



## PakTrakr® Display

Please read before installing.

**Thank you for purchasing your PakTrakr® Add-on Display from Woodward Aftermarket Components.**

We felt that the PakTrakr® could use a bigger display, so we have developed two models, both with 128 x 64 graphical LCD readouts. Our displays use transmissive and temperature compensated technologies that allow them to be used over a wide range of temperatures and lighting, including full daylight. The only difference between the two models is that one of them (PAK-DISP-SD-1) has an SD Card interface that allows you to collect data from your PakTrakr® without connecting a laptop to the serial port. The model that has the SD Card interface will collect data regardless of which PakTrakr® serial interface you have – the ES1 standard interface or the ES1R recording interface. The SD Card will collect data for several days (at least 40 with a 512MB card depending on battery configuration) and allow you to read the resulting file with Microsoft Excel or a similar spreadsheet using your favorite card reading hardware.

The displays re-configure themselves to suit your particular battery configuration. They will work on packs ranging from one single lithium cell up to forty eight lithium, 6V lead acid, or 12V batteries in a series configuration. Whatever your pack configuration, whatever serial interface you use, whether or not you have the optional PakTrakr® current sensor, our displays reconfigure themselves to reflect your particular arrangement. Because they are so versatile there are many different possible screen arrangements. We will discuss only a few of the most likely configurations here. Once you see how the display operates, you will be able to figure out your particular screen arrangement.

## Installation

Installation of our displays is very simple. Connect the red wire to a source of 12V accessory power, and the black wire to the vehicle ground. Plug the serial connector into the PakTrakr® ES1 or ES1R interface and you are finished. We recommend either connecting the display to a source of power that is switched on with the key, or putting a manual switch on the power line so that the display can be turned on and off as required. If it is on a manual switch you will be in a position to leave our display running (and therefore recording) during a charge cycle if you desire.

## The Screens

The first screen is the one depicted in Figure 1. It is a basic configuration with a six battery traction pack, and the PakTrakr® has the optional current sensor. The first thing to note is that this figure, as with all our examples shows data that is purely random data. It does not represent an actual battery pack.

First, in the top left corner of the display, you will see the pack State of Charge (SOC) represented. The pack in this example appears to be at 27% of its full charge. Notice that the horizontal bar graph below the “27%” is hollow. Any time the SOC drops below 50% the bar will become hollow. The further it drops the more hollow it becomes.



Figure 1

When it drops below 15% it will begin flashing. Below the pack SOC are the power graphs. We purposely placed the kilowatt bar graph next to the amperes bar graph. Normally the two graphs more or less track each other as you accelerate and slow down. In certain circumstances however, you may find that by lifting your foot slightly while climbing a hill or accelerating from a traffic light, you can actually reduce the amperes while maintaining or even gaining in kilowatt output to the traction system. This is

because when you lift your foot a little, you actually allow the pack voltage to climb (less sag) enough so that you are putting more power to the rear wheels while using less amps. This is a good thing.

In the center of the display are the battery graphs. Each bar graph represents the voltage of one of the traction batteries, and if you have hooked up your PakTrakr® according to their instructions then the batteries are numbered in ascending order starting with the battery closest to the most negative end of the string (Battery 1) and ending with the one closest to the positive end of the string (Battery 6 in this case). Any time that a battery drops below 10.6 volts, the bar for that battery will become hollow. Driving with batteries discharged enough to drop below 10.6 volts (even under load) may cause long term damage to the battery. If at all possible you should try to never see a hollow bar graph on a battery. If you do, try to lift your foot and drive less aggressively so that the battery stays above 10.6 volts. Below 10.6 volts there is risk of cell “reversal” which can destroy a battery very quickly. If the PakTrakr reports an error on one of the batteries, the display will alternate between showing the bar graph and showing the error above the battery in question. The errors reported are as follows:

1. WATER – the battery may need water.
2. BALANC – Pack Imbalance
3. FAILED – Battery is failing
4. MAINT - Maintenance required
5. DAMAGE - Damaged battery
6. OCHARG - Overcharging
7. DISCHG - Excessive discharge

Below the battery bar graphs is the temperature display in degrees Fahrenheit. This is the temperature at the PakTrakr® remote unit.

Down the right hand side of the display are listed the exact voltages on each of the batteries in the pack, with a pack total at the bottom.



**Figure 2**

The screen in Figure 2 has a little more on it. This depicts a seven battery traction system (84V) with the optional PakTrakr® current sensor installed. The display items are the same as were described for Figure 1, except that because of the number of batteries, now there are two remotes. PakTrakr® then sees the batteries as two “packs”, each with its own state of charge (SOC). In this case Pack 1 (which consists in this case of batteries one through five) is at 62% SOC, while Pack 2 (batteries six and seven) is at 56% SOC. Once again the kilowatts and amperes are tracking together, and now you can see seven bar graphs in the center. Each bar graph represents one of the batteries, and the bar graphs from left to right match the digital voltages down the right hand side of the display. Once again the total pack voltage is represented at the bottom right.

So you can see that our displays are very versatile and can reconfigure themselves to suit the configuration of your battery pack and PakTrakr® accessories. Depending on the configuration of your particular battery pack, the display may shift items around to make better use of space or to make them more readable. There are several different screen configurations built in to the displays.

## The SD Interface

One of our best accomplishments has been to build an SD Card interface into our PAK-DISP-SD-1 displays that allow you to collect data without the need to drag a laptop out to your vehicle and fumble with cables, protocols, USB to serial adapters and so on. The PakTrakr ES1R serial interface has a recording feature, but it can only record a few hours of data before it is full. Depending on how large your SD Card is, you could collect data for six months or more on a single SD Card with our display interface.



**Figure 3**

Figure 3 shows how easy it is to record data with our interface. Simply insert a card in the slot – simple... If our display sees a card in its slot it will record while it displays. If no card is present, it continues on without it. It simply couldn't be easier.

To read the data that you have collected, remove the card and stick it in a card reader on your desktop computer. On the card you will find a file called WAC00001.CSV, which is a standard comma separated data file in normal PakTrakr® format. If you have Microsoft Excel you can simply open the file in Excel by double clicking on the file. Note that it may take some time to read the file off the card if it has a lot of data on it. It is usually good practice to move the file off the card and onto your computer's hard drive before you begin to manipulate the data. To use the card again simply insert it into our display again. A new file will be created with a new number in the name and it will

begin recording. Any standard FAT16 or FAT32 formatted SD Card (2GB or less in size) that has space on it can be used. Our display will simply create the CSV file if required, even if there are other files on the disk. However, we take no responsibility for the loss of any data on the card. We recommend that you keep a designated card specifically for use with our display rather than using a card that has other valuable data on it.

The protocol format with which the data is recorded is explained in the PakTrakr® documentation that came with your ES1 or ES1R interface, and therefore we will not go into it here.

Thank you once again for purchasing our product. Here is our contact information should you need help with your installation or if you have questions or problems that need our assistance:

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### **Product Disclaimer:**

Vehicles modified by the addition of after market parts may not meet legal requirements for use on public roads. It is the responsibility of the customer to comply with Federal, State, Provincial and local laws prior to installation. Use or installation of Woodward Aftermarket Components parts may affect your insurance or warranty coverage. It is the customer's sole responsibility to comply with laws pertaining to aftermarket parts on public roads.

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