Pro-Trak Charger

Jon Tanner checks out one of the most exciting aids to battery charging he's come across yet!

THE PRO-TRAK is the most comprehensive charging/discharging package that I have ever come across. H.H.Systems have certainly gone to town with this one and it's hard to think of anything it can't do!

If this Delta Peak charger marks a new generation of home charges, what makes it so different?

The answer is that it can monitor the cells in a pack individually during the charge or discharge cycle. This means that you can check the performance of each cell in your pack and monitor how well each is performing. This in turn tells you how well the cells are matched - yes, I know that the better race packs are already matched (that's why they cost two or three times as much) but did you know that during use the performance of individual cells in a pack changes at differing rates?

What this means is that you can have a perfectly balanced pack that is performing really well and winning you races, but after a while its performance will drop off. The chances are that this is due to one (or more) cells becoming mis-matched. What we do with a pack like that is to throw it away! What in reality you have done is to put in the bin five really good cells and one bad one - what a waste. I won't go into the technical stuff about all this but it is important to understand that one bad cell in a pack will affect all the other cells by drawing on them. The net result is that this one bad cell pulls down the performance of the whole pack in such a way that you will think the whole pack is duff when it could be just one cell.

There is nothing new in what I have just said, the problem has been in being able to identify what is going on in a pack and this is where the Pro-Track comes into its own. This charger is capable of telling you exactly how each cell is performing during charge and discharge. This information tells you which cell to replace and while you are about it, how the replacement cell should perform to match the rest.

To use the Pro-Trak to its fullest extent of monitoring individual cells, a set of five fly leads plug into the charger via a DIN socket. These five coloured wires then have to be connected to the individual cells within the pack. This means modifying the pack by attaching flying leads to the bridging straps. This is a bit of a pain and you do need to be careful that these wires don't short out on each other - but it's worth it!

Now let's look at the charger itself. The Pro-Trak is well built using a plastic wedge shaped box that houses the extensive electronics. An aluminium plate supports a large heat sink at the back and the fluorescent yellow top plate displays a large LCD data screen and the number button pad that controls everything. On the right there are the heavy duty charging leads which are ready fitted with 'gold' 4mm banana-type plugs. The seven pin DIN socket for the fly leads sits here alongside the 25amp output fuse. On the left are the 12 volt power supply leads, which are fitted with crocodile clips - also here is a second DIN socket (5 pin this time so they can't be confused) which provides an interface to a printer and computer - more about this later!

Power up the Pro-Trak and you are first informed of the version you have, in the review case the:

Pro-Trak
Graph Ver 2.12

Next you are prompted to enter your PIN number, a nice touch this as it gives you some protection against anyone messing about with your charging sequence, it's a 7 figure number so there are 10,000,000 combinations! Once in the system there is the following message:

Simply the Best
0191 2521330

A bit of free advertising and there's no reason to forget H.H.Systems' telephone number!

Pushing any button then takes you straight into the Main Menu:

Charge
Discharge
Cycle
View
Print
Motor Test
Set-up

Two items are shown on the LCD screen at a time, the ° and # keys are used to scroll up and down the menu with the > sign highlighting the option ready to be selected. Pressing the '0' key selects the highlighted option and acts as the Enter/Start key. This procedure is common for all the options and so using the charger is surprisingly easy.

Now let's take a closer look at the options you can choose from.

Charge

Selecting Charge (by pushing the '0' key) gives the choice of a Soft Start or Quick Start. This is simply a choice of how fast you want the charger to reach its maximum set rate. Next you select the type of charge you want, the choices are:

Repulse Charge
Burp Charge
Soft Pulse
Linear Charge
Bump Start
Race Start
Tx Charge

With seven different charge types available to you, a full explanation of all these would fill this magazine so I'll limit the explanation to that used in the User Manual:

Repulse charging

Combination of Burp and Soft Pulse (Reduces any large crystal formation inside the cell).

The complete Pro-Trak set-up including the charger itself, the computer software for the PC and all leads and connections.

REPULSE CHARGING 7121094 05/08/1995
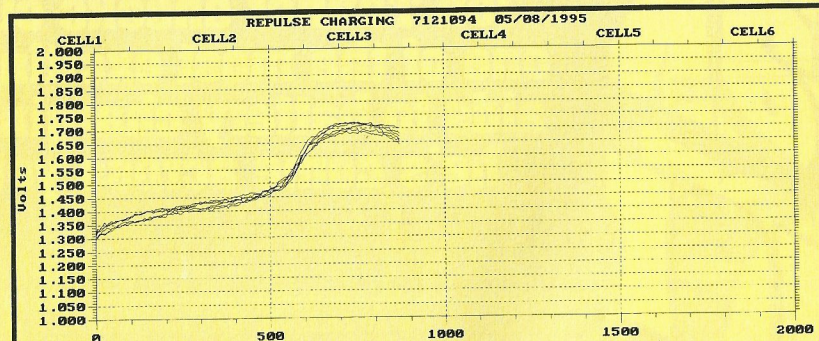
	Time	Volts	Peak	Fallback	Start	End	Capacity	Amps
Pack	836	10.00	10.25	0.25	7.73	10.00	928	4.40
Cell11	819	1.67	1.72	0.05	1.29	1.67	930	
Cell12	827	1.68	1.72	0.04	1.28	1.68	939	
Cell13	827	1.66	1.69	0.03	1.28	1.66	939	
Cell14	783	1.64	1.73	0.09	1.30	1.64	889	
Cell15	804	1.70	1.72	0.02	1.28	1.70	928	
Cell16	804	1.65	1.71	0.06	1.30	1.65	913	

DISCHARGING REVIEW 05/08/1995

	Time	Volts	Ave	Kjoules	Start	End	Capacity
Pack	176	5.91	6.35	27.02	7.16	5.91	977
Cell11	152	0.99	1.04	3.94	1.18	0.99	844
Cell12	181	1.00	1.07	4.01	1.20	1.00	1005
Cell13	176	1.00	1.07	4.67	1.21	1.00	977
Cell14	122	0.95	1.03	3.14	1.17	0.95	677
Cell15	178	1.00	1.08	4.76	1.21	1.00	988
Cell16	131	0.97	1.04	3.48	1.19	0.97	727

DISCHARGING REVIEW 05/08/1995

	Time	Volts	Ave	Kjoules	Start	End	Capacity
Pack	137	5.89	6.28	21.47	6.75	5.89	761
Cell11	118	0.98	1.03	3.84	1.13	0.98	655
Cell12	136	0.99	1.05	3.56	1.14	0.99	755
Cell13	135	0.99	1.06	3.56	1.14	0.99	750
Cell14	85	0.96	1.02	2.17	1.10	0.96	472
Cell15	154	1.00	1.07	4.09	1.15	1.00	855
Cell16	103	0.97	1.03	2.65	1.11	0.97	572

Burp Charging

Linear charge but includes a discharge pulse. (Reduces any large crystal formation inside the cell).

Soft Pulse

Linear charge but includes a rest period of 50 mS every 250mS.

Linear Charging

Constant current.

Bump Start

Charge for 1 minute. This is repeated 5 times then normal charge takes place. (To charge packs that peak early.)

Race start

Current ramped up quickly to 9 amps for 45 seconds. (Peak before race to give a good start off the line.) To be used at owners discretion.

Tx Charge

Will soft pulse charge at 2 amps for 2 minutes. To be used at owners discretion.

Once you have selected the one you want, pressing the 'O' key will start the selected charge at which point you are informed of the type of charge selected and the Delta value, (which has a default setting of 0.24). As the charge starts, you will hear a fan running which cools the charger - this is much more efficient than just relying on the heat sink.

While the charger is operating you have the option to view 11 data menus about the state of the pack - pressing button 4 gives you the following options:
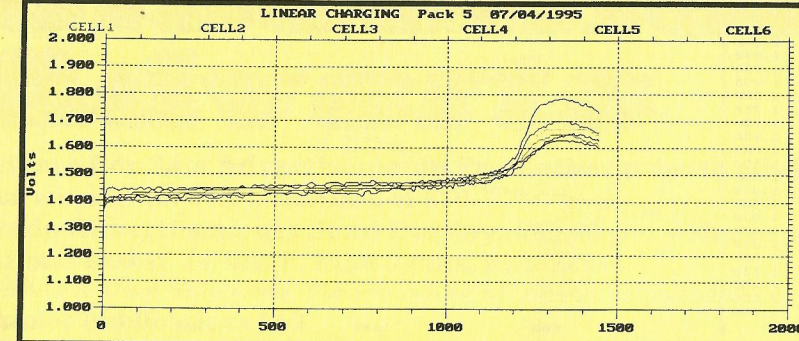
Time:	Run time charging /discharging.
Pack Volts:	Voltage of pack.
Peak Volts:	Peak voltage reached by pack.
Fallback:	Calculated fallback voltage of pack (peak minus end volts).
End Volts:	Voltage of pack at switch off.
S/Volts:	Voltage of pack 5 seconds after starting charge/discharge.
Ave Volts:	Average voltage of pack (discharge only).
Capacity:	Capacity of pack calculated at end of charge/discharge.
K/Joules:	K/Joules of pack calculated at end of discharge.
Cycles:	Number of cycles left to do.
Restart volts:	Programmed restart voltage.

If you are using the fly leads, you can monitor the state of each cell for each of the above data screens. Simply pressing the 'O' button gives you the selected data but in the individual cell format instead of the aggregate pack format. Pretty good eh, and simple to do!

Discharge

Select discharge and you are presented with the Cut-off Volts screen where you can set the point at which the discharge will cut off (by using the * and # keys). The discharge rate is default set at 20 amps.

The View Menu is available during discharge, as

is the data for individual cells. Accessing this data is the same whether you are charging or discharging.

LINEAR CHARGING Pack 5 07/04/1995

	Time	Volts	Peak	Fallback	Start	End	Capacity	Amps
Pack	1403	9.88	10.00	0.20	8.86	9.88	1593	4.50
Cell11	1360	1.60	1.68	0.08	1.06	1.60	1574	
Cell12	1362	1.61	1.65	0.04	1.34	1.61	1547	
Cell13	1363	1.66	1.70	0.04	1.34	1.66	1540	
Cell14	106	1.60	1.63	0.03	1.35	1.60	120	
Cell15	58	1.73	1.80	0.07	1.35	1.73	65	
Cell16	87	1.63	1.66	0.03	1.34	1.63	90	

This is one smart piece of equipment - there's almost more electrickery in there than there is in my PC!

Cycle

This gives you the option to cycle the pack with the option to set the following:

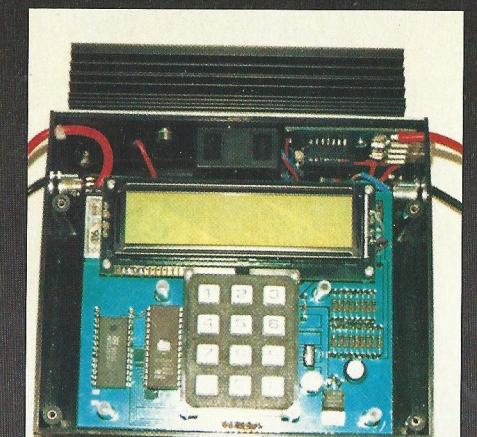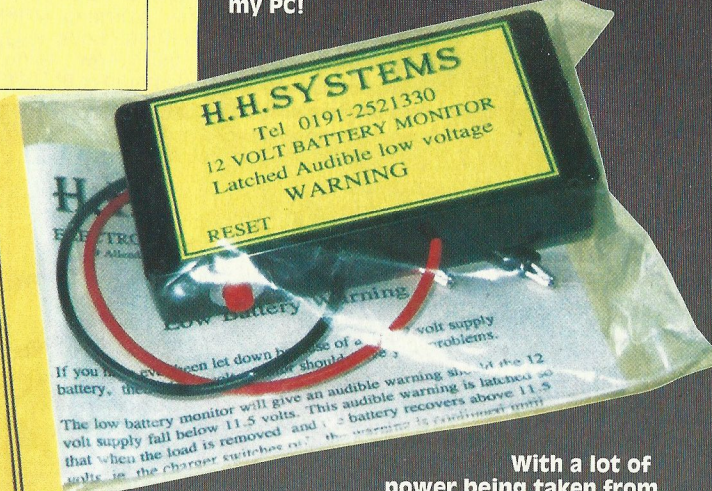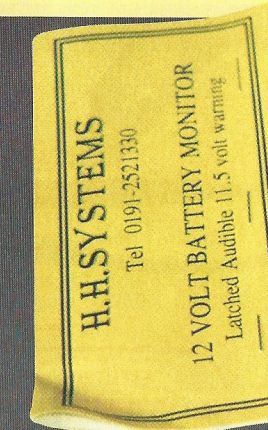|	
Set Cycles:	Number of cycles.
Recycle Time:	Time (in hours) between cycles.
Delta Peak of	This is the fallback voltage the pack, when the pack voltage has fallen by this amount charging will be stopped.
Repeat Time:	If a time of 5 minutes is entered, then the pack is charged, allowed to rest for 5 minutes then the pack is re-peaked before being discharged. (0-60 min. in 5 min increments.)
Re-peak Current:	By default set at 500mA above the set current but can be scrolled up or down.
Cut-off Volts:	This is the voltage the capacity of the pack is calculated at when being discharged.
Set Print Mode:	This tells PRO-Trak to print a report or individual cell label at the end of charge/discharge.
Charge Print?:	This tells PRO-TRAK whether to print charge data at the end of charge.
View:	This is in fact the same menu as mentioned above.

Print

I've hinted a couple of times about printing and now is the time to explain what is available in a little more detail. Included in the review Pro-Trax was the Graph Program V2.12 which is the software that allows the charger to communicate with a Personal Computer via a supplied interface lead.

The interface lead connects into a COM Port

With a lot of power being taken from your pitting 12volt battery, H.H. Designs' 12volt battery monitor is going to become more and more of a necessity!

DISCHARGING 05/08/1995

|	Time	Volts	Ave	Kjoules	Start	End	Capacity
Pack	107	5.90	6.27	16.74	6.87	5.90	594
Cell11	91	0.99	1.03	2.34	1.13	0.99	505
Cell12	118	1.00	1.05	2.98	1.14	0.99	622
Cell13	101	1.00	1.05	2.69	1.16	1.00	578
Cell14	63	0.95	1.01	1.60	1.12	0.95	350
Cell16	78	0.97	1.03	2.01	1.13	0.97	433

Discharge Complete

By using the PC link, it is possible to get a thoroughly accurate and graphic picture of the state of each cell in your pack.

using a 25 pin plug and the software is used via the floppy drive. The COM port on my PC uses the smaller socket and so a converter was needed.

A simple set of instructions are supplied which are easy to follow as long as you have a basic knowledge of computers.
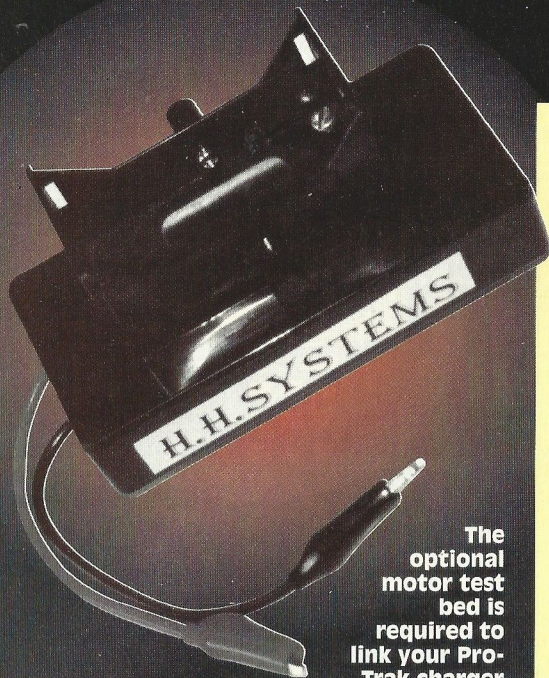
The optional motor test bed is required to link your Pro-Trak charger to the motor - this facility is very useful for running motors in.


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                LINEAR  CHARGING  REVIEW  05/08/1995
     CELL1      CELL2      CELL3      CELL4      CELL5      CELL6
2.000
1.950
1.900
1.850
1.800
1.750
1.700
1.650
1.600
1.550
Volts 1.500
1.450
1.400
1.350
1.300
1.250
1.200
1.150
1.100
1.050
1.000
        0         500        1000        1500        2000
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	Time	Volts	Peak	Fallback	Start	End	Capacity	Amps
Pack	1049	9.62	9.88	0.26	7.64	9.62	1191	4.50
Cell1	955	1.63	1.67	0.04	1.28	1.63	1084	
Cell2	1049	1.60	1.62	0.02	1.26	1.60	1191	
Cell3	957	1.57	1.63	0.06	1.27	1.57	1087	
Cell4	946	1.56	1.69	0.13	1.28	1.56	1193	
Cell5	957	1.64	1.66	0.02	1.26	1.64	1087	
Cell6	951	1.62	1.66	0.04	1.29	1.62	1151	

What this option provides is the ability to view on a computer screen graphs of the charge/discharge of the cells. Each of the six traces are colour coded with the vertical axis showing VOLTS and the horizontal as time (seconds). A table at the bottom displays the numeric values for Time, Volts, Peak, Fallback, Start, End, Capacity and Amps (charging).

At the end of the charge/discharge you can select the print option which prints out the display shown on the screen. To get the best from this you need a reasonable colour printer because the graph lines run very close to each other - in fact the closer they are, the better matched the cells are so a perfect pack will have six lines all on top of each other! You ideally need colour to pick out which line relates to which cell. I used a DeskJet 540 on a mono cartridge which produces good results but I didn't have a colour cartridge at the time so can't comment on the colour quality with this printer. The graphs supplied with the charger as examples appear to be printed on a colour ink jet and these are fine.

Motor Test

The charger includes this feature although to use it you will need the motor test bed from H.H.Systems. The motor you wish to test is fitted into the test bed and connected to the charger. Select the motor test function in the charger and the motor will be pulse run between levels. The levels can be overridden by the user but when
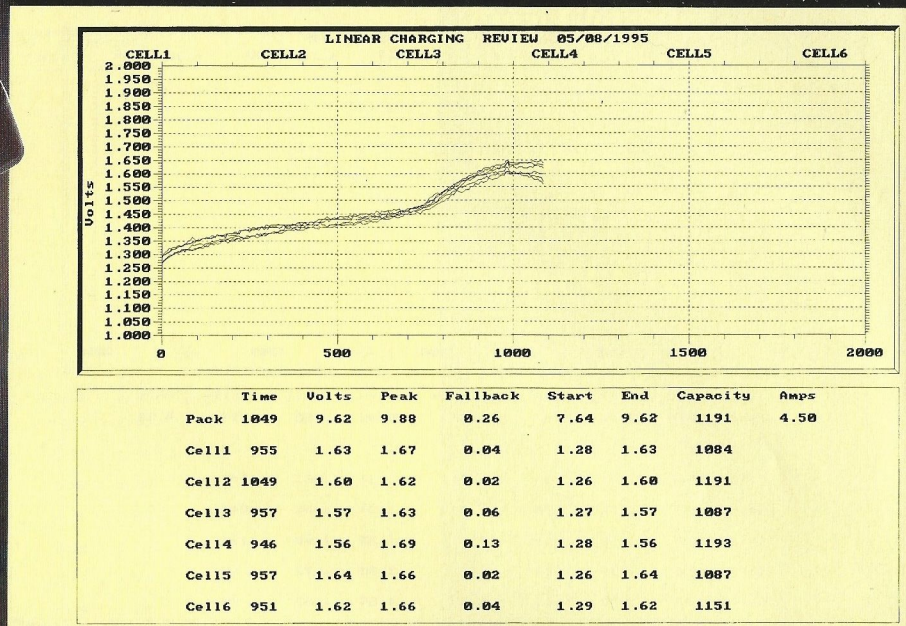
Quality is high and all the supplied connections are 'gold' plated for good conductivity.

left to its own programme it will run the motor at various speeds for 30 minutes. This feature is more to do with running in motors and brushes than testing the motor.

12volt Battery Monitor

Whilst this review was under way a new product from H.H.Systems arrived. This latest offering is a 12volt battery monitor which monitors the capacity of your 12 volt supply battery and so

Linking the unit to my PC was simply achieved via a DIN socket on the side of the charger.
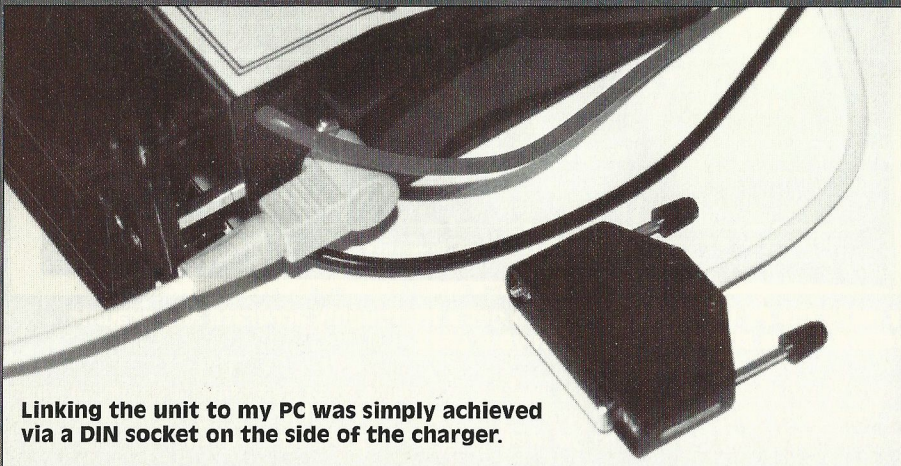
gives warning when its ability to charge racing packs is running low.

Summing up

As I said at the beginning this is a charger which really does bring to your home the ability to keep racing packs properly matched. I don't think it's a charger which will be used to its fullest extent at the race track. Having said that you do not have to use all the features so it performs two jobs, the one at the track (charging for the next race offering six types of pack charging plus a TX charge) and the monitoring/maintaining of packs in the workshop. For the person who is really serious about getting the very best performance from their cells the PRO-TRAK will give them what they've been looking for - individual cell monitoring.

If you are interested in this level of performance then it's definitely for you but be warned! You'll have to modify your packs, be prepared (and equipped) to reassemble packs, be prepared to keep careful records of cell performance (the label function assists with this) and above all have plenty of time!

All in all it's a very impressive and comprehensive charging and monitoring unit that is capable of giving the totally committed enthusiast quite an edge.