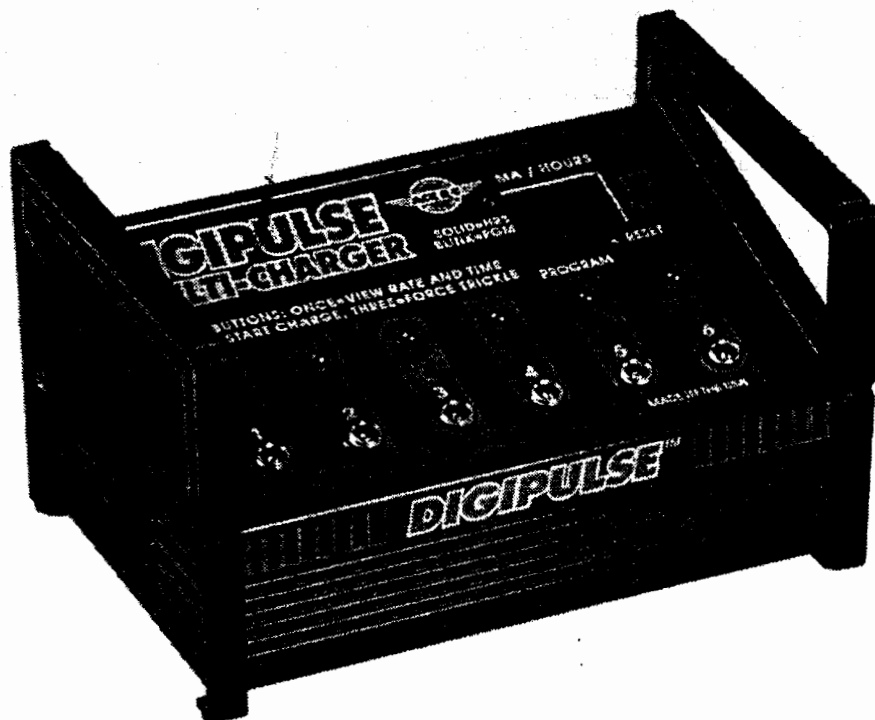


# DIGIPULSE™ MULTI-CHARGER

34-600



Users Manual

Contents

---

QUICK START	2
I. INTRODUCTION	2
DIGIPULSE FUNCTIONS	3
II. HOW THE DIGIPULSE WORKS	4
III. HOOKING UP THE BATTERIES	5
IV. DIGIPULSE OPERATION	6/7
V. USING AND STORING YOUR DIGIPULSE	8
VI. CONCLUSION	8
DIGIPULSE SPECIFICATIONS	8



*When you're the best, they call you ACE*

Ace R/C, Inc., 116 W 19 St., P.O.Box 472, Higginsville, MO  
U.S.A. 64037-0472 • (800) 322-7121

**NOTE: Read this manual completely before operating your Digipulse™. "Quick Start" is a reference guide to use after you are familiar with this device.**

## **DIGIPULSE™ QUICK START**

1. Plug power supply into a 110V wall outlet and then into the side of the Digipulse.
2. Program the outputs as desired using the following procedure:
  - Enter the Program Mode by pushing the Program button. Observe that the Mode LED blinks.
  - Push and hold the button that corresponds to the output you are wanting to program until the desired rate is displayed; release button.
  - Repeat as needed for other outputs.
  - Exit the Program Mode by pushing and holding the Program button until the Mode LED stops blinking and remains on; release button.
3. Verify correct programming by pushing the buttons on each output one time. The programmed rate will appear on the display, followed by the hours left until Trickle (at this point, they should all indicate "0" hours; when hours are being displayed, the Mode LED comes on.)
4. Using properly polarized Adaptor Cables, connect up to six battery packs to the outputs.
5. Start the Charge Sequence for the desired output by pushing the corresponding button twice. The Output Status LED will blink twice a second. (If the output is programmed to 140 ma, the light will not blink.)
6. 16 hours later, the Charge Sequence will terminate, and the Trickle will begin; the corresponding Output Status LED will blink much slower....twice every 5 seconds. The time remaining in the overnight charge sequence can be monitored by pushing the desired output's button once; the programmed charge rate will first appear, followed by the number of hours remaining in the charge sequence; when hours are being displayed, the Mode LED comes on.

## **I. INTRODUCTION**

Congratulations are in order. You have purchased the most versatile Ni-Cd and NiMH battery charger available to the R/C modeler.

For over 40 years Ace R/C has been listening to what R/C'ers would like to have to make pursuit of their hobby more enjoyable. Something we have heard repeatedly is:

"Make us an affordable, multiple output charger that has easy-to-change charge rates, will handle ALL my various sized batteries, and will automatically go into a safe trickle; oh, yes....make it easy to adapt to my different radio systems."

For years this was impossible to do in a cost effective manner, so we had to apologize and say: "Sorry."

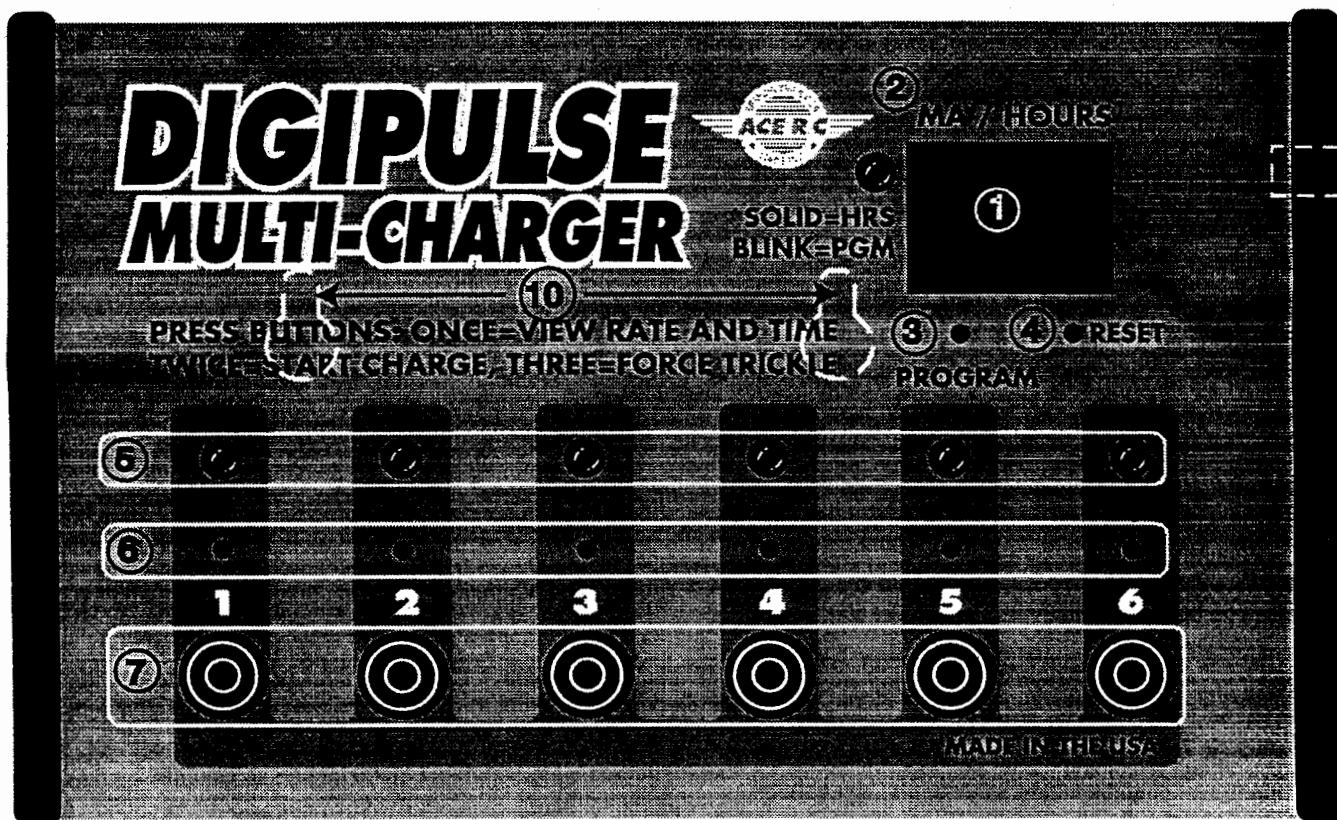
Now, thanks to the advent of superpowerful microprocessor based controllers, we can offer the Ace Digipulse.

It provides six totally independent outputs, each of which is easily programmable to provide a charge rate from 10 to 140 milliamperes and handling packs from one to 10 cells. Each output automatically goes into a safe trickle rate at the end of a 16 hour overnight charge period. At any time, you can display the number of hours left in the overnight charge sequence for any of the outputs.



*When you're the best, they call you ACE*

Ace R/C, Inc., 116 W 19 St., P.O. Box 472,  
Higginsville, MO U.S.A. 64037-0472  
(800) 322-7121



## DIGIPULSE FEATURES

1. LED DISPLAY....Two digit high visibility display shows output current in milliamperes and hours remaining in overnight charge sequence.

2. MODE LED....when blinking, it indicates that the Digipulse is in the Program Mode; when lit solidly, hours are being displayed.

3. PROGRAM BUTTON...for entering and exiting the program mode.

4. RESET access...pushing a straightened paper clip through this hole resets the computer to factory settings; only use if computer locks up.

5. STATUS LED....Indicates that a battery is hooked up. If it is blinking twice per second (or on solid), output is in overnight charge sequence; if blinking slowly (twice very 5 seconds), output is in trickle charge.

6. OUTPUT PUSH BUTTON....Push ONCE and the display shows the programmed output current first, then it shows the number of hours left in the overnight charge sequence, then the display goes out. (The Mode LED lights when the display is showing hours.) Push TWICE and overnight charge sequence begins. Push THREE times and the output is forced into the Trickle mode.

7. OUTPUT JACK....Allows hookup to the battery pack being charged.

8. POWER INPUT JACK... Allows wall transformer power supply to be plugged in.

9. RACK-TYPE HANDLES...allow the unit to rest horizontal or vertical on your bench top or shelf. Also, makes the Digipulse stackable with other Ace products in this family of enclosures.

10. KEYWAY SLOTS for wall mounting. Use two No. 8 screws, 4" on center, and leave 1/4" between the screw's head and the wall.

### 220V USERS ONLY:

If you live in a country that has 220V power, you will need a "Step-Down" (220V to 110V) transformer to plug in-between the Digipulse's furnished power supply and your wall outlet. Either 50 Hz or 60 Hz is acceptable.

## II. HOW THE DIGIPULSE WORKS

### A. CHARGE RATE DISCUSSION

When charging batteries with a charger such as the Digipulse, we are concerned about the charge rate, or the amount of electrical energy flow that is going into the batteries while being charged. This amount of energy flow, the charge rate, is measured in milliamperes (ma).

By definition, there are four different charge rates for ni-cds: Overnight, Trickle, Quick, and Fast.

**OVERNIGHT:** When charged at the overnight rate, discharged ni-cds will reach 100% of charge in 14 to 16 hours. This rate is determined by the formula  $C/10$ , or the rated capacity of the batteries divided by 10. So, if we are charging 500 milliamper-hour (mah) batteries at the overnight rate, the rate would be 50 ma. For 900 mah cells, it would be 90 ma; etc.

You are able to program the Digipulse to provide charge rates between 10 ma and 140 ma in 10 ma increments. This gives you the ability to effectively charge battery packs with 100 mah to 1400 mah of capacity. If you have a battery pack that has a capacity that does not calculate to the 10 ma increment, round UP; i.e., the overnight rate for a 270 mah battery would be 27 ma. Program your Digipulse for 30 ma.

From a practical standpoint, 1800-2000 mah battery packs can also be charged with the Digipulse....we would recommend that they be charged for two overnight charge sequences if they are significantly discharged.

**TRICKLE:** The Trickle (or Float) rate replaces the energy that ni-cds lose by just sitting idle. It is defined by  $C/50$  (capacity divided by 50); for 500 mah batteries, it would be 10 ma; for 1200 mah, 24 ma; etc. Ni-cds can be left on trickle indefinitely without damage and will always be 100% charged. Realize that the batteries can't be charged up at this rate, only maintained. If you use the Trickle Rate, only do so after the batteries have been fully charged. The Digipulse automatically switches to the trickle rate after charging 16 hours at the overnight rate

Some misconceptions exist concerning charging at the overnight rate. Within reason, modern ni-cd batteries can withstand the overnight charge rate repeatedly without damage. This means that no matter what state of charge the batteries are in, it doesn't hurt to charge them for 16 hours at the overnight rate. Don't worry about using them only a few minutes or not at all when you go out for a

flying or boating session and then coming home, hooking them to your Digipulse and charging them overnight. It won't hurt a thing. When dealing with the overnight charge rate, the main concern is to charge batteries long enough, not too long.

To further reinforce this statement, think about the wise advice that has been a part of R/C ever since we started using ni-cds. That is, if you have not used your batteries for a couple weeks, charge them overnight before using them. In these cases, the batteries are at 90 or 95% charge when they were charged overnight and no one hesitates to abide by this advice!

To summarize, when in doubt, charge.

Since the Digipulse is primarily intended for overnight and trickle charging, the following discussion is for your information only.

**QUICK:** Discharged batteries charged at the Quick Rate will reach full charge in 4-6 hours. It is determined by the formula  $C/3$  or the capacity divided by 3. For 500 mah batteries it would be 167 ma; 900 mah would be 300 ma; 1200 mah, 400 ma; etc. It is not recommended that the batteries be left on beyond the 6 hour period or overcharge could result. The Digipulse can Quick Charge smaller batteries, but it is not recommended.

**FAST:** The Fast Rate will charge ni-cds in 15 minutes or less. It is determined by the formula  $3C$  or three times the capacity. For 500 mah batteries, this would be 1500 ma or 1.5 amps. It is not recommended for R/C receiver and transmitter batteries because the charge time is very critical to prevent overcharge and damage. Of course, the Digipulse is not capable of delivering the current necessary for fast charging; only specialized chargers for fast charging should be used such as Ace's Smart Charge.

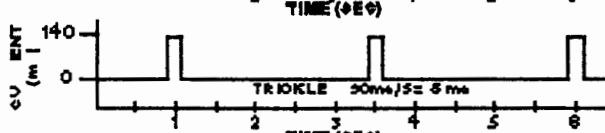
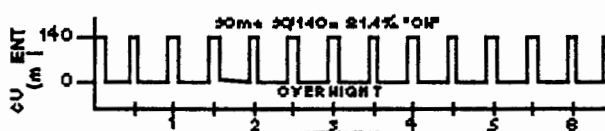
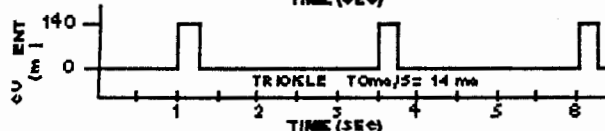
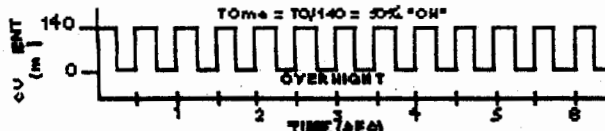
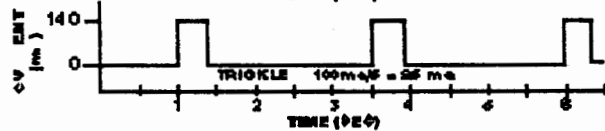
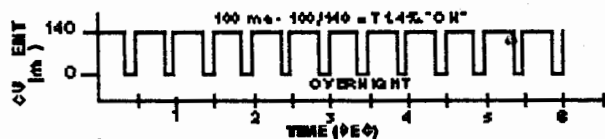
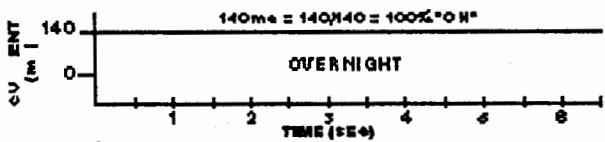
### B. THE DIGIPULSE CONCEPT

The Digipulse consists of six separate circuits that produce a fixed current rate of 140 milliamperes; an on-board microprocessor based controller switches this current on and off (pulses it) in a specific manner to provide the proper amount of energy at each of the six outputs to properly charge batteries. The duration of the "ON" time relative to the "OFF" time is controlled by the computer and is the heart of the Digipulse concept.

Battery manufacturers (such as Sanyo) recognize the pulsed charging concept as a preferred and safe technique for charging both ni-cd and NiMH batteries. They are charged by the average amount of current going into the batteries over a period of time. Example: If 140 ma of current is ON only 50% of the time, the effective current is 70 ma.

Therefore, if the Digipulse is programmed to provide 70 ma of current, it turns the output ON 50% of the time and OFF 50% of the time....it pulses this current on and off twice a second.

After the batteries have received the overnight charge rate for 16 hours, the Digipulse automatically switches to a trickle (maintenance) mode which allows the batteries to safely remain on charge until ready for use. To accomplish this, the Digipulse simply slows the pulsing down from twice per second to twice every five seconds; or, 2.5 seconds between pulses. This effectively cuts the charge rate by 1/5th which equates to C/50, the recommended rate for trickle charging. The following graphs are furnished to further illustrate this concept.



The Digipulse's computer performs the mathematics to compute the proper "ON" time for programmed charge rates from 10 ma to 140 ma in 10 ma increments. It also does the necessary timing, switching, and other work needed to provide this average current to each of the six outputs so they are completely independent of one another...in essence, the Digipulse is six different programmable rate, auto-trickle chargers in one package!

### III. HOOKING UP THE BATTERIES

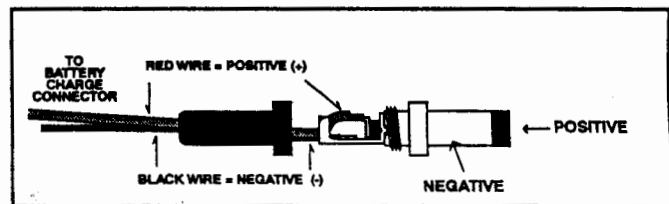
Two major considerations must be observed when interfacing the Digipulse to your batteries.

One, proper polarity must be maintained at all times: positive (+, red) to positive and negative (-, black) to negative.

Two, the battery packs must never short out (positive and negative touch).

It is highly recommended to use a scheme of connectors that would be physically impossible to plug in backwards (reverse polarity) or short out.

**CAUTION:** If the Digipulse is improperly connected to batteries causing reverse polarity, the batteries WILL be damaged! If you are unsure, use an Ace Voltmaster to verify polarity.



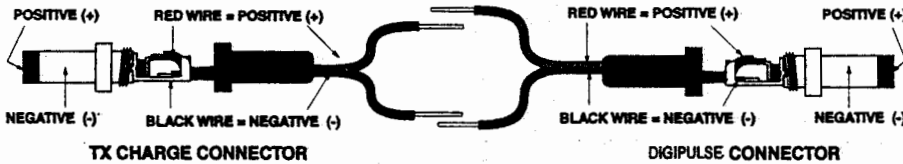
You will need to obtain pre-wired or fabricate Adaptor Cables yourself to interface the Digipulse to the various battery packs you want to charge.

To make Adaptor Cables, you will need to obtain readily available 0.10" pin DC Power Plugs to plug into the Digipulse; of course, you will need a charge connector to mate with the battery pack. Refer to the above drawing and make sure you maintain proper polarity when soldering these connections. Use heat shrink tubing to cover any exposed splices so a short circuit can not occur.

Power plugs (Ace P/N CC084 Power Plug w/o Wire OR CC084W Power Plug w/Wire) may be purchased from Ace R/C or an electronics supply store such as Radio Shack. Ace also carries charge connectors plus manufactures pre-wired Adaptor Cables for most currently available radio systems.



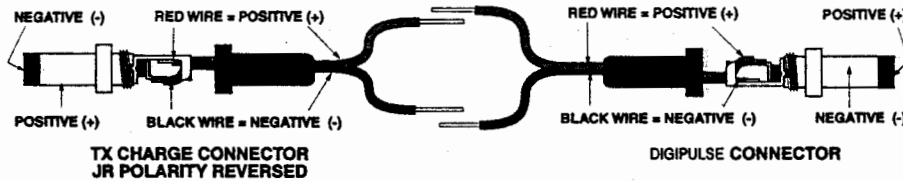
### FOR ACE MICROPRO8000, HITEC, FUTABA, AIRTRONICS TRANSMITTERS



### JR TX WIRING

To clarify the proper polarity for hookup to JR transmitters, refer to this drawing. Please pay close attention to it because JR polarity is opposite most other manufacturers.

### FOR JR TRANSMITTERS ONLY



### ADAPTER CABLES AVAILABLE:

- 1245-90 Custom Electronics CEU Universal Connector
- 19K101 Ace Silver 7 Tx and all Deans Rx
- 19K102 Ace Micropro Tx/Futaba Std. Tx/Hitec Tx
- 19K103 Futaba 5 Pin Tx
- 19K104 Futaba G Rx
- 19K105 Futaba J Rx
- 19K106 Airtronics Tx
- 19K107 Airtronics Rx
- 19K108 JR Tx
- 19K109 JR Rx
- CC084 0.10" Power Plug w/o Wire
- CC084W 0.10" Power Plug w/Wire
- 19-115 "6 Pack" Power Plug w/Wire (contains 6 of the above, especially for the Digipulse)
- 19K55 Deans Charge Connector Set

Note: If you are having trouble finding charge connectors that are compatible with your radio, you may consider changing over to Dean's Charge Connectors. They are readily available, high quality, and easy to work with, since you can solder directly to them.

### POLARITY CHECK

If a battery pack is four cells or more, there is a simple polarity check you can perform to make sure you have wired the Adaptor Cable properly.

With the Digipulse unconnected from AC power, plug the battery pack/Adaptor Cable into any of the Digipulse's outputs. If the Status LED lights for that output, the Adaptor Cable is wired incorrectly and you have to reverse the polarity; if the LED stays off, the cable is properly wired. Note: If you have already programmed your Digipulse and you unplug it from the AC power, your programming will be lost unless you have installed a backup battery. (Sec. IV, 7.) Also, if the pack is three cells or less, this check will not work.

## IV. DIGIPULSE OPERATION

To familiarize yourself with your Digipulse, study the drawing on Page 3 and read the descriptions of the various physical elements of the Digipulse. We will cover the operation of this device in a step-by-step manner.

### 1. PLUG-IN POWER

Plug the power supply furnished into a 110V wall outlet and into the side of the Digipulse. Note that the display counts up to 10 and the Mode LED blinks. *NOTE: If you live in a country with 220V power, you will need a "step-down" transformer to go between your wall outlet and the power supply furnished with the Digipulse to convert to 110V. Either 50 or 60 Hz frequency is acceptable.*

### 2. PROGRAM THE CHARGE RATE

Each of the six outputs can be independently programmed. Observe that each of the six outputs are labeled "1, 2, 3, etc." and have a Status LED, Push-button, and Output Jack associated with it. We will use Output No. 1 as an example; the other five outputs are programmed in the same manner.

1. To enter the Program Mode, push and releasing the Program Button. Note that the Mode LED starts blinking to indicate your are ready to program. If it doesn't blink, try again.

2. Push and hold Output No. 1's button. Notice that the display begins counting up and continues to do so as long as you hold the button down; it will count to 14 and then start over at 0. When you reach the desired charge rate, release the button. (Realize that the number that is being displayed has to be multiplied by 10 to give the charge rate in milliamperes. A zero is printed on the faceplate to help you visualize this calculation; i.e., 5 is 50 ma.) At this point, you can stay in the Program Mode and program any of the other outputs as desired.

3. Exit the Program Mode by pushing AND HOLDING the Program Button until the Mode LED stops blinking and remain on; release the button; the Mode LED will go off in a second or two, indicating you have exited. If the Mode LED is still blinking, try again.

### 3. VIEW THE CHARGE RATE

The various charge rates for each individual output can be viewed by simply pushing and releasing a particular output's push-button ONCE. The rate that is programmed into that output will be displayed on the readout. Another number will follow and then the display will go out. The second number is the number of hours left in the overnight charge sequence; since you haven't started any charging, this number should be "0". When the hours are being displayed, the Mode LED will come on as an indicator. If the second number is not "0", the overnight charge has been initiated.

### 4. PLUG IN THE BATTERIES

Using properly polarized Adaptor Cables, connect up to six battery packs to the outputs. (Refer to Section III regarding Adaptor Cables.) If continuity is achieved, the Status LED for that output will blink slowly (twice every 5 seconds....if it blinks quicker or remains on, that's OK, the output is already in the overnight charge sequence.

You can reprogram any of the outputs with the batteries plugged in, if you want.

### 5. START THE OVERNIGHT CHARGE SEQUENCE

You can start the overnight charge sequence on any of the outputs when desired, totally independent of one another.

To do so, simply push and release any output's button TWICE in rapid succession. If a battery pack is plugged in and making contact, the output's Status LED will begin blinking rapidly....twice a second. (Note: if the output is programmed at 140 ma, it won't blink; it will remain on continuously.)

16 hours later, the Digipulse will automatically switch this output out of the overnight charge rate into the trickle charge rate. When it does so, the blinking will slow down to twice every 5 seconds. That way, the Status LED will tell you at a glance whether a particular output is in the overnight charge sequence or in trickle.

Status LED:

Rapid Blink (or lit solid)=Overnight Rate  
Slow Blink=Trickle Rate

At any point in time, you can restart the overnight charge sequence by pushing any output's button twice. The 16 hour sequence will start over again.

When you are pushing the button twice, you may notice that the display will show the programmed charge rate on the first push and then show "2" on the second push.

### 6. MONITOR THE OVERNIGHT CHARGE SEQUENCE

The amount of time left in the overnight charge sequence can be monitored by the push of a button. If you want to know how long it will be before the Digipulse switches from the overnight charge to trickle, push and release the desired output's button ONCE. The programmed charge rate will appear first, followed by the number of hours left in the overnight charge sequence. This time remains on the display for a short period then the display goes blank. To tell you that the hours are being displayed, the Mode LED comes on. Of course, while hours are being displayed, you will need to ignore the "0" that is printed on the faceplate to the right of the display.

### 7. FORCE THE TRICKLE

Although it is something that you normally wouldn't need to do, you have the ability to force any output into the trickle charge mode. To do so, push any particular output's button THREE times in rapid succession. The Status LED will blink slowly, indicating trickle mode.

When you are pushing the button three times, you may notice that the display will show the programmed charge rate on the first push, show "2" on the second push, and then "3" on the third.

### 8. POWER INTERRUPTIONS/ BACKUP BATTERY

As with all computers, power interruptions may cause loss of the programmed settings and require reprogramming. The Digipulse has a built-in "keep alive" circuit that will keep the computer powered up during brief power interruptions; this covers most common situations.

If you live in an area where power interruptions of more than a couple seconds happen regularly, the Digipulse has a battery backup option that will prevent loss of programming when power fails for extended periods. To install the battery, unplug everything, including power, from the Digipulse. Access the inside of the Digipulse by removing the two screws that secure the plastic endcap on the right side of the enclosure. Look beneath the printed circuit board and you will see a 9V battery connec-

tor; it should be nestled between two capacitors. Reach in and free the connector and plug in a 9V alkaline battery; observe that the display lights up and performs a count-up diagnostic then goes out. Secure the battery in place to the back or bottom of the aluminum case's interior using a piece of double sided servo tape or a square of sticky-backed Velcro (not furnished.) This battery should last for at least a year, assuming you leave your Digipulse plugged in as it is intended to be.

### 9. RESET THE COMPUTER

In rare cases, due to power spikes or other extraordinary causes, the computer may get locked up and need to be reset; this will clear everything back to factory settings. The symptom would be a garbled display, erratic operation, or the inability to change the programming. To do so, with the power plugged in, take a straightened paper clip and push it through the small hole labeled "RESET". This will activate a push-button that is just below the surface of the faceplate; you will notice that when you reset the computer, the display will count up to "10" and the Mode LED will light as it performs a self-diagnostic procedure. After resetting, you will need to reprogram all of the charge rates as needed.

## VI. USING AND STORING YOUR DIGIPULSE

Because of the trickle charging feature of your Digipulse, it is designed to remain plugged into AC power at all times. If you use the product as intended, you will have batteries plugged in and trickle charging continuously. If you need to unplug it from the wall for extended periods of time, remove the 9V battery (if installed) to prevent leakage. After being disconnected from all power, you will need to reprogram when you power it back up.

Your Digipulse is housed in a unique, sturdy enclosure that has a few features worthy of mention.

The "rack" style endcaps allow the Digipulse to sit horizontally or vertically on your bench top or

shelf. Also, notice there are some tabs and notches molded into the endcaps. These make the product stackable with other Ace R/C products in this family, including the Digipace 3, DDVC, CVC, and Abacus.

You may find that you want to hang the Digipulse on a wall in your shop similar to hanging a telephone. There are keyway slots in the back of the case that will allow you to do so. Use two No. 8 screws, 4" on center with 1/4" clearance under the head of the screw; now the Digipulse can be hung on these screws or removed as desired.

## VII. CONCLUSION

We are confident you will find this product a welcome addition to your stable of equipment. At Ace R/C, we take pride in providing you with products that are useful, dependable, and a true value. Our Limited Lifetime Warranty confirms this commitment. See the separate sheet for details.

Also, we listen to our customers. Please let us know your likes, dislikes, suggestions, and criticisms on this product as well as any of our hundreds of other products. We need your feedback so we can continue to provide the service and products we are famous for.

## Digipulse Specifications

Input Voltage	110VAC
Overnight Charge Rates (Programmable)	10 ma to 140 ma X 6 (Pulsed)
Trickle Charge Rate	1/5th the programmed overnight rate
Overnight Charge Time	16 hours (timed)
LED Readout	MA (X 10) and Chg Time Remaining (Hrs)



*When you're the best, they call you ACE*