a line.

Show data points

Select this option to display data on the graph using a point. The size of the point can be adjusted between 1 and 4 using the data mark dot box.

If the data card was removed during logging, the card’s absence is graphed as a straight line.

Invert black background color

This option lets you change the background of the graph from black to a medium gray color.

7.1.3 - Sync Hours

This function allows you to force two graphs to begin at the same start time. The Sync Hours option is only available when a reference graph is enabled and on top. See the Reference Graph section of this manual.
7.2 - View

Through the View menu you can view a configuration file, select a reference graph, and access the file shuttle dialog box.

<table>
<thead>
<tr>
<th>Display Controls</th>
<th>View</th>
<th>Events</th>
<th>Export</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

7.2.1 - Configuration File

Selecting this option lets you view the configuration file of the decoded data file.
7.2.2 - Reference Graph
This option lets you select a graph saved as a .csv file to compare to the graph you are viewing. The reference graph is 50 percent transparent and overlays the current graph. You can also synchronize the two graphs to the same start time using the Synchronize Hours option under Display Controls.

Use the “W” key to toggle between the active graph and the reference graph. The reference graph is indicated by the text “ref” at the top of the graph.

7.2.3 - File Shuttle
Choose this menu option to display the File Shuttle dialog box. By default this dialog box appears automatically when the data file has been divided into more than one .csv file. Click │< to display the first file. Click │> to display the last file. Click the triple arrows to shuttle back or forth one file at a time.
7.3 - Events
Using a series of preset functions, you can build formulas for up to three separate events. This allows you to search for specific criteria within a data file when troubleshooting an electrical problem. Once you create an event formula, you can save, edit, and reuse it.

7.3.1 - Edit Events
In this dialog you can create, edit and save your own custom event formulas. You can also recall existing formulas and use them again and again.

A series of preset Operators, Parameters, and Constants allow you to quickly create your formulas. Two preset formulas are also available that you can import, modify, and save.

The preset formulas are in C:\Program Files\Midtronics, Inc\inGEN DAS\DataStore.
Discharge.evt is a formula that detects battery discharge greater than 5 amperes.
EngineRunning.evt detects battery voltage greater than 13.50 VDC.
**Import Formula**
Import a saved formula using dialog box. There are also two formulas available that were created when you installed the software on your computer.

**Export Formula**
Save an existing formula using a dialog box. By default, formulas are saved in the DataStore folder with a .evt extension.

**Event (1–3)**
Use these boxes to build your formulas. Select an event by clicking on the radio buttons next to each box to make an event active.

**Operators**
Use these parameters to determine less than, greater than, equals, less than or equal to, and greater than or equal to. The Boolean operators **AND** and **OR** are also available.

**Parameters**
Determines which data parameters are included in your event formula.

**Constants**
These functions allow you to include numeric values into your formula parameters. You can edit each of the five constants by clicking on the **Edit** button and changing the values in each of the boxes.
**Creating And Editing Events**

With the Events feature, you can create powerful formulas that lets you zero in and isolate specific conditions and events. These formulas can be modified and saved to use in other graphs. Using a series of predefined parameters, formulas for up to three separate events can be created quickly and easily with no programming knowledge required. Use the buttons in the Edit Event Window as you would calculator keys to create formulas that isolate data in a graph.

**Examples**

The Events 1 through 3 in the illustration and the following examples show a combination of operators, parameters, and constants to create a formula that triggers a specific event.

**Example 1:**

The formula

\[(BATT+<K1), \text{ where } K1 = 12.00 \text{ VDC}\]

describes a discharged battery.

**Example 2:**

The formula

\[(BATT+<K1) \text{ AND (MAIN A}>K2) \text{ where } K1 = 12.30 \text{ VDC and } K2 = -5 \text{ ADC}\]

describes a battery that is discharging.
To create a new event formula.

1. Click the radio button beside the event number you want to create. The box next to the radio button becomes active.

2. Click the left parenthesis. The parenthesis appears in the active event box.

3. Choose a parameter option from those listed in the Parameters box and click on it. The parameter you select appears in the active event box.

   Be aware that V1 through V4 are logic indicators that report TRUE or FALSE corresponding to the V1 through V4 thresholds set in the configuration file. For example, if the V1 wire was connected to a specific electronic control module and this V1 threshold was set to 12.00 VDC, the V1 trace rises to logic “1” every time the electronic control module powers up.

4. Select an operator from those listed under the Operators box and click it. Some operators may not be available depending on which parameter you have selected.

5. Select a Constant value. The constant K1 through K5 will appear in the active event box, depending on which constant you have selected.

   You can choose from any one of five separate constants values, which are adjustable by clicking the Edit button. In the case of V1–V4, you can use the values 1 or 0 by clicking the appropriate button. When finished editing constants, click Resume.

   NOTE: In addition to selecting a constant, you also have the option of adding up to three parameters to your event formula line, depending which operator you have selected.

6. Click the right parenthesis to complete the expression.

7. You now may have the option to click the AND or OR operators. You can then create another expression in your formula.

8. Repeat the process for each expression in your formula.

9. To save your event formulas, click on the Export Formula button. You can then navigate to the desired folders using a standard Window dialog box. By default, the DAS puts saved formulas in the DataStore folder.

10. Click the Close button when you have finished creating your event parameters to apply the event formulas to the graph.

11. Enable the events traces that you have created.

The following illustration shows the graph that the formula produces given some data.
7.3.2 - View Events

This dialog box lets you view the formulas currently applied to the displayed graph. Formulas cannot be edited in this box.

Event 1: \((\text{Temp} > 150.00)\) OR \((V1=0)\)
Event 2: \(\text{BATT}+=0.00\)
Event 3: \(\text{Ah} = 0.00\)

7.3.3 - Export

Click Export > Export Graph to .CSV file to create a .csv file of the displayed portion of the decoded data file in the graph. All traces, whether visible or hidden, are included in the .csv file, which you can open in Microsoft Excel.
7.4 - Graph Icon Bar

7.4.1 - Resume All (Tracking)
Click this icon to reset the displayed graph, removing any zoom operations.

7.4.2 - Scroll (Axes)
This function lets you scroll a trace along its vertical or horizontal axis.

1. Click the Scroll (Axes) icon.
2. Move the mouse pointer over the numeric values displayed on the far left side or lower portion of the graph. The cursor changes to a pointing finger.
3. Click and hold the left mouse button and move the cursor up and down, or left and right. The trace scrolls vertically or horizontally.
4. Click anywhere away from the scale to turn the function off.
5. Click the Resume All icon to return the trace to its original display.

7.4.3 - Zoom (Axes)
This function lets you zoom in on a selected trace.

1. Click the Zoom (Axes) icon.
2. Move the cursor over the graph. A white square is added to the cursor.
3. Click and hold the left mouse button.
4. Drag the cursor from top left to bottom right over the portion of the graph you want to zoom.
5. To cancel the zoom, click the Zoom icon.
6. Click the Resume All icon to return the graph to its original size.

7.4.4 - Select
This function lets you choose a trigger point on the graph, indicated “A” for current or “V” for voltage, and display the trigger data.
7.4.5 - Zoom Box

Click this button to zoom in on all of the displayed traces in a graph.

1. Click the **Zoom Box** icon.
2. Move the cursor over the graph. A small white square appears with the cursor arrow.
3. Click and hold the left mouse button.
4. Drag the cursor from left to right over the part of the graph you want to zoom.
5. Click the icon again to turn off the function.
6. Click the **Resume All** icon to return the graph to its original display.

7.4.6 - Cursor (Data Bar)

Click this button to display a scrolling data bar on your graph.

As you move the bar, the values underneath it are displayed in the upper right-hand corner of the graph as well as the time value at the top of the graph.

1. Click the **Cursor (Data Bar)** icon. A yellow vertical line appears in the graph covering all of the displayed traces.
2. Move the cursor over the yellow line. The cursor changes to a pointing hand.
3. Hold down the left mouse button and move the line. The values directly underneath are displayed in the upper right hand corner of the graph along with the appropriate time values.
4. Click the icon again to turn off the function.

7.4.7 - Copy To Clipboard

Click this button to send the displayed graph to the Windows Clipboard.

From there it can be displayed in any software application that can import from the Clipboard.

7.4.8 - Save To File

Click this button to save a displayed graph as a standard bitmap file.

A standard Windows Save As dialog box lets you navigate to any available folder.

7.4.9 - Print

Click this button to print the graph.

**NOTE:** The displayed graph is inverted when printed. The black background prints as white and any white text is printed black.
8 - Appendices

8.1 - Triggers and Data Collection

While logging data, the DDR-10 samples incoming data in 50-millisecond intervals over a 30-second time period, then the cycle repeats. This data is then averaged and stored on the data card. When a trigger is detected, discrete 50-millisecond data is saved to the data card. The amount of incoming data recorded and saved is determined by the trigger conditions you have set in the Configuration File.

The DDR-10 records and saves triggered data only in Full Power Mode. In the reduced power modes, the DDR-10 periodically wakes up and checks for triggers. Only the trigger on Auxiliary Voltage Channel 1 (V1) wakes up the DDR-10 from Low Power or Deep Sleep Mode. See the section “Mode Transition Conditions” for more information about the activities in the reduced power modes.

8.1.1 - Triggers in Full Power Mode

When a trigger occurs, the stored 50-millisecond data is saved to the data card, including data collected 30 seconds before and after the trigger. The 60-second total equals 1,200 records of 50-millisecond data.

\[ A = 30 \text{ seconds prior to trigger} \]
\[ B = \text{trigger point} \]
\[ C = 30 \text{ seconds after trigger; 60 seconds total, 1200 records} \]
\[ D = 30 \text{ seconds to save trigger data to card} \]
\[ E = \text{first 30-second interval after the trigger is saved, where } n = \text{ the number of seconds to the next 30-second interval (example: } n = 7 \text{ will result in a 7 second delay before the start of the next 30-second interval)} \]

*Trigger Timing in Full Power Mode with More Than 90 Seconds of Data*
The figure below details the trigger timing in Full Power Mode with more than 90 seconds since the last trigger.

A = seconds prior to trigger (<30 seconds)
B = trigger point
C = seconds after trigger (>30, <60 seconds), 60 seconds total (1200 records)
D = 30 seconds to save trigger data to card
E = first 30-second interval after trigger save, where “n” = number of seconds to next 30-second interval

Timing with <30 Seconds since Last Trigger or Full Power Transition

8.1.2 - Reduced Power Mode and Consecutive-Trigger Handling
When in Low Power or Deep Sleep Modes, the total trigger data storage time is still 60 seconds, but the length of time and quantity of data records stored after the event is relative to the amount of recorded data available prior to the event. Since no 50-millisecond records are available during reduced-power modes, no data will be available prior to the trigger while in these modes.

NOTE: This condition also occurs if there are consecutive triggers with no 50-millisecond of data available between.

A = seconds prior to trigger (<30 seconds)
B = trigger point
C = seconds after trigger (>30, <60 seconds), 60 seconds total (1200 records)
D = 30 seconds to save trigger data to card
E = first 30-second interval after trigger save, where “n” = number of seconds to next 30-second interval
## 8.2 - Approved Data Cards

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The DDR-10 / DAS Diagnostic System

PATENTS
The DDR-10 Electrical Diagnostic Data Recorder is made in the U.S.A. by Midtronics, Inc. and is protected by one or more of the following U.S. Patents: 4,816,768; 4,825,170; 4,881,038; 4,912,416; 5,572,136; 5,585,728; 5,592,093; 5,757,192; 5,821,756; 5,831,435; 5,914,605; 6,051,976; 6,091,245; 6,163,156; 6,249,124; 6,304,087; 6,310,481; 6,316,914; 6,323,650; 6,351,102; 6,359,441; 6,363,303; 6,392,414; 6,441,585; 6,445,158; 6,456,045; 6,469,511; 6,534,993; 6,544,078; 6,556,019; 6,566,883; 6,586,941; 6,707,303. Canadian Patents: 1,295,680; 1,280,164. United Kingdom Patent: 0,672,248; 0,417,173. German Patent: 693 25 388.6; 689 23 281.0-08; 93 21 638.6. And other U.S. and Foreign patents issued and pending. This product may utilize technology exclusively licensed to Midtronics, Inc. by Johnson Controls, Inc. and/or Motorola, Inc.

LIMITED WARRANTY
The DDR-10 is warranted to be free of defects in materials and workmanship for a period of one year from date of purchase. All accessories are warranted to be free of defects in materials and workmanship for a period of 90 days from date of purchase. Midtronics will, at our option, repair or replace the unit with a remanufactured unit. This limited warranty applies only to the DDR-10 and accessories, and does not cover any other equipment, static damage, water damage, over-voltage damage, dropping the unit, or damage resulting from extraneous causes including owner misuse. Midtronics is not liable for any incidental or consequential damages for breach of this warranty. The warranty is void if owner attempts to disassemble the unit or to modify the cable assembly.

SERVICE
To obtain service, contact Midtronics for a Return Authorization number, and return the unit to Midtronics freight prepaid, Attention: RA# _________. Midtronics will service the analyzer and reship the next scheduled business day following receipt, using the same type carrier and service as received. If Midtronics determines that the failure was caused by misuse, alteration, accident, or abnormal condition of operation or handling, purchaser will be billed for the repaired product and it will be returned freight prepaid with freight charges added to the invoice. Battery analyzers beyond the warranty period are subject to the repair charges in effect at that time. Optional remanufacturing service is available to return the tester to like-new condition. Out-of-warranty repairs will carry a 3-month warranty. Remanufactured units purchased from Midtronics are covered by a 6-month warranty.