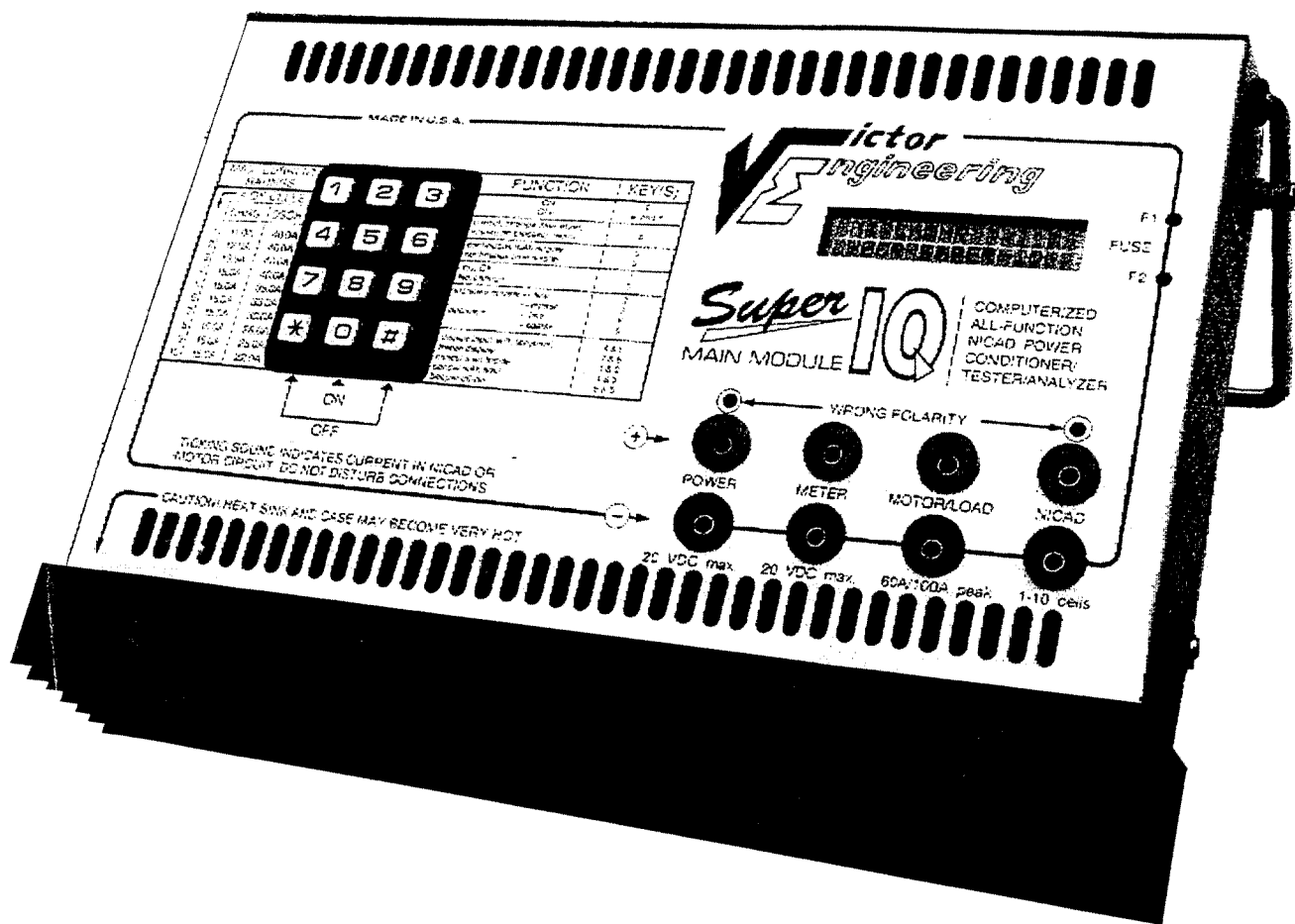


VICTOR ENGINEERING



SUPER-IQ USERS MANUAL

SUPER-IQ General Features and Specifications

- Zilog Z-80 (™ of Zilog Inc.) microcomputer based, software driven.
- 2 Independent solid state precision LINEAR constant current sources. One for charge and one for discharge and motor functions, fully programmable by internal software or from keypad. .1A resolution up to 40A continuous load and 100A limited duration load (the latter used only during specific battery or motor functions under software control only).
- Internal 4 1/2 digit DC A/D converter (Voltmeter) with solid state switch matrix performs all necessary voltage or current readings under software control. Also available for external use (using supplied leads).
- Built in Self-Test checks all other internal voltages and currents (verified by a high precision ultra-stable laser trimmed voltage reference chip). Continuous (every 3 tenths of a second) automatic self-test and self re-calibration keep current sources very accurate and stable throughout the duration of selected functions, virtually eliminating thermal drift (a problem common with other products).
- Internal Quartz crystal electronic timer automatically measures elapsed time during any selected function. The time can be continuously displayed and updated during selected functions along with other measurements.
- Digital Thermometer (optional Thermal-Probe required). Also available as external digital thermometer (1 deg. C resolution).
- Revisable Software (by changing EPROM).
- Protected against polarity reversals and shorts.
- EXPANDABLE. Thermal Probe, Super-Tuner commutator analyzer, IQX8 8-channel Multiplexer, and many other optional modules available.
- Optional TRACPAC ™ Computer (IBM P/C compatible) program allowing the retention of all cell/pack matching data in a virtually unlimited data base. Both charge and discharge measurements and graphs are retained for future comparison. Allows the user to write charge/discharge/matching scripts for any application. IQ-MATCH ™ program selects groups of cells by user specified parameters from the data base of previously graded cells and prints the identification numbers of cells which should be grouped together to form matched packs. Allows complete control of the SUPER-IQ from the P/C. Print graphs and cell matching/grading labels. Requires optional serial port.

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UNPACKING

The Victor SUPER-IQ comes in a sturdy box, surrounded by a flexible foam wrapper. Use this box to store the SUPER-IQ when you are not using the unit. A tough padded carrying case is also available. Remember, the SUPER-IQ is a delicate computerized instrument. Take good care of the SUPER-IQ and the SUPER-IQ will take good care of you.

Inside the box you should find:

1. (1) **SUPER-IQ.**
2. (1) Wire Set bag containing 4 sets of silicon insulated cables with connectors.
3. This Instruction Manual
4. The Registration Card.

Please fill out and return the registration as soon as possible. Send the registration card to:

VICTOR ENGINEERING
380 CAMINO DE ESTRELLA
SUITE 170
SAN CLEMENTE CA 92672

We would like to sincerely **THANK YOU** for purchasing one of our products.

If you have any questions or problems, feel free to give us a call. Our telephone number is 714/830-8483 We are open for business Monday - Friday 9 a.m. to 5 p.m. PST.

LIABILITY DISCLAIMER:

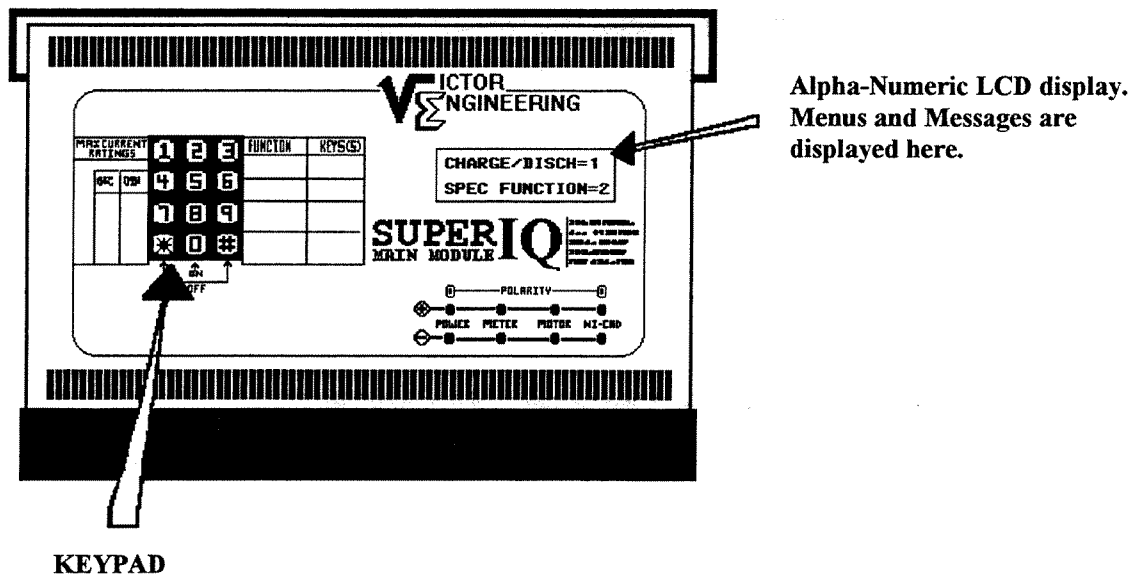
VICTOR ENGINEERING shall not be held responsible for any type of damage claimed to be the result of the use of any SUPER-IQ product.

BASICS

FACE PANEL

The Victor SUPER-IQ is a very powerful computer based Ni-Cad battery charging, motor conditioning system. The system is controlled through a series of easy to use and understand menus. Each menu contains choices or functions that may be performed. You respond to these menus by pressing numbers on the SUPER-IQ keypad.

For example, the first screen of the MAIN MENU is displayed below. It offers you two choices, to perform a charge/discharge function, or to perform a special function.



To choose a CHARGE or DISCHARGE function, press the ① key,
To choose a SPECIAL FUNCTION, press the ② key.

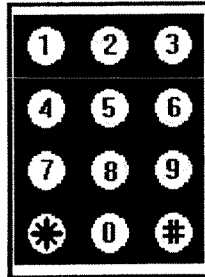
The next menu may then display more choices or parameters for the function selected. The SUPER-IQ will display the various parameters for each function. You may select the values for the parameters for each function selected. For example, If a charge function is picked, the SUPER-IQ will ask for the number of cells being charged and then the charge rate. You may charge from 1 to 10 cells and depending on the number of cells being charged you may charge them with up to 15 amps. For more information on menu selection refer to section C. Operation.

Please take the time to read the rest of this manual. Knowing how the SUPER-IQ functions will help you to use and enjoy the SUPER-IQ system. But most importantly it will help you get the most out of your batteries.

KEYPAD / KEY FUNCTIONS

The SUPER-IQ uses a telephone style keypad. The keypad has 10 numbered keys (① through ⑩) and the "*" and "#" keys. It is from the keypad that you will control the SUPER-IQ. When entering commands, press the key firmly, but not too hard. The SUPER-IQ will acknowledge each key pressed by a short beep.

VICTOR 12 KEY KEYPAD



Some keys have special meanings besides their numerical value used for parameter entry. These keys and key combinations are shown on the units FACE PANEL, just to the right of the KEYPAD. They are:

The ① key

The ① key has several functions. Primarily it turns the unit on. If the ① key is pressed when performing a function (charging/discharging, etc.) the "ABORT" menu will be displayed. This menu will vary depending on the function being performed, but basically, it will give you the option of aborting or continuing the function in process. If while entering parameters to a function, you decide you no longer want to perform that function, pressing ① on any "1=OK 2=CHANGE" screen will abort the current entry routine and return you to the MAIN MENU. The ① key will of course be used to enter various parameters. Be careful when entering data, pressing one too many zeroes will cause the function to be aborted, and the MAIN MENU will be displayed. Also, when a function completes and the results are being displayed, pressing the ① key will return you to the MAIN MENU. You DO NOT have to turn the unit off and on again. Repeated pressing of the ① key will always return the program to the MAIN MENU.

The ⑤ key

When charging or discharging, you have the option of displaying the elapsed-time, or mAh accepted/supplied. Pressing the ⑤ key will toggle the elapsed-time and mAh display. If the time is being displayed, pressing the ⑤ will cause the mAh to be displayed in place of the time. Pressing ⑤ again will return the time.

CHANGING THE AMPERAGE DURING CHARGE OR DISCHARGE

The Charge/Discharge amperage may be changed in any CHARGE, DISCHARGE, CYCLE or TRICKLE CHARGE function, except in the AUTO-TRICKLE charge after charge function and during FULL TEST / GRADING functions.

- To *Increase* the charge rate in tenths of an amp, press the ② key.
- To *Increase* the charge rate by whole amps, press the ③ key.
- To *Decrease* the charge rate by tenths of an amp, press the ⑧ key.
- To *Decrease* the charge rate by whole amps, press the ⑨ key.

KEY COMBINATIONS

The ① & ② keys

Pressing and holding the ① & ② keys simultaneously, will cancel the auto-trickle charge function. This is only valid when performing a charge function. Many of the charge functions performed on the SUPER-IQ will fall into auto-trickle charge mode after the normal charge is completed. To use the option properly, wait until the charge has begun. Then press the ① & ② keys. The SUPER-IQ will respond with a **"TRICKLE CHARGE CANCELED"** confirmation screen. Then after the normal charge is completed, the SUPER-IQ will not fall into trickle charge mode. This function is especially useful when charging SCE cells.

The ① & ③ keys

Pressing and holding the ① & ③ keys simultaneously, will cancel the mAh limit. The mAh limit is set to 3400mAh for Ni-Cad Sub-C size cells, and 1000 mAh for AA sized cells. If a cell isn't charged after absorbing 3400mAh, it probably isn't going to charge. If this happens, the SUPER-IQ will respond with a **"mAh LIMIT EXCEEDED"** screen. This screen will give you the option of continuing, or aborting the current function. This normally only happens when grading cells. We have had cells which could not be charged. This option must be used when working with "D" cells or paralleled batteries.

The ④ & ⑤ keys

Pressing and holding the ④ & ⑤ keys simultaneously, will display the input voltage. This may be done anytime. The SUPER-IQ will display **"PWR VOLTS=XX.XXV"**. Where XX.XX is equal to the current input voltage. Note: Pressing the ④ & ⑤ key will cause the time/mAh toggle to occur as well. (whenever the ⑤ key is pressed, the time/mAh toggle occurs).

The ⑤ & ⑥ keys

Pressing the ⑤ & ⑥ keys simultaneously will toggle the beeper/ticking option. The SUPER-IQ beeper will tick continuously when performing a function. Pressing the ⑤ & ⑥ keys simultaneously will turn the ticking off, or if it is already off, will turn the ticking back on.

The ⑦ & ⑧ keys

Pressing and holding the ⑦ & ⑧ keys simultaneously, will freeze the display as long as the keys remain pressed. The readings on the screen being frozen may change, but the current screen will continue to be displayed. (It will not scroll to the next screen. See the DISPLAY section for more information).

DISPLAY

The screen shown below is displayed when the SUPER-IQ is initially powered-on.

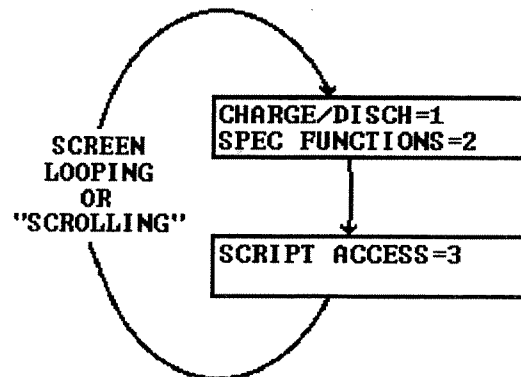
**HI CHAMP ! I'M
YOUR SUPER-IQ**

The SUPER-IQ uses a two line screen. Each line contains 16 characters. This gives the SUPER-IQ the ability to display up to 32 characters on the screen at a time. Because the screen area is limited, the SUPER-IQ employs two methods to get more out of the screen. Words displayed on the screen are frequently abbreviated and the SUPER-IQ will use multi-screen menus. In this case the menu will scroll from one screen to the next. The first screen will be displayed for a few seconds, then the next screen is displayed. Depending on the option selected the SUPER-IQ may display as many as four screens of data or options. To stop (freeze) the screen at any time, press the ⑦ & ⑧ keys simultaneously and hold them down. As long as the keys are held down, the screen will stay frozen. As soon as the keys are released, the display will continue to scroll through the screens.

**CHARGE= 1 DISCH=2
CYCLE=3**

Some menus will wait for a response. The Charge, Discharge, Cycle menu shown above will wait for you to enter a 1, 2, or 3 (or 0 to return back to the Main Menu).

The MAIN MENU consists of two screens. The first screen is displayed for a second or two, then the second screen is displayed for a second or two, and then the first again. This operation is known as "SCROLLING" through the screens. You may enter the function at any time. It doesn't matter which screen is currently being displayed, just enter the number of the function you would like to perform.



NOTE: We have omitted the explanations of many of the screens displayed in this manual. The screens will be listed in the order that they appear within the function you are reviewing. A complete explanation for all of these screens is available in Appendix-A. Each screen is displayed and explained in detail. Screens that are only used by one or two functions will be documented within that function. We could not include all of this text in with every function. If we had this manual would be bigger than the SUPER-IQ.

ABORTING PEAK CHARGE.

The Screens shown below assume that a CHARGE function is in process. The ABORT screens offer the same basic options no matter which function is currently in process.

If the ⓪ key is pressed before the actual charge is started, the screen to the right is displayed. It offers you two choices, to return to the MAIN MENU or to REPEAT the last function.

MENU=0 REPEAT SAME=1

If the ⓪ key is pressed after the actual charge is started, the ABORT / CONTINUE screen is displayed, (the function continues).

CHARGING PXX.XXA ABORT=0 CONTNU=1
--

If the ⓪ key is pressed after the function completes, a options screen is displayed. The screen shown to the right is displayed if the ⓪ key is pressed following a CHARGE function.

MENU=0	SAME=1
TRICKLE=2	PEAK=3

APPENDIX B

HI-IQ JR. ERROR MESSAGES

IF THE BATTERY BECOMES DISCONNECTED

If the Battery becomes disconnected or the contact isn't good, the following screens are displayed. Fix the problem and press the ① key to resume the function.

NO NICAD CURRENT
NOT CONNECTED OR

BAD CONTACT
CORRECT PROBLEM

THEN PRESS 1 KEY

IF THE THERMAL PROBE IS NOT CONNECTED

The THERMAL-MODULE must be plugged into the HI-IQ JR. and switched on. The THERMAL-PROBE sensor must also be connected to the battery. If the HI-IQ JR. senses that the thermal module is not plugged in, or it is not connected to the battery, the CONNECT THERMAL MODULE screens are displayed. Reconnect the thermal module, or probe and press the ① key.

CONNECT THERMAL
MODULE TO METER

THEN PRESS KEY 1

IF METER LEADS ARE NOT CONNECTED

The HI-IQ JR. uses "REMOTE VOLTAGE SENSING". This gives the HI-IQ JR. the most accurate voltage readings. If the HI-IQ JR. senses that the METER leads are not connected, the screens to the right are displayed. Attach the METER leads to the battery and press the ① key. If you press the ② key, the HI-IQ JR. will take the readings internally. Internal readings are not as accurate due to the voltage loss on the wires.

CUTOFF VOLTAGE
ACURACY REQUIRD?

YES=1 NO=2

IF POWER IS DISCONNECTED OR LOST.

If the power source becomes disconnected, or loses output the power lost screens are displayed. Restore the power and press the ① key.

POWER LOST

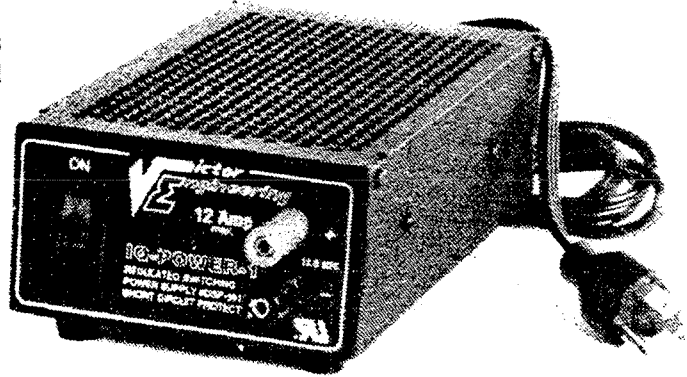
NOT CONNECTED OR
BAD CONTACT

CORRECT PROBLEM
THEN PRESS KEY 1

THE POWER CONNECTION

The SUPER-IQ is computerized and as such it requires reasonably clean, smooth power. If you are uncertain about the quality of your power supply or if you experience any deviation from the normal operation of your SUPER-IQ, use a capacitor (see below). Remember that the SUPER-IQ draws .5A to support its own operation.

Victor Engineering's IQ-POWER-1 is suitable power source, however any well filtered DC power supply regulated at a minimum of 13.8V and a maximum of 19.8V will serve the purpose.



A car or motorcycle battery can also be used, but the voltage will not be high enough to maintain current at a constant rate when charging 7 or 8 cell packs. The POWER VOLTS LOW message will be flashed every 10 seconds.

However the charging process will continue until completed. The pack will peak even though the current will start to slowly decay as soon as the voltage across the pack approaches levels over 11 volts. Using a car battery charger or any other type of unregulated power source is NOT recommended, however one can be used if the following precautions are taken:

- Always have a minimum 4700 uF / 25V capacitor (available at your local Radio Shack) connected to its output (make sure to observe polarity).
- Do NOT leave the instrument unattended. Unpredictable results may be experienced due to random data loss caused by the unregulated and unfiltered power source. Even some expensive power supplies do not have their outputs filtered well enough and may require the above capacitor.

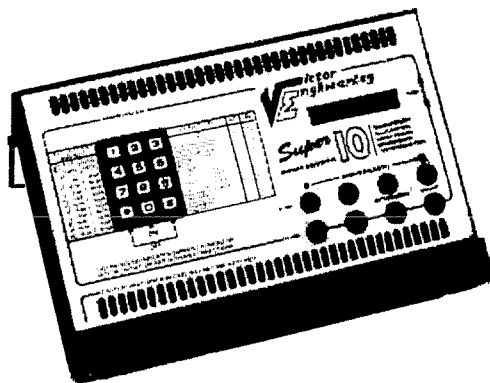
When connecting leads to the designated jacks, make sure to connect them to the SUPER-IQ first. This will help to prevent shorts and reduce the fire hazard connected with subsequent arcing. Use only the leads supplied with the unit. Should you need longer leads, consult us to prevent malfunction and fire hazard. When discharging at rates above 25 Amps use the included heavy, short test leads. Connect the NEGATIVE to NICAD NEGATIVE (-), connect the POSITIVE TO MOTOR NEGATIVE (-). Yes, the above connections are correct. As a matter of fact, it is a good idea to always connect the leads this way when discharging cells or packs, when charging cells or packs and even when high charge / discharge rates are not used. This configuration gives the lowest resistance path thru the unit, making all readings more accurate and generating less heat.

When accuracy of DISCHARGE (or any other battery function) is required, connect a set of test leads to the METER jacks on the SUPER-IQ. Hook the alligator clips as close as possible to the terminals of the cells. This is called REMOTE VOLTAGE SENSING. The SUPER-IQ will know if the meter is not connected and will ask "VOLTAGE ACCURACY REQUIRED ?". Should you choose NO, the SUPER-IQ will take the voltage measurements internally. Internal readings are less accurate due to the voltage drop on the leads.

CAUTION: Care must be taken not to connect the sense leads to the MOTOR jacks instead of the METER jacks. This will cause damage to the circuit board of the unit as soon as the next discharge cycle starts. This is the ONLY known operator error in wiring that can damage the unit. Should this happen, call us and we can give you instructions on an easy emergency repair that you can do yourself.

THE CARRYING HANDLE

The carrying handle also serves as a slant stand when flipped all the way back. The slanted position is very important when the unit is in use for two reasons;



1. To keep the heat sink on it's edge which maximizes the air flow around the heat sink.
2. It gives the ideal angle of the face plate, making the screen easier to read.

TEMPERATURE SELF-MONITORING

The SUPER-IQ has the ability to sense the temperature of the its heat-sink. If the temperature of the heat-sink reaches 100 degrees Celsius the screen below is displayed.

The TEMPERATURE ALARM Screen

USE COOLING FAN
C---T-----H

Where: C=Cool T=Current temperature H=Hot

This screen will be flashed every 10 seconds (the internal beeper will also sound). THIS DOES NOT MEAN THAT THE FUNCTION IN PROCESS HAS BEEN INTERRUPTED, IT HAS NOT. The bottom line of the screen represents a temperature gauge, the span of the gauge is approx. 25 degrees Celsius. The function in process will not be interrupted until the T (Temperature) reaches the H (Hot) limit. If a cooling fan is placed so that it blows across the right hand side of the heat sink the unit will begin to cool long before the function in process would be interrupted. Under normal operating circumstances the temperature alarm screen will never be displayed. Even if it is, most functions will complete on their own before the temperature reaches the H limit. A cooling fan is suggested if you will be charging/discharging several cells/packs back to back at a high rate

OPERATION

INITIAL POWER-ON.

To power on the SUPER-IQ, connect the unit to a power source (see the power connections section), and press the **Ⓢ** key. The unit should power on and display one of the GREETING screens shown below. The GREETING screen will display for about 2 seconds.

The SUPER-IQ GREETING screen

**HI CHAMP ? I'M
YOUR SUPER-IQ**

The GREETING screen with IQX8 8-Channel Multiplexer installed

**HI CHAMP ?
I'M IQX8**

If you have the IQX8 8-channel Multiplexer installed the Configuration Screen will be displayed next. The configuration check screen is displayed while the SUPER-IQ checks what devices are attached.

**CONFIGURATION
CHECK...**

The MAIN MENU ACCESS screen is displayed to remind you that you can return to the MAIN MENU by pressing the **Ⓢ** key at any time.

**MAIN MENU ACCESS
BY Ⓢ AT ANY TIME**

The MAIN MENU consists of two screens. The first screen is displayed for a second or two, then the second screen is displayed, then the first again. This operation is known as "SCROLLING" through the screens. You may enter the function at any time. It doesn't matter which screen is currently being displayed, just enter the number of the function you would like to perform.

**CHARGE/DISCH=1
SPEC FUNCTIONS=2**

SCRIPT ACCESS=3

1. The Charge/Discharge option will lead you to most of the normal charge and discharge functions, but not all of them.
2. The Special Functions option will lead you to the test and utilities menus. The Tests menu contains options to test batteries/motors/speed controls, and perform grading. The Utilities menu contains options to allow you to use a Digital Volt Meter, Stopwatch, and/or Thermometer.
3. The Script Access option will allow you to program one to five custom programs or macro-programs and execute them by a single keystroke from that point on. These scripts or macros are stored in a power-down (permanent) memory and remain there until you edit or reprogram them.

"PEAK" CHARGE

Lets start with the Main Menu screen.

The MAIN MENU screens

**CHARGE/DISCH=1
SPEC FUNCTIONS=2**

SCRIPT ACCESS=3

- To select a CHARGE or DISCHARGE function, press the ① key.
- To select a SPECIAL FUNCTION, press the ② key.
- To select a SCRIPT ACCESS function, press the ③ key.

We want to perform a peak charge, press the ① key. The unit will display the charge / discharge / cycle menu.

The CHARGE/DISCHARGE/CYCLE screen

**CHARGE=1 DISCH=2
CYCLE=3**

There are three options on this screen, display the CHARGE menu, display the DISCHARGE menu, or display the CYCLE menu.

- To select a CHARGE function, press the ① key.
- To select a DISCHARGE function, press the ② key.
- To select a CYCLE function, press the ③ key.

We want to perform a peak charge, press the ① key.
The Type of Charge screens are displayed.

As you can see, there are six different types of charges to choose from. We must now pick the type of charge to perform. Press the ① key to select the "PEAKED" charge.

**PEAKED=1 TIMED=2
TRKL=3 THERMAL=4**

**VOLTAGE PULL=5
LINFLEX=6**

The options chosen so far are,

From the MAIN MENU

**CHARGE/DISCH=1
SPEC FUNCTIONS=2**

SCRIPT ACCESS=3

From the CHARGE/DISCHARGE/CYCLE menu

**CHARGE=1 DISCH=2
CYCLE=3**

From the CHARGE menu

**PEAKED=1 TIMED=2
TRKL=3 THERMAL=4**

**VOLTAGE PULL=5
LINFLEX=6**

"PEAK" CHARGE

When a PEAK CHARGE is selected, the SUPER-IQ will display the Type of Cell Screen.

If you are charging C or D cells, press the ① key,
otherwise to charge AA cells, press the ② key.

**C OR D CELL=1
AA OR OTHER=2**

The SUPER-IQ will display the Number of Cells to Charge Screen.

If you are charging a six cell pack, press the ① key.
Otherwise to change the number of cells to charge,
press the ② key.

**NMBR OF CELLS=6
OK=1 CHANGE=2**

If the ② key was pressed, the number of cells screen is
displayed again with the number of cells to charge
empty. You must enter the number of cells you are
charging. You must enter two digits. If your pack contains less than ten cells, you must enter a leading
zero. If you are charging a four cell pack, enter 04. If you are charging a seven cell pack, enter 07. If you
enter an invalid amount, the SUPER-IQ will "BEEP" and redisplay the "Number of Cells" screen. This
will continue until you enter a valid number of cells. The SUPER-IQ will then display the Number of
Cells screen again. But now it is updated to the number of cells you entered.

**NMBR OF CELLS=____
ENTR 1 TO 10 MAX**

If the number of cells is now correct, press the ① key,
Otherwise, Press the ② key to repeat the process.

**NMBR OF CELLS= 07
OK=1 CHANGE=2**

The SUPER-IQ will now display the CHARGE RATE
screen. You may accept the charge rate displayed, or
change the charge rate. To accept the charge rate
displayed, press the ① key. To change the charge rate displayed, press the ② key.

**CHRG RATE= 3.8A
OK=1 CHANGE=2**

If the ② key is pressed, the "Enter the Charge Rate"
screen is displayed. If the charge rate is less than 10
amps, you must enter a leading zero. For example, to
charge at 5 amps, enter 050. The SUPER-IQ will see this as 05.0 Amps, or 5.0 amps. To charge at 1/2
amp, enter 005, the SUPER-IQ will see this as 00.5 Amps. This screen shows the range of charge rates
available for the number of cells being charged. The range will vary depending on the number of cells
being charged. Enter a charge rate in the range (00.1 to 15.0 amps in this example) shown on the
screen. When a valid charge rate is entered, the SUPER-IQ will re-display the charge rate screen.

**CHRG RATE= ____A
ENTR 00.1 - 15.0**

The screen is now updated to the charge rate you
entered. Press ① to accept the charge rate, or press ②
to re-enter the charge rate. We are not and do not
pretend to be battery experts but we have compiled a fair amount of statistics on battery charging. We
charge our SCE's at 3.5 to 4.5 Amps, our 1400 SCR's at 6 to 8 Amps, and our 1700 SCR's at 4 to 6
Amps. When the charge rate is accepted, the SUPER-IQ will begin the charging process. The charge
process will continue until the cell/pack being charged peaks.

**CHRG RATE= 4.5A
OK=1 CHANGE=2**

"PEAK" CHARGE

The charge may be aborted by pressing the ① key. The Cancel-Trickle (① and ② keys), Cancel-mAh-Limit (① and ③ keys), and the current increase/decrease keys may also be used.

- To *INCREASE* the charge rate in tenths of an amp, press (and hold) the ② key. Be careful, The SUPER-IQ will display the charge rate, and then begin to increment the rate (in tenths of an amp) rather quickly. Release the ② key when the rate you want is displayed. If you hold the key too long, use the ③ key to decrease the charge rate (see below).
- To *INCREASE* the charge rate by whole amps, press/hold the ③ key.
- To *DECREASE* the charge rate by tenths of an amp, press/hold the ② key.
- To *DECREASE* the charge rate by whole amps, press/hold the ③ key.

While the charge is in process, the CHARGING screen is displayed. Either the elapsed-time or mAh's accepted charge screen is displayed, depending on the option selected. (see the "5" key in keypad options above). Both screens display the number of

Amps the cell/pack is being charged at (@XX.XXA), and the current voltage of the cell/pack (XX.XXV). The time charge screen displays the elapsed time of the charge (HH:MM:SS), while the mAh charge screen displays the number of mAh accepted (XXXXmAh).

CHARGING @XX.XXA
HH:MM:SS XX.XXV

CHARGING @XX.XXA
XXXXmAh XX.XXV

When the CHARGE process completes, the following screens are displayed.

The first screen shows the voltage that the cell/pack peaked at and the current voltage.

PEAKED AT XX.XXV
OFF CHRG: XX.XXV

The second screen shows the elapsed time of the charge and the mAh accepted.

CHRG TIME XXmXXs
ACCEPTED XXXXmAh

The third screen shows that the auto-trickle charge has been invoked. The trickle charge screen displays the trickle charge voltage, elapsed time (of the trickle charge) and current cell/pack voltage. This screen will not be displayed if the auto-trickle charge has been canceled.

TRICKL CHRG@.XXA
HH:MM:SS XX.XXV

The last screen gives you your current options. Press the ① key to return to the MAIN MENU, press the ① key to repeat the last function, press the ② key to enter trickle charge mode or press the ③ key to peak the cell/pack.

MENU=0	SAME=1
TRICKLE=2	PEAK=3

"TIMED" CHARGE

The Highlighted options below show how to select a TIMED charge. A timed charge is exactly what it says. The SUPER-IQ will charge the battery for a specified length of time. Please note the SUPER-IQ will NOT STOP charging when the battery peaks.

From the MAIN MENU

CHARGE/DISCH=1
SPEC FUNCTIONS=2

SCRIPT ACCESS=3

From the CHARGE/DISCHARGE/CYCLE menu

CHARGE=1 DISCH=2
CYCLE=3

From the CHARGE menu.

PEAKED=1 TIMED=2
TRKL=3 THERMAL=4

VOLTAGE PULL=5
LINFLEX=6

The following screens are displayed in the order shown. If you require more information on how to use these screens, please refer to Appendix A.

The Type of Cell screen

C OR D CELL=1
AA OR OTHER=2

The Number of Cells screen

NMBR OF CELLS=6
OK=1 CHANGE=2

The Charge Rate screen

CHRG RATE= 3.8A
OK=1 CHANGE=2

The TIME LIMIT screen. Enter the amount of minutes and seconds you want to charge for. If you are charging for less than 10 minutes, you must enter a

leading zero. Ex. to charge for 5 minutes, enter 0500, the SUPER-IQ will see this as 05 minutes, 00 seconds. To charge for 7.5 minutes, enter 0730, the SUPER-IQ will see this as 07 minutes, 30 seconds.

ENTER TIME LIMIT
__MIN:__SEC

After you enter the time, the TIME LIMIT the screen is displayed again. The screen has been updated to show the amount of time you entered. If the time is correct, press the ① key, otherwise press the ② key to repeat the process.

OK=1 CHANGE=2
10MIN:00SEC

The CHARGING Screens will be displayed while the charge is in process. When the CHARGE process completes, the CHARGE COMPLETED screens are displayed. See Appendix A for a complete description of these screens.

"TRICKLE" CHARGE

The Highlighted options below show how to select a TRICKLE charge.

From the MAIN MENU

CHARGE/DISCH=1
SPEC FUNCTIONS=2

SCRIPT ACCESS=3

From the CHARGE/DISCHARGE/CYCLE menu

CHARGE=1 DISCH=2
CYCLE=3

From the CHARGE menu

PEAKED=1 TIMED=2
TRRL=3 THERMAL=4

VOLTAGE PULL=5
LINFLEX=6

The following screens are displayed in the order shown. If you require more information on how to use these screens, please refer to Appendix A.

The Type of Cell screen

C OR D CELL=1
AA OR OTHER=2

The Number of Cells screen

NMBR OF CELLS=6
OK=1 CHANGE=2

The Charge rate is automatically set to 100mA. The SUPER-IQ will now enter TRICKLE CHARGE mode. The CHARGING Screens are displayed while the charge is in process. When the CHARGE process completes, the CHARGE COMPLETED screens are displayed. See Appendix A for a complete description of these screens.

"THERMAL PUSH" CHARGE (requires Thermal-Probe)

The Highlighted options below show how to select a THERMAL PUSH charge.

From the MAIN MENU

CHARGE/DISCH=1
SPEC FUNCTIONS=2

SCRIPT ACCESS=3

From the
CHARGE/DISCHARGE/CYCLE menu

CHARGE=1 DISCH=2
CYCLE=3

From the CHARGE menu

PEAKED=1 TIMED=2
TRKL=3 **THERMAL=4**

VOLTAGE PULL=5
LINFLEX=6

The THERMAL PUSH CHARGE is a more narrowly specified type of a THERMAL CUT-OFF CHARGE in which a NICAD cell or pack is "Pushed" BEYOND the VOLTAGE PEAK by a controlled margin defined by a selectable cut-off temperature. The thermal-probe plugs directly into the METER jacks of the SUPER-IQ. There is only one way the module will fit, this is with the DECAL FACING TO THE LEFT. The probe is connected to the module by a two-prong plug. The wider prong marked (+) is closer to the switch. The end of the wire loop is the ONLY temperature sensing area. Make sure this end is in good contact with the battery. When using "Saddle" packs, insert the end of the probe between the cells. With regular packs insert the probe wire into the shrink wrap. For single cells use tape that can withstand 60 degree Celsius heat (3M Magic tape works) to attach the probe end. ALWAYS REMEMBER TO TURN THE SWITCH ON BEFORE THERMAL CHARGE AND OFF WHEN FINISHED. If the SUPER-IQ senses that the thermal module is not plugged in, or it is not connected to the battery, the CONNECT THERMAL MODULE screens are displayed (see Appendix B - Error Messages for a complete explanation). The following screens are displayed in the order shown. If you require more information on how to use these screens, please refer to Appendix A.

The Type of Cell screen

C OR D CELL=1
AA OR OTHER=2

The Number of Cells screen

NMBR OF CELLS=6
OK=1 CHANGE=2

The CHARGE CUTOFF TEMPERATURE screen is displayed with a default cut-off temperature of 45 degrees Celsius. Press the ① key to accept the default temperature, or press the ② key to override. If the ② key is pressed, you must enter the temperature to stop charging at. Enter a Celsius temperature between 00 and 99 degrees. When a valid temperature is entered, the CHARGE CUTOFF TEMPERATURE screen is displayed again. The screen has been updated to the temperature you entered. Press the ① key to accept the new temperature, or press the ② key to repeat the process.

CHRG CUTOFF 45 °C
OK=1 CHANGE=2

CHRG CUTOFF 0__ °C
ENTER 00 TO 99

CHRG CUTOFF 45 °C
OK=1 CHANGE=2

The CHARGE RATE screen. The user may accept the default charge rate of 3.8 amps, or may override the charge rate. See appendix A for a complete explanation.

CHRG RATE= 3.8A
OK=1 CHANGE=2

"PUSH" CHARGES AVAILABLE IN THE SUPER-IQ

"PUSH CHARGING" is the act in which a NICAD cell or pack is "Pushed" (charged) BEYOND the VOLTAGE PEAK by a determined margin. This elevates the temperature of the pack without the abusive and less effective multiple recharging at high current rates (see "PUSHING WITH PEAK CHARGING" below). The elevated temperature increases the average discharge voltage and often the capacity of the battery. This is equivalent to more "Horsepower". There are two types of "PUSH" charges available to the SUPER-IQ user. These are THERMAL - PUSH CHARGING and VOLTAGE PULL - PUSH CHARGING. To understand "PUSH" charging you must first understand a little about batteries. The battery charges in three stages. In stage-1 the electric energy is mainly consumed for the conversion of active material in the electrode into a chargeable form. In stage-2 charging is carried out in the near ideal state with almost all of the input energy used for the conversion of active materials. In stage-3 the cell approaches the state of full charge. As the cell enters overcharge the input energy is used for generation of oxygen gas. This reaction is what produces the heat. It is noted that there is a decrease in the cell capacity if the temperature reaches higher than desired levels, due to a fall in potential for oxygen gas generation at the positive electrode. As the temperature of the cell climbs there is a decrease in internal resistance (that's why the charge voltage drops after the peak) as well as in oxygen gas generation potential. The heat decreases the internal resistance allowing the power stored in the cell to get out easier, meaning there is a lower voltage drop at any given current load.

The THERMAL PUSH CHARGE

The thermal push charge uses the thermal heat probe to overcharge a battery to a specified temperature. Using a thermal cut-off while push charging is the most logical termination of the process, since the reason for pushing a NICAD battery is to reach a predetermined temperature higher than that reached by normal peak charging. The thermal push charge requires the optional thermal-probe. If you don't have the thermal-probe use the voltage push charge.

The VOLTAGE PUSH CHARGE

The voltage push charge overcharges a battery till it peaks and then drops a specified amount of volts. The voltage-pull or voltage-push charge reaches an elevated temperature the same as a thermal charge. But the voltage push charge is not as accurate. This is because different cells will reach different temperatures at the same cut-off voltage drop. The cell temperature will also vary with ambient temperature.

PUSHING WITH PEAK CHARGING

Regular peak charge should ONLY be used when "Pushing" is NOT the objective. As stated above the reason for pushing a pack is to get the pack warm or slightly hot. The elevated temperature can be reached by using normal peak charging. To do this however requires the use of abusive charge rates and multiple re-peakings. Both of these activities will shorten battery life drastically. For cycling, peak charge is sufficient. For grading/matching only peak charge is used for more accuracy and repeatability of the data.

BE CAREFUL: Pushing can be hard on the cell/pack. Getting the pack too hot will damage it. We have found the following to be true;

1. Expect shorter run times, (If "Pushed" in excess).
2. The life expectancy of cells might be adversely affected by "Pushing".
3. Some packs do not respond to "Pushing". We have had the best results with "VIRGIN" cells.
4. Packs previously "Pushed" do not perform well when only peak charged later.

The default parameters in the SUPER-IQ "PUSH" charges represent values we recommend. However, we do not guarantee them to be the best for every cell or cell type. NiCad batteries change from batch to batch. What is the right "PUSH" for one batch, may be too much for another.

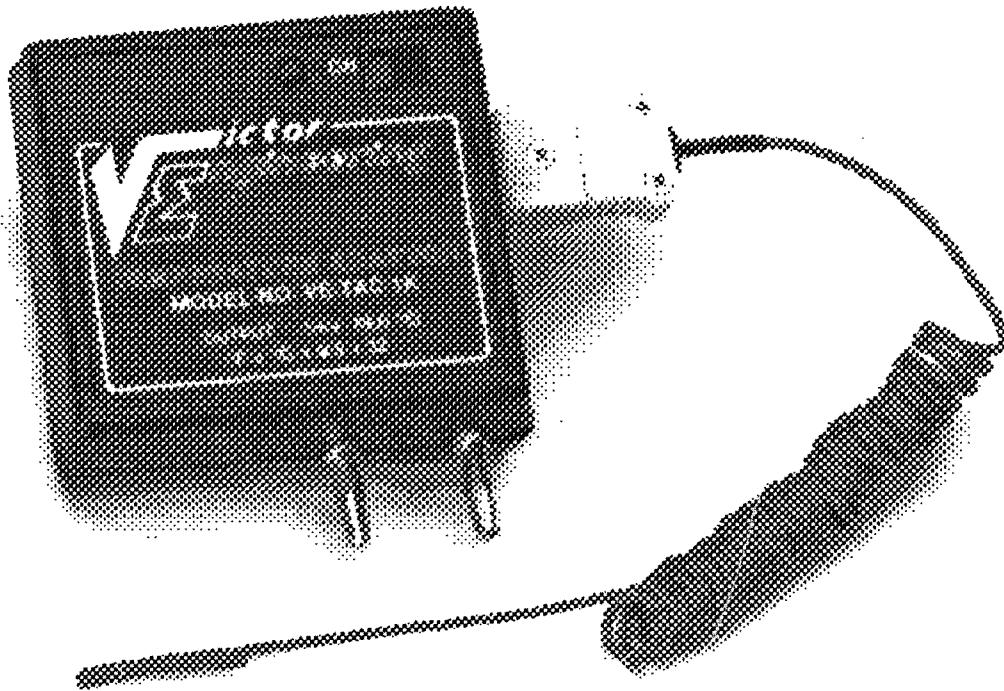
"THERMAL PUSH" CHARGE (continued)

For SCR 1200 packs use cut-off temperatures in the high 40's to the mid 50's with current rates between 6 to 8 Amps. For other packs use cut-off temperatures in the low to mid 40's and current rates between 3.5 to 4.5 Amps.

While charging the Voltage Peak will be indicated by a triple beep. A flashing message will keep announcing it while "Pushing" continues. In case the probe is not attached to the battery the SUPER-IQ will recognize it and will shut off at the VOLTAGE PEAK. The message "PEAK REACHED NO TEMP. INCREASE" is displayed.

While charging the "Thermal" charging screen is displayed. When the CHARGE process completes, the CHARGE COMPLETED screens are displayed. See Appendix A for a complete description of these screens.

MAKE SURE THE THERMAL-PROBE BATTERY HAS ENOUGH LIFE.
CHANGE THE BATTERY EVERY 30 HOURS OF USE OR EVERY 2 MONTHS OF STORAGE.



"VOLTAGE-PULL" CHARGE

The Highlighted options below show how to select a VOLTAGE-PULL charge.

From the MAIN MENU

CHARGE/DISCH=1
SPEC FUNCTIONS=2

SCRIPT ACCESS=3

From the CHARGE/DISCHARGE/CYCLE menu

CHARGE=1 DISCH=2
CYCLE=3

From the CHARGE menu

PEAKED=1 TIMED=2
TRKL=3 THERMAL=4

VOLTAGE PULL=5
LINFLEX=6

The VOLTAGE-PULL or PUSH CHARGE is a method of constant current charging which uses a cut-off point BEYOND the VOLTAGE PEAK specified as post - peak drop. This method of charging is sometimes call "Negative Slope" charging. (See the section entitled "PUSH CHARGING" above for a complete explanation). This is done to warm-up a cell or pack.

The following screens are displayed in the order shown. If you require more information on how to use these screens, please refer to Appendix A.

The Type of Cell screen

C OR D CELL=1
AA OR OTHER=2

The Number of Cells screen

NMBR OF CELLS=6
OK=1 CHANGE=2

When the Voltage Drop screen is displayed you may accept the default voltage drop, by pressing the ① key, or change the voltage drop, by pressing the ② key. If the ② key is pressed, the voltage drop screen is displayed again, with the voltage drop empty.

STOP @ DROP=.0600
OK=1 CHANGE=2

Enter the voltage to drop to be used, between .003V and .999V. After entering the voltage drop, the

STOP @ DROP=____ V
ENTR .003 - .999

screen is displayed again. The voltage drop has been updated to the voltage you entered. Press the ① key to accept the new voltage drop, or press the ② key to repeat the process.

We are not battery experts, however a statistical analysis of the data compiled by our race team have yielded the following usage guidelines;

- For SCR 1200 cells, use a 0.04V drop per cell at a 6 to 8 Amp. Charge Rate.
- For Other cells, use a 0.03V drop per cell at a 3.5 to 4.5 Amp Charge Rate.
- When lower charge rates are used, REPEAK once using the "SAME" function.

While charging the CHARGING screen is displayed. When the CHARGE process completes, the CHARGE COMPLETED screens are displayed. See Appendix A for a complete description of these screens.

"LIN-R-FLEX"™ CHARGE (requires Thermal-probe)

The Highlighted options below show how to select a LIN-R-FLEX charge.

From the MAIN MENU

CHARGE/DISCH=1
SPEC FUNCTIONS=2

SCRIPT ACCESS=3

From the CHARGE/DISCHARGE/CYCLE menu

CHARGE=1 DISCH=2
CYCLE=3

From the CHARGE menu

PEAKED=1 TIMED=2
TRKL=3 THERMAL=4

VOLTAGE PULL=5
LINFLEX=6

Reflex charging was developed by a US. firm Christie Electric Corp. in the period between mid 1970 and early 1980. Reflex charging is based on the scientific expertise of this company in the field of NICAD rechargeable batteries. Originally it was a pulse or linear peak charge periodically interrupted by so-called "Burps". "Burps" are nothing else but high rate discharge pulses of short duration. These "Burps" were designed to release (burp) gas internally developed by rapid charging. It is the pressure build-up that causes premature deterioration of the internal structure of cells. Lin-R-Flex charging will rejuvenate NICAD batteries as well as to provide a rapid charge without the loss of life expectancy usually connected to charging with rates higher than 1C. (C is a measure of current in Milli-Amps equal to the total battery capacity in mAh as specified by the battery manufacturer. I.E. in the case of a 1200 mAh SCR, 1c=1200 mAh or 1.2 Amps). Christie Electric Corp., developed and still markets a computerized instrument similar to the SUPER-IQ. This instrument is very sophisticated, but hard-to-use, bulky and much too expensive (approx. \$6000.00). Victor Engineering purchased one of these machines in order to research the reflex charge concept. Our team has compiled a large data base using this machine. We combined the originally very mild Christi "burp" charge (which did not yield performance good enough for our requirements) with our knowledge of "PUSHING" and here's what we came up with.

1. LIN-R-FLEX charging yields the same (or better) performance as the Thermal Push Charge with substantially longer lifetime expectancy of the battery.
2. LIN-R-FLEX charge can bring tired cells back to life.
3. LIN-R-FLEX charge allows repetitive use of the same packs in the same day (make sure the pack is completely cool before recharging) without a noticeable loss of performance.

The following screens are displayed in the order shown. If you require more information on how to use these screens, please refer to Appendix A.

The Type of Cell screen

C OR D CELL=1
AA OR OTHER=2

The Number of Cells screen

NMBR OF CELLS=6
OK=1 CHANGE=2

The CHARGE CUTOFF TEMPERATURE screen

CHRG CUTOFF@45°C
OK=1 CHANGE=2

For SCR 1200 packs use cut-off temperatures in the high 40's to the mid 50's with a current rates between 6 to 10 Amps. For other packs use cut-off temperatures in the low to mid 40's and current rates between 3.5 to 4.5 Amps.

"LIN-R-FLEX" CHARGE

The CHARGE RATE screen

CHRG RATE= 3.8A
OK=1 CHANGE=2

The BURP INTERVAL is the amount of time the SUPER-IQ will charge between BURPS. Press the ① key to accept the BURP INTERVAL, or press the ② key to change the BURP INTERVAL.

BURP INTERVAL
XXmin XXsec

OK=1 CHANGE=2
XXmin XXsec

If the ② key is pressed, the change BURP INTERVAL Screen is displayed.

ENTR BURP INTERVAL
XXmin XXsec

After entering the burp interval time, the SUPER-IQ will re-display the burp interval screens, but they will now be updated with the burp interval you entered. If the interval is correct, press the ① key, otherwise, press the ② key to repeat the process.

The BURP DISCHARGE RATE screen is displayed next. Press the ① key to accept the discharge rate, or press the ② key to enter a new discharge rate. If the ② key is pressed, the following screen is displayed. Enter the BURP DISCHARGE RATE. You can discharge from .1A to 50A (depending on the number of cells being charged). After entering the discharge rate, the DISCHARGE RATE screen is displayed. The screen has been updated to the discharge rate you entered. If the discharge rate is correct, press the ① key, otherwise press the ② key to repeat the process.

DISCH RATE=XX.XA
OK=1 CHANGE=2

DISCH RATE=___A
ENTR 00.1 - 50.0

The THERMAL-PROBE must be plugged into the SUPER-IQ and switched on. The THERMAL-PROBE sensor must be connected to the battery under charge. If the SUPER-IQ senses that the thermal module is not plugged in, or it is not connected to the battery, the CONNECT THERMAL MODULE screens are displayed (see Appendix A for a complete explanation).

While the charge is in process the thermal CHARGING screens are displayed. When the CHARGE process completes, the CHARGE COMPLETED screens are displayed. See Appendix A for a complete description of these screens.

MAKE SURE THE THERMAL-MODULE/PROBE BATTERY HAS ENOUGH LIFE.
CHANGE THE BATTERY EVERY 30 HOURS OF USE OR EVERY 2 MONTHS OF STORAGE.

VOLTAGE CUTOFF DISCHARGING

The Highlighted options below show how to select a VOLTAGE CUTOFF DISCHARGE.

From the MAIN MENU

CHARGE/DISCH=1
SPEC FUNCTIONS=2

SCRIPT ACCESS=3

From the CHARGE/DISCHARGE/CYCLE menu

CHARGE=1 DISCH=2
CYCLE=3

From the DISCHARGE menu

VOLTAGE CUTOFF=1
TIMED=2

The Voltage cutoff discharge is the most common type of discharge used. The term "Voltage Cutoff Discharge" means that the cell/pack will be discharged until the specified voltage cutoff is reached. Different battery matching companies use different discharge rates and voltage cutoffs. Victor Engineering set the default value to .95V per cell. The Super-IQ automatically multiplies this value by the number of cells (See the Number of Cells screen below). The .95V per cell cut-off default is suitable for 10 Amp. discharge. For higher discharge rates use slightly lower values (i.e. .85V to .90V for 20 Amp. rate or .80 for 30 Amp. rate). Voltage cut-off discharge is used to mainly bring the battery to a "FULL" discharge state after use. This is done for two reasons:

1. To measure remaining capacity
2. To prepare the battery for storage (batteries should always be stored fully discharged).

The discharge capacity of batteries is measured in mili-Ampere-Hours (mAh). NiCad battery manufactures rate their batteries by numbers (SCR 1200, 1400, 1700 etc.) which specify the minimum guaranteed number of mAh's. The SUPER-IQ calculates the discharge capacity in mAh. This is more technically correct than just counting seconds. mAh figures of a given battery correspond at different discharge currents, seconds do not. However, the seconds can be derived from the time read-out by converting the minutes to seconds and adding that number to the seconds. The following screens are displayed in the order shown. If you require more information on how to use these screens, please refer to Appendix A.

The Type of Cell screen

C OR D CELL=1
AA OR OTHER=2

The Number of Cells screen

NMBR OF CELLS=6
OK=1 CHANGE=2

The Discharge Cut-off Voltage screen

DSCH CTOFF=XX.XXV
OK=1 CHANGE=2

The Discharge Rate screen

DISCH RATE=XX.XA
OK=1 CHANGE=2

The SUPER-IQ will now begin to discharge the cell/pack. The METER leads should be attached to the battery being discharged. If they are not the SUPER-IQ will ask "VOLTAGE ACCURACY REQUIRED". If you enter NO, the voltage readings will be taken internally. Internal readings are not as accurate due to the voltage drop on the lines. While discharging the DISCHARGE Time or mAh-Supplied screens will be displayed. When the discharge completes, the DISCHARGE COMPLETED screens are displayed. For a complete explanation of these screens please refer to Appendix-A.

"TIMED" DISCHARGING

The Highlighted options below show how to select a TIMED DISCHARGE.

From the MAIN MENU

CHARGE/DISCH=1
SPEC FUNCTIONS=2

SCRIPT ACCESS=3

From the CHARGE/DISCHARGE/CYCLE menu

CHARGE=1 **DISCH=2**
CYCLE=3

From the DISCHARGE menu

VOLTAGE CUTOFF=1
TIMED=2

A TIMED DISCHARGE is just what it says it is. The SUPER-IQ will discharge the cell/pack for a specified amount of time. When discharging a pack it is important to not discharge below .6V per cell. Going any lower may cause one or more of the cells in the pack to reverse polarity. This happens when the voltage in one cell of the pack is lower than the rest. The rest of the cells in the pack will still have voltage left in them when the lowest voltage cell in the pack has none. When discharge continues beyond this point the cell with no voltage left reverses its polarity. Single cells can be discharged to 0.0V if you like, but it is not recommended to go below .4V for any cell.

The following screens are displayed in the order shown. If you require more information on how to use these screens, please refer to Appendix A.

The Type of Cell screen

C OR D CELL=1
AA OR OTHER=2

The Number of Cells screen

NMBR OF CELLS=6
OK=1 CHANGE=2

The Discharge Rate screen

DISCH RATE=XX.XA
OK=1 CHANGE=2

The TIME LIMIT screen. Enter the amount of minutes and seconds you want to charge for. If you are charging for less than 10 minutes, you must enter a leading zero. Ex. to charge for 5 minutes, enter 0500, the SUPER-IQ will see this as 05 minutes, 00 seconds. To charge for 7.5 minutes, enter 0730, the SUPER-IQ will see this as 07 minutes, 30 seconds.

ENTER TIME LIMIT
__MIN: __SEC

After you enter the time, the TIME LIMIT the screen is displayed again. The screen has been updated to show the amount of time you entered. If the time is correct, press the ① key, otherwise press the ② key to repeat the process.

OK=1 CHANGE=2
10MIN:00SEC

The SUPER-IQ will now begin to discharge the cell/pack. The METER leads should be attached to the battery being discharged. If they are not the SUPER-IQ will ask "VOLTAGE ACCURACY REQUIRED". If you enter NO, the voltage readings will be taken internally. Internal readings are not as accurate due to the voltage drop on the lines. While discharging, the DISCHARGE Time or mAh-Supplied screens will be displayed. When the discharge completes, the DISCHARGE COMPLETED screens are displayed. For a complete explanation of these screens please refer to Appendix-A.

"CYCLING" CELLS/PACKS

The Highlighted options below show how to select the CYCLE function.

From the MAIN MENU

CHARGE/DISCH=1
SPEC FUNCTIONS=2

SCRIPT ACCESS=3

From the CHARGE/DISCHARGE/CYCLE menu

CHARGE=1 DISCH=2
CYCLE=3

Cycling is an important conditioning or maintenance function. It refreshes batteries by ridding them of so called "Memory", which is usually caused by repetitive incomplete discharge followed by charging. A "Memory" is a temporary loss of discharge capacity. The SUPER-IQ cycle consists of three functions. These are Initial Discharge, Charge, and Final Discharge. The SUPER-IQ can wait a specified amount of time between the initial-discharge and charge processes, and between the charge and final discharge processes. The first thing the SUPER-IQ does after you select CYCLING is to display the Number of Cycles screen.

You can accept the number of cycles displayed (1), or change it. Press the ① key to accept the number of cycles, or press the ② key to change the number of cycles. If the ② key is pressed, the "Number of Cycles" screen is displayed. Enter the number of cycles to

OF CYCLES=1
OK=1 CHANGE=2

OF CYCLES=---
OK=1 CHANGE=2

perform. You must enter 2 digits. If you want to cycle less than 10 times you must enter a leading zero. For Example to cycle 5 times, enter 05. To cycle 10 times enter 10. After entering the number of cycles, the NUMBER OF CYCLES screen is displayed again. If the number of cycles is correct, press the ① key, otherwise press the ② key to repeat the process. The following screens are displayed in the order shown. If you require more information on how to use these screens, please refer to Appendix A.

The Type of Cell screen

C OR D CELL=1
AA OR OTHER=2

The Number of Cells screen

NMBR OF CELLS=6
OK=1 CHANGE=2

The Discharge Cut-off Voltage screen

DSCH CTOFFV.XXV
OK=1 CHANGE=2

The Discharge Rate screen

DISCH RATE=XX.XA
OK=1 CHANGE=2

"CYCLING" CELLS/PACKS

This screen shows the X hours and XX minutes to wait after the initial discharge before continuing on with the charge. To accept the time to wait press the ① key, to change the time to wait, press the ② key.

**AFTER DISCHARGE
COOLOFF:XhrXXmin**

OK=1 CHANGE=2

Enter the hours and minutes to wait between the initial discharge and charge functions. Enter 000 to NOT WAIT, the charge function will begin immediately after initial discharge ends. Enter 030 to wait for 0 hours and 30 minutes, enter 130 to wait for 1 hour and 30 minutes. Enter any amount of time (up to 9 hours 59 minutes). When you enter the third digit, the Accept time to wait screen is displayed again. If the time to wait is correct, press the ① key, otherwise press the ② key to repeat the process.

**AFTER DISCHARGE
COOLOFF:_hr__min**

OK=1 CHANGE=2

You must now select the type of charge to use while cycling. You may perform a PEAKED or THERMAL charge. Press the ① key to select the peaked charge, or press the ② key to select the thermal charge. If a PEAK charge is selected the following screens are displayed.

**PEAKED CHARGE=1
THERMAL CHARGE=2**

The Type of Cell screen

**C OR D CELL=1
AA OR OTHER=2**

The Number of Cells screen

**NMBR OF CELLS=6
OK=1 CHANGE=2**

The Charge Rate screen

**CHRG RATE= 3.8A
OK=1 CHANGE=2**

If a THERMAL charge is selected the following screens are displayed.

The Type of Cell screen

**C OR D CELL=1
AA OR OTHER=2**

The Number of Cells screen

**NMBR OF CELLS=6
OK=1 CHANGE=2**

The CHARGE CUTOFF TEMPERATURE screen

**CHRG CUTOFF@45°C
OK=1 CHANGE=2**

The Charge Rate screen

**CHRG RATE= 3.8A
OK=1 CHANGE=2**

For SCR 1200 packs use cut-off temperatures in the high 40's to the mid 50's with a current rates between 6 to 8 Amps. For other packs use cut-off temperatures in the low to mid 40's and current rates between 3.5 to 4.5 Amps.

"CYCLING" CELLS/PACKS

The After charge cool-off screen is displayed for both the PEAK and THERMAL charge options.

Enter the amount of time to wait between the completion of the charge process and the beginning of the final discharge process. Enter X hours and XX minutes. See the Discharge cool-off time above for more information.

**AFTER DISCHARGE
COOLOFF:XhrXXmin**

OK=1 CHANGE=2

After entering in the after-charge cool-off period, the SUPER-IQ will begin the cycling process. If a THERMAL CHARGE was selected, the SUPER-IQ will check the thermal module to make sure that it is connected and on. If it is not the "THERMAL METER NOT CONNECTED, CONNECT THERMAL MODULE AND PRESS THE 1 KEY" warning screens will be displayed. Connect the thermal module and press the ① key to continue.

The SUPER-IQ will now begin to discharge the cell or pack. The METER leads should be attached to the battery being discharged. If they are not the SUPER-IQ will ask "VOLTAGE ACCURACY REQUIRED". If you enter NO, the voltage readings will be taken internally. Internal readings are not as accurate due to the voltage drop on the lines.

The SUPER-IQ will now enter Initial Discharge. The cell/pack will be discharged to the voltage cutoff you have specified. the INITIAL DISCHARGING screens are displayed. When Initial Discharge is complete, the SUPER-IQ will wait the amount of time specified on the after discharge cool-off screen. When the cool-off period is complete the SUPER-IQ will begin the charge you have selected (peaked or thermal). The CHARGING screens are displayed while the cell/pack is being charged. When the charge completes, the SUPER-IQ will wait for the amount of time specified on the after-charge cool-off screen. Finally when the after charge cool-off is complete, the SUPER-IQ will begin the FINAL DISCHARGE. The FINAL DISCHARGE screens are displayed. The DISCHARGE COMPLETED screens are displayed after completion of the final discharge. For a complete explanation of these screens refer to Appendix-A.

Note: For battery grading use the FULL TEST / COMPUTER GRADING function. You can find this feature under the SPECIAL FUNCTIONS menu.

SPECIAL FUNCTIONS

QUICK - BATTERY TEST

The Highlighted options below show how to select a QUICK - BATTERY TEST.

From the MAIN MENU

CHARGE/DISCH=1
SPEC FUNCTIONS=2

SCRIPT ACCESS=3

From the SPECIAL FUNCTIONS menu

TESTS=1
UTILITIES=2

From the TESTS menu

QUICK BAT TEST=1
<4 minute max.>

FULL TEST/COMPUTER
BAT GRADING=2

MOTOR TEST=3
MUX CELL GRADING=4

Note: The "MUX CELL GRADING" (option 4 on the TESTS menu) will only display when the IQX8 8-channel Multiplexer is installed.

The following screens are displayed in the order shown. If you require more information on how to use these screens, please refer to Appendix A.

The Type of Cell screen

C OR D CELL=1
AA OR OTHER=2

The Number of Cells screen

NMBR OF CELLS=6
OK=1 CHANGE=2

The Charge Rate screen

CHRG RATE= 3.8A
OK=1 CHANGE=2

The BATTERY TEST screen is displayed to remind you that if the pack peaks in less than 4 minutes it is ready to use, otherwise it may need a full discharge / charge cycle.

FULLY PEAKED IF
PEAKED BEFORE 4min

The CHARGING screen will be displayed while the test is in process. Refer to Appendix-A for a complete explanation of this screen.

The NEEDS RECHARGING screen will be displayed if the cell /pack in question needs a full DISCHARGE / CHARGE CYCLE.

NEEDS RECHARGING
LAST READ XX.XXU

The PACK IS READY screen is displayed if the pack peaks in less than 4 minutes. The voltage the pack peaked at is shown as well (XX.XXV).

PACK IS READY
PEAKED AT XX.XXV

FULL TEST / COMPUTER GRADING

This feature constitutes an ideal cycle for GRADING batteries (cells or packs). Rather than using a separate charge and discharge or the cycling feature.

The highlighted options below show how to select FULL TEST COMPUTER GRADING

From the MAIN MENU

CHARGE/DISCH=1
SPEC FUNCTIONS=2

SCRIPT ACCESS=3

From the TESTS/UTILITIES menu

TESTS=1
UTILITIES=2

From the TESTS menu

QUICK BAT TEST=1
<4 minute max.>

FULL TEST/COMPUTER
BAT GRADING=2

MOTOR TEST=3
MUX CELL GRADING=4

Note: The "MUX CELL GRADING" (option 4 on the TESTS menu) will only display when the IQX8 8-channel Multiplexer is installed.

The SUPER-IQ FULL TEST COMPUTER GRADING consists of three functions. These are:

1. Initial Discharge
2. Charge
3. Final Discharge.

You may specify the amount of time to wait between the initial-discharge and charge processes. The following screens are displayed in the order shown. If you require more information on how to use these screens, please refer to Appendix A.

The Type of Cell screen

C OR D CELL=1
AA OR OTHER=2

The Number of Cells screen

NMBR OF CELLS=6
OK=1 CHANGE=2

The Discharge Cut-off Voltage screen

DSCH CTOFF=XX.XXV
OK=1 CHANGE=2

The Discharge Rate screen

DISCH RATE=XX.XA
OK=1 CHANGE=2

This screen shows the X hours and XX minutes to wait after the initial discharge before continuing on with the charge. To accept the time to wait press the ① key, to change the time to wait, press the ② key.

AFTER DISCHARGE
COOLOFF:XhrXXmin

OK=1 CHANGE=2

FULL TEST / COMPUTER GRADING

Enter the hours and minutes to wait between the initial discharge and charge functions. Enter 000 to NOT WAIT, the charge function will begin immediately after initial discharge ends. Enter 030 to wait for 0 hours and 30 minutes, enter 130 to wait for 1 hour and 30 minutes. Enter any amount of time (up to 9 hours 59 minutes). When you enter the third digit, the Accept time to wait screen is displayed again. If the time to wait is correct, press the ① key, otherwise press the ② key to repeat the process.

AFTER DISCHARGE
COOLOFF: _hr_ _min

OK=1 CHANGE=2

The Charge Rate screen

CHRG RATE= 3.8A
OK=1 CHANGE=2

The Discharge Cut-off Voltage screen

DSCH CTOFFV.XXU
OK=1 CHANGE=2

The Discharge Rate screen

DISCH RATE=XX.XA
OK=1 CHANGE=2

The SUPER-IQ will now begin the FULL TEST / COMPUTER GRADING cycle. The unit will perform the following functions:

- **INITIAL DISCHARGE**
(the INITIAL DISCHARGING screens are displayed).
The cell/pack will be discharged to the voltage cutoff you have specified.
- **AFTER DISCHARGE COOL-OFF**
When Initial Discharge is complete, the SUPER-IQ will wait the amount of time specified on the after-discharge cool-off time screen.
- **CHARGING**
When the discharge cool-off time expires, the SUPER-IQ will begin to charge the cell/pack.
(The CHARGING screens are displayed).
- **FINAL DISCHARGE**
Finally when the charge completes, the SUPER-IQ will begin the FINAL DISCHARGE.
(The FINAL DISCHARGE screens are displayed).
See the next page for a complete explanation of the FINAL DISCHARGE screens.

FULL TEST / COMPUTER GRADING

When the discharge function completes the following five screens are displayed. There are two special readings displayed only in the FULL TEST / GRADING function. These are the Holeshot and the Internal Resistance readings.

The first and second screens display the "HOLESHOT" voltage readings and the Internal Resistance reading. The Holeshot reading is representative of the unloaded voltage before discharging (the "surface" voltage) and the very first voltage reading, taken at the nominal discharge current. These readings represent valuable data for evaluating the

**TEST ENDED...
XX.XXV @ 0A LOAD**

**XX.XV @ 20A LOAD
INTRNAL XX.XmOHM**

"HOLESHOT" and the "FIRST LAP" performance of the battery. The Internal Resistance reading displayed by the SUPER-IQ is a true (not just relative) figure. The figure is calculated from a voltage differential between nominal and half discharge current. This reading is more descriptive of the cell "PUNCH" (ability or tendency to hold its voltage under heavy load variations), than the "PUNCH TEST" available in the lower HI-IQ models. Just to give you an idea, typical Internal Resistance readings of a good SCR cell should be under 10.0 mOHMS with discharge current of 20 to 30 Amps. We have seen readings below 5.0 mOHMS. The lower the reading the better.

The third screen shows the discharge duration and the number of mAh's supplied. The discharge capacity of batteries is measured in mili-Ampere-Hours (mAh). NICAD battery

**FINL DSCH XXmXXs
SUPPLIED XXXXmAh**

manufactures rate their batteries by numbers (SCR 1200, 1400, 1700 etc.) which specify the minimum guaranteed number of mAh's. The SUPER-IQ calculates the discharge capacity in mAh. This is more technically correct than just counting seconds. mAh figures of a given battery correspond at different discharge currents, seconds do not. However, the seconds can be derived from the time read-out by converting the minutes to seconds and adding that number to the seconds.

The forth screen shows the discharge average voltage, and the number of mAh's accepted during the peak charge of the FULL TEST / GRADING function.

**FNL DS AVR XX.XXV
PK CHRG XXXXmAh**

The fifth screen gives you the option of printing a cell label by pressing the "*" key on the SUPER-IQ keyboard. See the section entitled "PRINTING CELL LABELS" later in this manual for complete instructions.

PRINT LABELS=*

SPECIAL FUNCTIONS - MOTOR TESTS

CURRENT MEASUREMENT TEST

The MOTOR TEST functions require a charged battery. Make the following connections before continuing. (Be sure to observe polarity when connecting the leads).

1. Connect the NICAD leads to the BATTERY.
2. Connect the METER leads to the MOTOR.
3. Connect the MOTOR leads to the MOTOR.

You are now ready to run the MOTOR TESTS. The Highlighted options below show how to select a MOTOR TEST.

From the MAIN MENU

CHARGE/DISCH=1
SPEC FUNCTIONS=2

SCRIPT ACCESS=3

From the TESTS/UTILITIES menu

TESTS=1
UTILITIES=2

From the TESTS menu

QUICK BAT TEST=1
(4 minute max.)

FULL TEST/COMPUTER
BAT GRADING=2

MOTOR TEST=3
MUX CELL GRADING=4

From the MOTOR TEST menu

CURRENT MEAS=1
BREAK IN=2

SPD CNTRL TEST=3

Note: The "MUX CELL GRADING" (option 4 on the TESTS menu) will only display when the IQX8 8-channel Multiplexer is installed.

The SUPER-IQ will display this screen to remind you to connect the METER leads to the motor. Check all of the connections at this time, when you're sure they are correct, press the ① key to begin the test.

CONNECT METER
ACROSS MOTOR

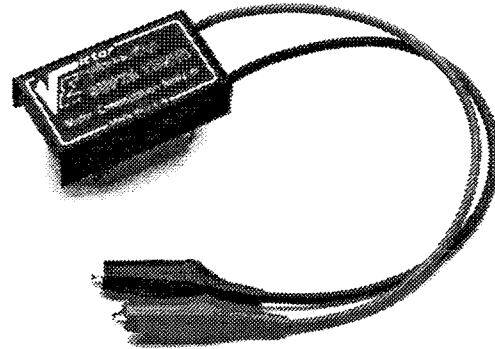
THEN PRESS KEY 1

The Current measurement screen will display the AMP (XX.XXA) and voltage (XX.XXV) draw of the motor. Press the ② key to end the motor test.

MOTOR CUR = XX.XXA
HH:MM:SS XX.XXV

CURRENT MEASUREMENT WITH THE SUPER-TUNER (optional)

The Super-Tuner displays real time current along with actual average (RMS) voltage of the commutation ripple. This ripple is produced by transitions of the commutator segments in respect to the motor brushes. Its magnitude indicates imperfections such as poor contact and arcing. The higher the reading the worse the contact between the commutator and the brushes. You can make accurate commutation timing adjustments by finding the point with the minimum current draw, minimum commutation ripple and maximum power. Every motor has this point, the trick is having an accurate tool like this one to find it. You can also find the absolute location of commutation Neutral. This is essential for proper break-in. We are not sure if a ripple reading of .00 is possible. We have had ripple readings of .01.



The usual readings for a "good" modified motor is anywhere from .01 to .08, stock motors fluctuate greatly. We have had stock motors read anywhere from .04 to .20 and still run reasonably well.

MOTOR TEST functions require a charged battery. The SUPER TUNER uses the same procedure as the current measurement test, but the wiring is different. Make the following connections before continuing. (Be sure to observe polarity when connecting the leads).

1. Connect the NICAD leads to the BATTERY.
2. Plug the SUPER-TUNER into the METER and MOTOR JACKS.
3. Connect the SUPER-TUNER leads to the MOTOR.

You are now ready to run the MOTOR TEST for the SUPER-TUNER. Use the same procedure as you would to run the Current Measure test.

The SUPER-IQ will display this screen to remind you to connect the METER leads to the motor. Check all of the connections at this time, when you're sure they are correct, press the \odot key to begin the test.

**CONNECT METER
ACROSS MOTOR**

THEN PRESS KEY 1

The Current measurement screen with the SUPER-TUNER connected will display the AMP draw (XX.XXA) and the commutator ripple voltage (XX.XXV) of the motor. Press the \odot key to end the motor test.

**MOTOR CUR = XX.XXA
HH:MM:SS XX.XXV**

MOTOR BREAK-IN

When breaking-in a high performance car or motorcycle engine, the best results are achieved, not by steady low speeds as some people might think, but by running the engine over the full range of RPM's with the lowest possible load, at moderate temperatures, and with the best attainable lubrication. The RPM's are allowed to peak periodically in short spurts followed by relatively longer periods of low RPM's in order to keep the temperature low. R/C competition motors benefit from the same break-in guidelines. The commutator and carbon brushes are most affected during the break-in process. A low mechanical drag is the most important criterion to keep commutator arcing and temperature at the absolute minimum. While keeping a fan pointed at the motor may be a good idea, Victor Engineering does not recommend the use of cooling propellers installed directly on the shaft of the motor during break-in as suggested by some other manufacturers. They present a significant drag. This causes the current to increase and needlessly heats up the motor. The motor should be absolutely free spinning. Even a pinion gear can produce a measurable drag to the motor. The break-in feature is not only designed for motors but also for transmissions, differentials and bearings in R/C cars. However it is not a good idea to break in a new motor in the same process with mechanical parts. Break in a new motor by itself (free spinning) and use a old motor to break-in the rest of the drive train.

When testing the motor a charged NiCad 4-cell or 6-cell battery must be connected to the NiCad jacks. Only use a 4-cell or 6-cell pack (not more, not less) or a regulated adjustable power supply capable of supplying 8 Amps instantaneously and 4 Amps continuous current. Most 5 Amp power supplies will do. The power supply voltage should be set between 6 and 7.5 VDC. If voltage over 7 VDC (6 cells) is used, DO NOT connect the main power source. The "SOME PROBLEM" display during the motor test process indicates not only the loss of connections to the motor, but it may also indicate some other problem including a fault in the motor. One break-in cycle takes 3 minutes. For the best results use two cycles on each motor. Let the motor cool down between cycles, you should wait at least fifteen minutes, even if the motor feels cool. Be sure to lubricate the motor. Use more cycles for the rest of the drive train (transmissions, gears and bearings). We recommend breaking-in gears and with the wheels and tires on the car. The slight drag caused by the tires against the air will insure a proper gear mesh.

You are now ready to run the MOTOR BREAK IN. The Highlighted options below show how to select a MOTOR BREAK IN.

From the MAIN MENU

CHARGE/DISCH=1
SPEC FUNCTIONS=2

SCRIPT ACCESS=3

From the TESTS/UTILITIES menu

TESTS=1
UTILITIES=2

From the TESTS menu

QUICK BAT TEST=1
<4 minute max.>

FULL TEST/COMPUTER
BAT GRADING=2

Note: The "MUX CELL GRADING" (option 4 on the TESTS menu) will only display when the IQX8 8-channel Multiplexer is installed.

MOTOR TEST=3
MUX CELL GRADING=4

From the MOTOR TESTS menu

CURRENT MEAS=1
BREAK IN=2

SPD CNTRL TEST=3

MOTOR BREAK-IN (continued)

The SUPER-IQ will display this screen to remind you to connect the METER leads to the motor. Check all of the connections at this time, when you're sure they are correct, press the ① key to begin break in.

**CONNECT METER
ACROSS MOTOR**

THEN PRESS KEY 1

The Break In screen will display the voltage (XX.XXV) being supplied to the motor and the elapsed time since the break in started. The break in cycle will run for three minutes. The SUPER-IQ will vary the voltage being supplied to the MOTOR.. To stop the break in function prematurely, press the ② key.

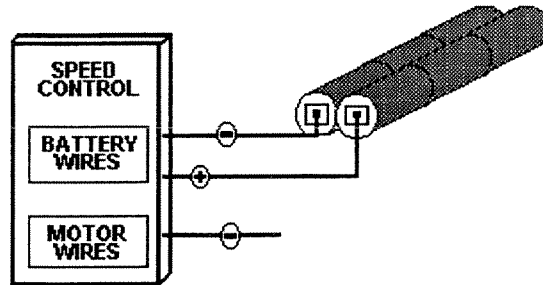
**BREAK-IN...
HH:MM:SS XX.XXV**

SPEED CONTROL TEST

This test will display the voltage drop of a electronic speed control (ESC). This test will be conducted by running a controlled voltage at a specified amperage thru the speed control and measuring the voltage on both sides of the NEGATIVE circuit.

Setup.

Connect a charged 6 cell battery to the speed control as you normally would.



Make the connections shown below.

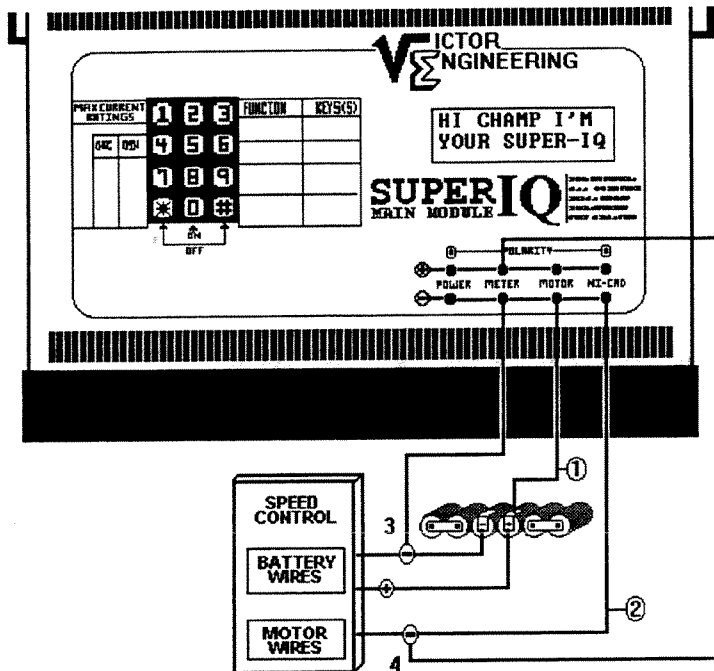
1. Connect the SUPER-IQ MOTOR NEGATIVE to the BATTERY POSITIVE (+) TERMINAL
2. Connect the SUPER-IQ NICAD NEGATIVE to the ESC MOTOR NEGATIVE (-) LEAD

The next two connections require you to push a pin or small nail thru the wire. Push the pin/nail thru the wire as close to the ESC as possible. This will give the most accurate reading of the ESC'S voltage drop and will minimize the voltage drop caused by the actual wires.

3. Push a pin/nail thru the ESC'S NEGATIVE BATTERY LEAD and connect it to the SUPER-IQ METER NEGATIVE JACK.

4. Push a pin/nail thru the ESC'S NEGATIVE MOTOR LEAD and connect it to the SUPER-IQ METER POSITIVE LEAD.

The SUPER-IQ will provide the "LOAD" for this test. As you can see the SUPER-IQ is connected to the speed control in the same manner as the motor would be. You are now ready to run the SPEED CONTROL TEST.



SPEED CONTROL TEST

The Highlighted options below show how to select a SPEED CONTROL TEST.

From the MAIN MENU

CHARGE/DISCH=1
SPEC FUNCTIONS=2

SCRIPT ACCESS=3

From the TESTS/UTILITIES menu

TESTS=1
UTILITIES=2

From the TESTS menu

QUICK BAT TEST=1
(4 minute max.)

FULL TEST/COMPUTER
BAT GRADING=2

Note: The "MUX CELL GRADING" (option 4 on the TESTS menu) will only display when the IQX8 8-channel Multiplexer is installed.

MOTOR TEST=3
MUX CELL GRADING=4

From the MOTOR TESTS menu

CURRENT MEAS=1
BREAK IN=2

SPD CNTRL TEST=3

This Screen is displayed to remind you to check all connections. If all connections are correct, press the ① key to begin the SPEED CONTROLLER TEST.

CONNECT METER
ACROSS SPD CTRLR

THEN PRESS KEY 1

The MOTOR CURRENT screen is used to display the results of the speed controller test. The Amps reading (XX.XXA) figure is the voltage drop of the speed controller. Press the ① key to end the speed controller test.

MOTOR CUR = XX.XXA
HH:MM:SS XX.XXU

SPECIAL FUNCTIONS - UTILITIES

Under the SPECIAL FUNCTIONS - UTILITIES menu you will find the following functions;

DVM - The Digital Volt Meter can be used to check the voltage of a cell or pack. Connect a set of test leads to the METER jacks on the SUPER-IQ and the other end to the cell or pack to be tested. NOTE: the DVM has a 20 VDC range. A power source is not needed if a 6 cell pack is connected.

STOPWATCH - The STOPWATCH function comes in very handy. You can time a single event as well as a chain of events. All times (events) can be read back at the conclusion of the event.

THERMOMETER - The Thermometer function can only be used with the optional Thermal-Probe. This function enables digital readout of air temperature or of any object the sensor is in contact with (Motors, Batteries). Ever wonder just how hot that motor or battery is ? Now you don't have to wonder anymore.

REVIVAL / SHOCK - This feature was designed to serve two purposes:

1. To attempt a revival of shorted or deteriorated cells or packs by a series of high power shocks. These shocks are limited to 30 amps and the duration is approx. 2 seconds each. There are five shocks in each revival attempt. Note that this feature will not be effective on open cells, however open cells are not as common as fully or partially shorted cells. We would like to stress that the outcome of the revival shock process is not a guaranteed success, merely an attempt with a fairly high success rate.
2. To "TOP" or "ZAP" a fully charged pack just before a race. "ZAPPING" is a procedure lately used by top race teams to increase the voltage and some claim even the capacity of a pack. It is usually accomplished by momentary direct connection of a car battery or two NiCad packs in series to the battery pack in question. This produces a shock of an uncontrolled high current which may be excessive, therefore damaging. By limiting the shock to a 30 Amp magnitude of controlled duration as done by this SUPER-IQ feature the danger of damaging the pack is minimized. However we feel that this procedure should not be used if a long lifetime of the pack is a higher objective than the immediate benefit of a slight increase in performance. In the case of "ZAPPING" a six or seven cell pack, the power supply used must be a minimum of 20 VDC and capable of delivering in excess of 30 AMPS in order to achieve 30 Amp current. The most feasible source in this case are three six cell packs connected in series or two 12V gel cells or two car or motorcycle batteries in series connected to the POWER jacks on the SUPER-IQ. Since the shock treatment is commonly done right at the starting line, the NiCad packs or gel cells are the more suitable than the other alternatives. For single cell shocking one 7 cell pack, or one 12V gel cell or car battery are a sufficient power source. The SUPER-IQ takes a voltage reading after each shock to see if the cell/pack voltage is up close to the nominal value corresponding to the number of cells selected. If the voltage found is sufficient, the shocks will not repeat. In order to get all five shocks in one series, select a higher number of cells than your actual pack contains.

BAUD RATE SELECT - This function is only used if the SUPER-IQ is connected to a personal computer or printer. The BAUD rate is the speed at which the SUPER-IQ communicates with the attached computer or printer. The BAUD rate must be set the same for both the SUPER-IQ and the computer / printer to allow the two units to communicate. The BAUD rate is actually the speed in which the data is sent over the cable to the computer/printer. Normally the higher the BAUD rate the faster the communication between the SUPER-IQ and the computer/printer takes place. However at the higher speeds cable noise becomes an issue. If this happens (electrical or electronic noise) the SUPER-IQ may seem to lock-up or function erratically. To correct the problem, select a lower BAUD rate. The SUPER-IQ defaults to a 9600 BAUD rate. This will be more than sufficient in most cases.

SCRIPT ACCESS: SCRIPTS and SCRIPT MACROS

The SUPER-IQ has five separate program (script) storage areas. Each one of these areas can store a SCRIPT or a SCRIPT MACRO. A script stores a single SUPER-IQ function, such as a "peak charge", a "voltage drop discharge", etc. A script macro stores a sequence (a chain) of scripts. For example; You could enter the following scripts;

- Script-1. Initial peak charge @ 4.0 Amps
- Script-2. Final peak charge @ 4.5 Amps
- Script-3. Discharge @ 20 Amps.
- Script-4. Script macro. Execute script-1, script-2, script-3 in order.

Instead of running script-1, waiting for it to finish and then running script-2, waiting again and finally running script-3, you could define script-4 as a script macro. When script-4 is run, it will automatically run script-1, script-2, and script-3. As you can see the script macro is a very powerful tool. See the script macro section later in this document for more information.

SCRIPTS

Plan the scripts you want to use, write them down, and then enter them into the SUPER-IQ. For example; In a normal day we will use the following 5 functions over and over. Since we don't want to keep entering the information/parameters into the SUPER-IQ over and over, we set them up as scripts.

- Script-1. Peak charge 6 cells at 4.5 Amps (for SCE's).
- Script-2. Peak charge 7 cells at 4.5 Amps (for SCE's).
- Script-3. Peak charge 6 cells at 6.5 Amps (for SCR's).
- Script-4. Discharge 6 cells at 20 Amps to 5.40 Volts.
- Script-5. Discharge 7 cells at 20 Amps to 6.30 Volts.

You can access any of the above functions by just pressing 2 keys. These keys are the "SCRIPT ACCESS (3)" key from the SUPER-IQ MAIN MENU, and the key of the script you want to run.

CREATING SCRIPTS

To create, edit or run scripts, press the 3 key (SCRIPT ACCESS) when the SUPER-IQ MAIN MENU is being displayed. The Script Menu screen is displayed. To Create a script, press the "*" key. This tells the SUPER-IQ that we want to enter a new script. The SUPER-IQ must know where to store the script so it displays the "Press Script Key" screen. Press the Key to be used for this script (1 thru 5). We want to setup Script-1, so press the ① key. This tells the SUPER-IQ to clear the Script-1 area of any previous data, and to save the data we will enter there. You may replace or change scripts (re-program) the SUPER-IQ as many times as you like. After pressing the script key, the SUPER-IQ displays the MAIN MENU screens. We want script-1 to be a charge script, so press the ① key to select Charge/Disch, and then press the ① key again to select Charge. Enter the rest of the charge parameters as you usually would. If you have any trouble, refer to the appropriate section of this manual for a complete explanation. After entering the charge rate, the SUPER-IQ will not start the charge process as it usually would. Instead the Script Menu is displayed. Congratulations you have just programmed a script. That's all there is to it. The peak charge you just entered is now stored in the SUPER-IQ's memory. It will be stored there until you replace it with another script.

RUNNING SCRIPTS.

As stated above existing scripts are run by pressing two keys. The two keys are the ③ key to select script access from the SUPER-IQ MAIN MENU and the actual script key itself. When script access is selected from the main menu, the script menu screen is displayed.

From this screen the user may run script 1 thru 5, create new scripts, or edit (change) existing scripts.

To run a script, press the key corresponding to its number. To run script-1, press the ① key. If the ① key is pressed, the SUPER-IQ will perform the function you selected when you programmed the script, with the parameters that you entered for the function.

Remember that all of the usual SUPER-IQ special and multiple-key combination keys can still be used while performing a script function. Once the function starts it is treated as if you entered the data yourself. To peak a battery before use, simply select the appropriate peak charge, and then use the Amperage increase (fine increase) to bump the charge rate up a tenth of an amp or two.

SCRIPT MACROS.

A script macro is simply a list of scripts to be performed in the order that they are entered. For example, We have entered the following scripts into the SUPER-IQ.

- Script-1. Normal peak charge @ 4.0 Amps
- Script-2. Before use peak charge @ 4.5 Amps
- Script-3. Discharge @ 20 Amps.

To enter a script macro perform the following steps;

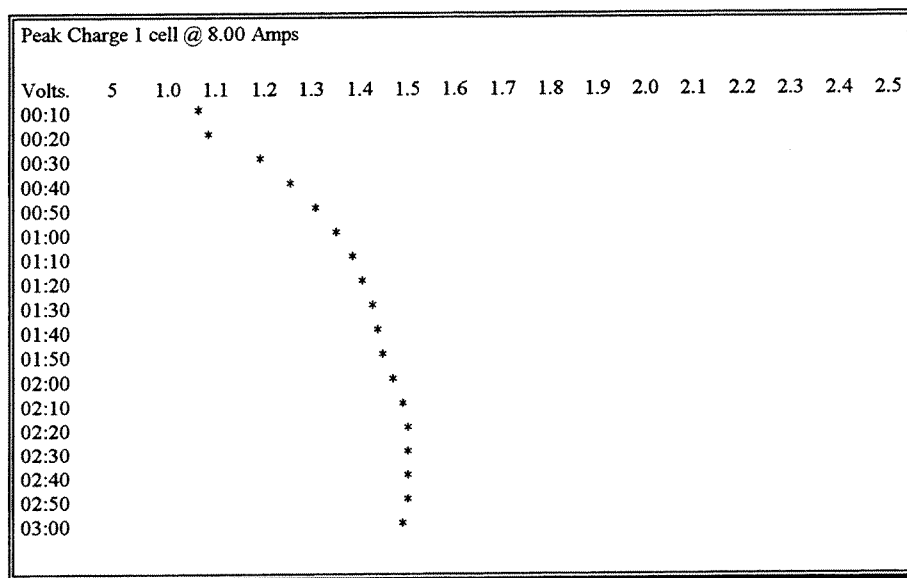
1. Select SCRIPT ACCESS from the MAIN MENU
2. Press the "*" key to create a script
3. Press the script number key (Use 4 for this example).
4. When the MAIN MENU is displayed, select SCRIPT ACCESS again. This will tell the SUPER-IQ that you are entering a script macro. Enter the numbers of the scripts to be executed (1, 2, 3) and press the "*" key.
5. The SUPER-IQ will now display the Number of cycles screen. You can repeat the script macro from 1 to 99 times.
6. If you entered more than 1 cycle, the type of delay screen is displayed. Select the type of delay between scripts you would like. Note: option 4 should be selected for "No-Delay".

The Script Macro is now stored in your SUPER-IQ main memory. To execute the script, select "SCRIPT ACCESS" from the main menu, and then press the number of the script to be executed. In this case we would press the 4 key. This would execute the script macro we programmed. Script-4 will execute script-1, script-2 and script-3 in order.

PRINTING GRAPHS.

The SUPER-IQ includes in its programming, the ability to print charge/discharge and motor graphs. To connect the SUPER-IQ to a serial printer the optional PC/PRINTER INTERFACE MODULE accessory (part # VE-IQSP-1) is needed. A NULL MODEM RS-232 cable or a standard RS-232 cable with a separate NULL MODEM adapter are also needed. The PC/PRINTER INTERFACE plugs into the 50 pin connector located on the bottom of the SUPER-IQ. It contains a female RS-232 serial port connector. Therefore the cable must have a male connector on the HI-IQ side and whatever type of connector (male or female) is required by your printer on the other side of the cable. Complete instructions for the simple installation of the "SUPER-IQ PC/PRINTER INTERFACE" are included with the product.

Graph Printing is a continuous "background" function automatically enabled and ongoing during any battery or motor function, even if a printer is not connected. The SUPER-IQ will begin by printing a description of the current function, it will then print a voltage scale across the top of the page. The voltage scale will vary depending on the number of cells being processed. Then every 10 seconds, a time and voltage line (the voltage of the cell/pack is represented by the "*") is printed until the function completes. When charging or discharging, the rate of charge/discharge (number of Amps) is printed after the time on each line until it stabilizes at the prescribed current. The rate of charge or discharge will be printed anytime major fluctuations in the current occur.



As you can see in the example above, a graph of this type can be very useful when matching a cell or packs current vs. previous performance. When turned on it's side the graph shows the charge or discharge characteristics of the cell or pack being tested.

PRINTING CELL LABELS.

Label printing is only available thru the FULL TEST / GRADING function. This section discusses only the printing of cell labels, see the section entitled "FULL TEST / GRADING" for instructions on performing the actual "FULL TEST / GRADING" function.

You must connect the SUPER-IQ to a serial printer before cell labels can be printed. To connect the SUPER-IQ to a serial printer the optional PC/PRINTER INTERFACE MODULE accessory (part # VE-IQSP-1) is needed. A NULL MODEM RS-232 cable or a standard RS-232 cable with a separate NULL MODEM adapter are also needed. The PC/PRINTER INTERFACE plugs into the 50 pin connector located on the bottom of the SUPER-IQ. It contains a female RS-232 serial port connector. Therefore the cable must have a male connector on the HI-IQ side and whatever type of connector (male or female) is required by your printer on the other side of the cable. Complete instructions for the simple installation of the "SUPER-IQ PC/PRINTER INTERFACE" are included with the product.

Note: If your printer is enabled during the charge or discharge function, the SUPER-IQ will print a charge and/or discharge graph. If you want to print both graphs and labels, you must put paper in your printer to print the graph and when the function completes, remove the paper from the printer and insert cell labels. If you don't want to print the graph, (so you can leave cell labels mounted in the printer), disable the printer (take it OFF-LINE) during the charge and/or discharge function. Before pressing the "*" key in response to the PRINT LABELS=* screen you must put the printer back "ON-LINE", print the label, and then take the printer OFF-LINE again. If the paper or labels jam in the printer, the SUPER-IQ will not stop sending data to the printer. This means that if the printer goes off line (due to a paper jam or whatever) the SUPER-IQ will continue to send data which will be lost. Your printer may contain enough memory to save some or most of the data sent to it, but once the printers memory fills up any other data sent to it will be lost. This is done to insure that the SUPER-IQ's operation will not be interrupted by a printer fault.

After the GRADING process is finished, the choice to print labels is presented. If the "*" key is pressed, the **NEXT ID** screen is displayed. Press the ① key to accept the displayed cell id. or press ② to change the cell id.

NEXT ID#XXXXXXXXX
OK=1 CHANGE=2

The next screen gives you the choice of either printing a cell label (in the current format) by pressing the ① key, or to edit the format of the cell label by pressing the ② key.

PRINT=1
EDIT=2

If the ① key is pressed the **PRINTING** screen is displayed while the label is being printed.

PRINTING...

If the ② key is pressed, the **CELL LABEL EDIT** screen is displayed.

C:A Vdr s mAh
D:A V S mAh aV R

PRINTING CELL LABELS.

The **CELL LABEL EDIT** screen gives you the opportunity to blank-out some of the items to be printed on the cell label.

C:A	Vdr	s	mAh
D:A	V	S	mAh aV R

The first line of the screen starts with "C:", which means **CHARGE DATA**.

The charge items are:

- "A" = The charge current in Amps,
- "Vdr" = The Peak Voltage Drop in volts
- "s" = The charge time in seconds
- "mAh" = The charge capacity in MAh's.

The second line of the screen starts with "D:", which means **DISCHARGE DATA**.

The discharge items are:

- "A" = The discharge current in Amps
- "V" = Is the cutoff voltage
- "S" = Is the discharge time in seconds
- "mAh" = The mAh supplied
- "aV" = Is the average voltage.
- "R" = The Internal Resistance

To accept the current format, press the ① key. To blank out one or more of the parameters, press the ② key. If the ② key is pressed, the SUPER-IQ will redisplay the cell label format screen again, and the "A" will be blinking. Press the ① key to ENABLE printing the blinking parameter, or press the ② key to blank-out the blinking parameter. If the parameter is ENABLED, it will stop blinking and remain on the screen. If the parameter is DISABLED it will disappear from the screen and will not be printed on the cell label. The next parameter will now begin blinking. This process is repeated until all of the parameters have been processed.

Example: Cell Label.

HI-IQ	MMDDYY	XXXX
AA.AA	.BBB	CCCC
DDDD		
EE.E	F.FF	GGG
HHHH	I.II	J.JJ

Charge Data:	Discharge Data:
MMDDYY = Month, Day and Year	EE.E=Discharge Amperage,
XXX = Serial Number	F.FF=Cut-off Voltage
AA.AA=Charge Amperage	GGG=Discharge Seconds
BBB=Peak Drop	HHHH=Discharge mAh's
CCCC=Charge Seconds	I.II=Average Discharge Voltage
DDDD=Charge mAh Accepted.	J.JJ=Internal Resistance in mOHM's.

APPENDIX A

SUPER-IQ "COMMON" SCREENS

This Appendix was developed to keep the SUPER-IQ manual from getting too large. Many of the screens displayed by the SUPER-IQ are used in many of the functions. Instead of explaining them in each function (over and over again) the screens are displayed/explained here once, and referenced though-out the manual by the functions that use them.

TYPE OF CELL Screen

If you are using C (Ni-Cad Sub-C) or D cells, press the ① key, otherwise to use AA cells press the ② key.

C OR D CELL=1
AA OR OTHER=2

NUMBER OF CELLS Screens

If you are using a six cell pack, press the ① key. Otherwise to change the number of cells to use, press the ② key. If you press the ② key, the following screen is displayed. Enter the number of cells you are using. You must enter two digits. If your pack contains less than ten cells, you must enter a leading zero. If you are using a four cell pack, enter 04. If you are using a seven cell pack, enter 07. If you enter an invalid amount, the SUPER-IQ will "BEEP" and redisplay the "Enter the Number of Cells" screen. This will continue until you enter a valid number of cells. The SUPER-IQ will then display the Number of Cells screen again. But now it is updated to the number of cells you entered. If the number of cells is now correct, press the ① key, Otherwise, Press the ② key to repeat the process.

NMBR OF CELLS=6
OK=1 CHANGE=2

NMBR OF CELLS=___
ENTR 1 TO 10 MAX

NMBR OF CELLS= 07
OK=1 CHANGE=2

CHARGE RATE Screens

You may accept the charge rate displayed, or change the charge rate. To accept the charge rate displayed, press the ① key. To change the charge rate displayed, press the ② key. If the ② key is pressed, the following screen is displayed. Enter the Charge Rate. If the charge rate is less than 10 amps, you must enter a leading zero. For example, to charge at 5 amps, enter 050. The SUPER-IQ will see this as 05.0 Amps, or 5.0 amps. To charge at 1/2 amp, enter 005, the SUPER-IQ will see this as 00.5 Amps. This screen shows the range of charge rates available for the number of cells being charged. The range will vary depending on the number of cells being charged. Enter a charge rate in the range (00.1 to 15.0 amps in this example) shown on the screen. When a valid charge rate is entered, the SUPER-IQ will re-display the charge rate screen, The screen is now updated to the charge rate you entered. Press ① to accept the charge rate, or press ② to re-enter the charge rate. We are not and do not pretend to be battery experts but we have compiled a fair amount statistics on battery charging. We charge our 1200 SCR's at 6 to 8 Amps, our 1400 SCR's at 5 to 7 Amps and our SCE's at 3.5 to 4.5 Amps,.

CHRG RATE= 3.8A
OK=1 CHANGE=2

CHRG RATE= ___A
ENTR 00.1 - 15.0

CHRG RATE= 4.5A
OK=1 CHANGE=2

CHARGING Screens

While the charge is in process the CHARGING screen is displayed. The screen displayed (time or mAh-accepted) depends on which option you have selected. See the SUPER-IQ Keypad section (5 key) for more information. The "@XX.XXA" is the number of Amps you are charging at. The "HH:MM:SS" is the elapsed time of the charge. The "XX.XXV" is the current voltage of the cell/pack. On the "mAh" screen the "XXXXmAh" represents the number of mAh accepted. While performing a function requiring the use of the thermal probe one of the following screens will be displayed. Either the elapsed-time or mAh's accepted is displayed, depending on the option selected. (see the "5" key in keypad options). When thermal charging the SUPER-IQ will not tell you the voltage of the cell/pack, instead it tells you the temperature (XX°C) of the cell/pack.

```
CHARGING @XX.XXA
HH:MM:SS  XX.XXV
```

```
CHARGING @XX.XXA
XXXXmAh   XX.XXV
```

```
CHARGING @XX.XXA
HH:MM:SS  XX°C
```

```
CHARGING @XX.XXA
XXXXmAh   XX°C
```

CHARGE COMPLETED Screens

When the SUPER-IQ completes a charge process, the following screens are displayed. The first screen tells you what voltage the cell/pack peaked at, and what the voltage is now. The second screen shows how long it took to charge the cell/pack, and how many mAh's were absorbed. The third screen informs you that the SUPER-IQ has automatically switched to trickle charge mode. If you have canceled auto-trickle charge the SUPER-IQ will not display this screen. The last screen gives you your current options. Press 0 to return to the main menu. Press 1 to repeat the same function. Press 2 to go into trickle charge mode. Press 3 to peak the pack.

```
PEAKED AT XX.XXV
OFF CHRG: XX.XXV
```

```
CHRG TIME XXmXXs
ACCEPTED XXXXmAh
```

```
TRICKL CHRG@.XXA
HH:MM:SS  XX.XXV
```

```
MENU=0    SAME=1
TRICKLE=2 PEAK=3
```

DISCHARGE RATE Screens

Press the 1 key to accept the discharge rate, or press the 2 key to enter the discharge rate. If the 2 key is pressed, the following screen is displayed. Enter the DISCHARGE RATE. You can discharge from .1A to 50A. After entering the discharge rate, the DISCHARGE RATE screen is displayed, except the screen has been updated to the discharge rate you entered. If the discharge rate is correct, press the 1 key, otherwise press the 2 key to repeat the process.

```
DISCH RATE=XX.XA
OK=1  CHANGE=2
```

```
DISCH RATE=___A
ENTR 00.1 - 50.0
```

DISCHARGE CUTOFF Screens

Press the 1 key to accept the discharge cutoff displayed. Press the 2 key to change the discharge cutoff. If the 2 key is pressed, you will have to enter the discharge cut-off voltage. The discharge cut-off screen will be displayed again now it is updated to the discharge cut-off voltage you entered. Press the 1 key to accept the new discharge cutoff voltage, or press the 2 key to repeat the process.

```
DSCH CTOFF@X.XXV
OK=1  CHANGE=2
```

```
DSCH CTOFF@___V
OK=1  CHANGE=2
```

```
DSCH CTOFF@5.40V
OK=1  CHANGE=2
```

DISCHARGING Screens

While discharging the SUPER-IQ will display the DISCHARGING screen. The screen displayed (time or mAh-supplied) depends on which option you have selected. See the SUPER-IQ Keypad section (Ⓢ key) for more information. The "@XX.XXA" represents the Amps you are discharging at. The "HH:MM:SS" represents the elapsed (HH=hours, MM=minutes, SS=seconds) time of the discharge. The XX.XXV represents the current voltage of the cell/pack being discharged. On the "mAh" screen the XXXXmAh represents the number of mAh supplied.

DISCHARGING @XX.XXA
HH:MM:SS XX.XXV

DISCHARGING @XX.XXA
XXXXmAh XX.XXV

DISCHARGE COMPLETE Screens

When the discharge function completes the following screens are displayed. The first screen shows the voltage the discharge completed at, and the current voltage. The second screen shows the number of minutes and seconds it took to discharge the cell/pack to the above voltage and the mili-ampere-hours supplied. The discharge capacity of batteries is measured in mili-Ampere-Hours (mAh). NiCad battery manufactures rate their batteries by numbers (SCR 1200, 1400, 1700 etc.) which specify the minimum guaranteed number of mAh's. The SUPER-IQ calculates the discharge capacity in mAh. This is more technically correct than just counting seconds. mAh figures of a given battery correspond at different discharge currents, seconds do not. However, the seconds can be derived from the time read-out by converting the minutes to seconds and adding that number to the seconds. The third screen shows the average voltage for the discharge.

DSCH ENDED @XX.XXV
PRESENTLY XX.XXV

DSCH TIME XXmXXs
SUPLIED XXXXmAh

AVERAGE XX.XXV

TIME LIMIT Screens

Enter the amount of minutes and seconds you want to charge for. If you are charging for less then 10 minutes, you must enter a leading zero. Ex. to charge for 5 minutes, enter 0500, the SUPER-IQ will see this as 05 minutes, 00 seconds. To charge for 7.5 minutes, enter 0730, the SUPER-IQ will see this as 07 minutes, 30 seconds. After you enter the time, the TIME LIMIT screen is displayed again. The screen will now be updated to show the amount of time you entered. If the time is correct, press the Ⓢ key, otherwise press the Ⓜ key to repeat the process.

ENTER TIME LIMIT
__MIN: __SEC

OK=1 CHANGE=2
10MIN:00SEC

CHARGE CUTOFF TEMPERATURE Screens

The CHARGE CUTOFF TEMPERATURE screen is displayed with a default cut-off temperature of 45 degrees Celsius. Press the Ⓢ key to accept the default temperature, or press the Ⓜ key to override. If the Ⓜ key is pressed, you must enter the temperature to stop charging at. Enter a Celsius temperature between 00 and 99 degrees. When a valid temperature is entered, the CHARGE CUTOFF TEMPERATURE screen is displayed again. The screen has been updated to the temperature you entered. Press the Ⓢ key to accept the new temperature, or press the Ⓜ key to repeat the process.

CHRG CUTOFF @45°C
OK=1 CHANGE=2

CHRG CUTOFF @__°C
ENTER 00 TO 99

CHRG CUTOFF @45°C
OK=1 CHANGE=2

VOLTAGE DROP Screens

When the Voltage Drop screen is displayed you may accept the default voltage drop, by pressing the ① key, or change the voltage drop, by pressing the ② key. If the ② key is pressed, the voltage drop screen is displayed again, with the voltage drop empty. Enter the voltage to drop to be used, between .003V and .999V. After entering the voltage drop, the screen is displayed again with the voltage drop updated to the voltage you entered. Press the ① key to accept the new voltage drop, or press the ② key to repeat the process.

STOP @ DROP=.060V
OK=1 CHANGE=2

STOP @ DROP=____V
ENTR .003 - .999

BURP INTERVAL Screens

The BURP INTERVAL is the amount of time the unit will charge the battery between burps. Press the ① key to accept the BURP INTERVAL, or press the ② key to change the BURP INTERVAL. If the ② key is pressed, the change BURP INTERVAL Screen is displayed. After entering the burp interval time, the burp interval screens will be re-displayed, but they are now be updated with the burp interval you entered. If the interval is correct, press the ① key, otherwise, press the ② key to repeat the process.

BURP INTERVAL
XXmin XXsec

OK=1 CHANGE=2
XXmin XXsec

ENTR BURP INTERVAL
XXmin XXsec

CYCLE Screens

You can accept the number of cycles displayed (1), or change it. Press the ① key to accept the number of cycles, or press the ② key to change the number of cycles. If the ② key is pressed, the "Number of Cycles" screen is displayed. Enter the number of cycles to perform. You must enter 2 digits. If you want to cycle less than 10 times you must enter a leading zero. For Example to cycle 5 times, enter 05. To cycle 10 times enter 10. After entering the number of cycles, the NUMBER OF CYCLES screen is displayed again. If the number of cycles is correct, press the ① key, otherwise press the ② key to repeat the process.

OF CYCLES=1
OK=1 CHANGE=2

OF CYCLES=____
OK=1 CHANGE=2

AFTER DISCHARGE COOL-OFF TIME Screens

This screen shows the X hours and XX minutes to wait after the initial discharge before continuing on with the charge. To accept the time to wait press the ① key, to change the time to wait, press the ② key. Enter the hours and minutes to wait between the initial discharge and charge functions. Enter 000 to NOT WAIT, the charge function will begin immediately after initial discharge ends. Enter 030 to wait for 0 hours and 30 minutes, enter 130 to wait for 1 hour and 30 minutes. Enter any amount of time (up to 9 hours 59 minutes). When you enter the third digit, the Accept time to wait screen is displayed again. If the time to wait is correct, press the ① key, otherwise press the ② key to repeat the process.

AFTER DISCHARGE
COOLOFF:XhrXXmin

OK=1 CHANGE=2

AFTER DISCHARGE
COOLOFF: _hr__min

OK=1 CHANGE=2