Eggtimer EZ-DD
Flight Manual

Disclaimers, Legal Stuff, Etc.

The Eggtimer EZ-DD is meant to be used for hobby and experimental rocketry purposes. Although hobby rocketry has an admirable safety record, largely due to the efforts of the good people at the National Association of Rocketry (NAR) and the Tripoli Rocketry Association (TRA), rocketry can be dangerous if proper safety precautions are not observed. This is particularly true with some of the advanced techniques like pyrotechnic parachute deployment and igniting rocket motors in flight ("Airstarts").   People can and have been seriously injured by not following recognized and accepted safety practices. We cannot be responsible for your actions.

We *strongly* recommend that if you are not a member of either the NAR or the TRA, you join one of them, join a local rocketry club, and pick the brains of experienced members before you try any kind of multiple deployment or airstart flight. The safety information included in these instructions is by no means comprehensive or complete, and is no substitute for the supervision and advice of experienced rocketeers.

Limited Warranty

Eggtimer Rocketry warrants that all of the parts on the packing list of this Eggtimer Rocketry kit have been included, and that they are all in working condition.   If you are missing something, contact us immediately at support@EggtimerRocketry.com and we will send you whatever it is that you are missing. If you are missing something really egregious (like the PC board or the processor, for example), we may ask you to return the entire kit unbuilt, we will send you a prepaid shipping label for this purpose. We'd especially like to see the packing list so we can figure out what went wrong so it doesn't happen again…

If your Eggtimer EZ-DD does not work properly after assembly, take a deep breath, get out the magnifying glass and a good light, and see if you have inadvertently created a solder bridge somewhere. Chances are pretty good that you have, or that you have installed a part incorrectly. We are a very small company and we just don't have the resources to repair your board, but we will be more than happy to give you advice and we might be able to help you find your error if you send us some high resolution pictures, to support@EggtimerRocketry.com . We cannot take responsibility for your assembly techniques; if you do not have experience building kits of this nature, we recommend that you enlist some help. (Another reason for joining a rocketry club, there is usually at least one electronically-inclined member who can be bribed with a beverage or two to give you a hand. Engineering types love a challenge, especially it it's easy for them but hard for you.)

Eggtimer Rocketry warrants that when properly assembled this Eggtimer Rocketry product will perform substantially according to the published documentation. This means that we spent a lot of time trying to ensure that it's going to work the way that we say it does, and we try to fix things that don't quite work right in a reasonable time. Nevertheless, we can not and do not warrant that this product is perfect and will meet every rocketry purpose, for the simple reason that we can't test every possible rocket/motor/environmental combination. It is the buyer's responsibility to determine the suitability of the Eggtimer EZ-DD for their particular purpose. If

you have a problem with this, please contact us and we will be happy to send you a prepaid return label for your unbuilt kit and we will refund your purchase price.

Meet the Eggtimer EZ-DD Rocket/Altimeter

The Eggtimer EZ-DD Rocket is designed be be an easy introduction to dual-deployment flying. Previously, you would have to pick out a rocket kit, then get all of the little bits that made it work… an altimeter, an AV bay "kit", the hardware missing from the AV bay "kit", charge wells, terminal blocks, wiring, connectors, not to mention the other rocket parts that might be missing such as parachutes, shock cords, rail buttons, motor retainers, etc.   With the Eggtimer EZ-DD Rocket, you don't need to worry about any of that… it's all included in the kit, including a specially designed Eggtimer EZ-DD Altimeter that's about a simple as you can get.

The Eggtimer EZ-DD Altimeter is a simple altimeter-based 2-output deployment controller, its job is to properly deploy your parachutes and bring your high-powered rocket safely to the ground. It has two channels: An Apogee channel, which is fired near the apogee of the flight, and a Main channel, which fires at a somewhat lower altitude. The idea is that the Apogee parachute is much smaller, so your rocket comes down at a controlled but relatively fast rate, typically between 50-100 ft/sec. This relatively high rate of descent helps minimize the rocket's drift due to wind, and for you impatient types it also helps it come down faster too. The Main parachute is typically opened somewhere between 500'-1000', slowing the rocket down so that it lands gently but preventing it from drifting excessively.

The EZ-DD is pre-set to fire the Main output at 600' and the Apogee output at nose-over, which is the most common configuration. This makes it an ideal choice for a beginning dual-deployment altimeter… nothing to configure, nothing to mess up.

In addition, there is a 3-pin serial output port that streams the live-altitude data during your flight. Along with an Eggtimer Telemetry Module, it will send out live altitude, flight status, and channel status data to an Eggfinder LCD receiver.

The deployment channels are capable of triggering just about any ematch that you're likely to encounter, we've tested them with the MJG "yellow" ematches, MJG FireWire ematches, and the command orange "Chinese" ematches.

Getting to know your EZ-DD

If you've already built your EZ-DD Altimeter you probably are familiar with this… but if you have not, or built the rocket first, you may want to brush up on the functions of the altimeter. It's about a simple as we could make it…

Battery (+/-) – Two solder pads, marked "+" and "-", for connecting the EZ-DD's battery.   The connector is polarity-protected, however we still recommend that you check your battery polarity before connecting to it.   Typical current draw is about 5 ma when running.

Buzzer - "Beeps" out status, warnings, apogee, and other important notifications.

Main Deployment (MAIN) - A locking header for connecting an electric match or other deployment device. MAIN Deployment altitude is fixed to fire at 600'.

Apogee Deployment (APOGEE) - Two solder pads for connecting an electric match or other deployment device, which triggers at your rocket's apogee.

Serial Output (GND, 3V3, & TXD) – 3-pin header connector for connecting an Eggtimer Telemetry Module to transmit real-time flight data to the ground. It can also be used for some startup diagnostics using an USB-Serial interface and a terminal program like Putty.   Details on that stuff are at the end of the manual.

Power Button – A push-on hold-off button for tuning your EZ-DD altimeter on and off.   You press it briefly to power it on, and you hold it down for at least 5 seconds to turn it off.

Note: If you read nothing else, read the safety information below.   It may save you a lot of grief, and maybe a trip to the ER too…

Dual-Deployment Safety Guidelines

Always wear eye protection when handling pyrotechnics.

This applies to when you're filling the charge wells and wiring the charges.   This protects your eyes against flash burns should the powder charge go off inadvertently.

Keep a safe distance from the charge wells when you're loading them with pyro powder.

Don't put your face right next to them.   You should be able to easily load them and tape them closed while maintaining about a 2' distance.

Treat any rocket with a "live" charge as if it was a loaded gun.

- When you are putting it together after the charges are loaded, do it from the SIDE… do not stand immediately in front of or behind the rocket.
- Do not point it at anyone or anything, preferably it should be pointed straight up while you are carrying it to the RSO/LCO table or to the pad.
- When you are putting it on the rail, load the rocket from the SIDE… do not stand immediately in front of it or behind it.
- **NEVER** move a rocket with an armed altimeter… your altimeter(s) should be disarmed and incapable of firing pyrotechnics while you are transporting it, or anywhere else except on the launch pad.   If you have a burned igniter and need to replace it, DISARM the altimeter when you leave the launch pad to get a new igniter.

Always arm your altimeter BEFORE you connect the igniter to the pad box/launcher.

If you wait until after you have connected your igniter to arm your altimeter and it launches with the altimeter disarmed, your rocket is going to go straight up and come straight down into the ground… not a safe situation.

Be familiar with your altimeter BEFORE you go to launch.

Altimeters sometimes make a dizzying number of "beeps", you need to know what they all mean. On the pad is not the time to be trying to figure it out… one altimeter's "I'm Ready" sound may be the same as another altimeter's "DO NOT FLY ME!" sound, so you need to KNOW what they mean before you try to fly them.   Practice arming and disarming your altimeter at home, so you know what it sounds like… in the case of the EZ-DD altimeter (and other Eggtimer altimeters, too) the "I'm Armed" sound is a rapid "chirping" that sounds nothing like the other sounds that other altimeters make.   That makes it easy to tell that you're ready to fly your Eggtimer altimeter.

Flying Your EZ-DD Rocket

The EZ-DD altimeter is very simple to operate, there is only one button… for power.

ON: TOUCH the button and release. Your EZ-DD should start beeping.
OFF: HOLD the button down for at least 5 seconds, then release. Your EZ-DD should go silent.

That's it! Pretty easy, huh?

Now that you know how to turn your EZ-DD on and off, we're going to go through the things you need to do to fly your EZ-DD rocket, in detail. If you already have some experience with electronic deployments, you may want to skip down to the end where we have the "Quick Start" checklist. We still recommend that you read through this entire procedure, however… there may be some things that are different than other altimeters that you have flown before.

STEP 1: AT YOUR TABLE

__ Choose and install your motor

Pick the motor that you want to fly with your EZ-DD rocket, and prepare it according to the manufacturer's instructions. The EZ-DD rocket uses 29mm motors, we recommend motors in the G and H total impulse range, which should typically give you an altitude in the 1200-2500' range. You can also fly "I" impulse motors if they will fit… we've done that with motors such as the Aerotech I205 DMS motor, you can expect about 3500' altitude with that motor. Note that H and I motors require an NAR or Tripoli Level 1 high power certification.

You also need to decide if you want to keep the deployment charge in the motor, or remove it. In general, we recommend **removing** the deployment charge from the motor. This keeps you from having to worry about whether the delay on the motor is correct or not, since the EZ-DD's Apogee charge is going to automatically deploy at apogee. If you DO decide to keep the motor's ejection charge (for example, as a backup for the electronic charge) you will need to figure out the delay that you need to "drill". We recommend setting the delay about 2 seconds PAST the time that you would expect your apogee. Typical values for delay with the EZ-DD rocket are 9 seconds for a G motor in the 100 newton-seconds range, 11 seconds for an H motor in the 200 newton-seconds range. The idea is that the motor's ejection charge is going to fire after the EZ-DD has already deployed your Apogee charge… it's being used as a backup.

The problem with keeping the deployment charge is that if the motor's charge fires early, i.e. before apogee, it's possible that your rocket will be going fast enough that the forces in flight will cause the shock cord to cut through the body tube due to the rapid extension of the shock cord against the body tube… this is called a "zipper", and is not what you want. Motor deployment charges are allowed to be +/- 20%... with longer delays (i.e. 10 seconds) that means that it could be anywhere from 8-12 seconds from burnout. Electronically triggered apogee charges are pretty darn exact… your rocket is guaranteed to be going slow when the charge fires.

See the motor manufacturer's instructions for information on setting the motor delay, and removing the deployment charge powder if you are not going to be using it. For most Aerotech motors you will either pop off a retaining cap and dump the powder, or just leave it out of the motor's charge well if the powder is packed separately. CTI motors have a thin plastic disk over the charge, you carefully pry or cut off the disk and dump the powder. We recommend that you do this over a small container so you can save the powder… you can use it for the Apogee charge well.

__ **Fold the Apogee shock cord**

Lay out the Apogee shock cord straight. Put your thumb and forefinger into a "V", then start wrapping the shock cord around your fingers in a figure-8 pattern, until you have about 6 inches left to get to the Drogue parachute. While holding the figure-8, slide it off your fingers and slide it all the way into the body tube.

__ **Fold the Main parachute**

Fold the MAIN parachute as follows… this is the same procedure that you've probably used for any other model rocket parachutes.

Lay the parachute out so that it's a flat circle
Fold it back so that it's a semi-circle.
Fold the sides in twice, so that it's "pointed".
Roll the parachute from the "point" in until it's a bundle.
Wrap the shroud lines around it ONCE (and ONLY once) to prevent it from coming undone.

__ **Attach the Nose Cone**

Slide the folded parachute and shock cord/shroud lines into the top of the payload tube.

Put the nose cone on the top of the payload tube, it should be snug but not so tight that it's hard to pull off. Use masking tape if necessary to build up the shoulder if it's a little loose.

Cut two pieces of ¾" wide Scotch tape about 2" long into four 3/8" wide strips. DO NOT use paper masking tape for this! Tape the nose cone on to the payload tube the long way, using three pieces of 3/8" wide Scotch tape. This will hold then nose cone on so that the initial jolt of the apogee separation doesn't pop the nose cone off, but will easily shear off when the main charge fires.
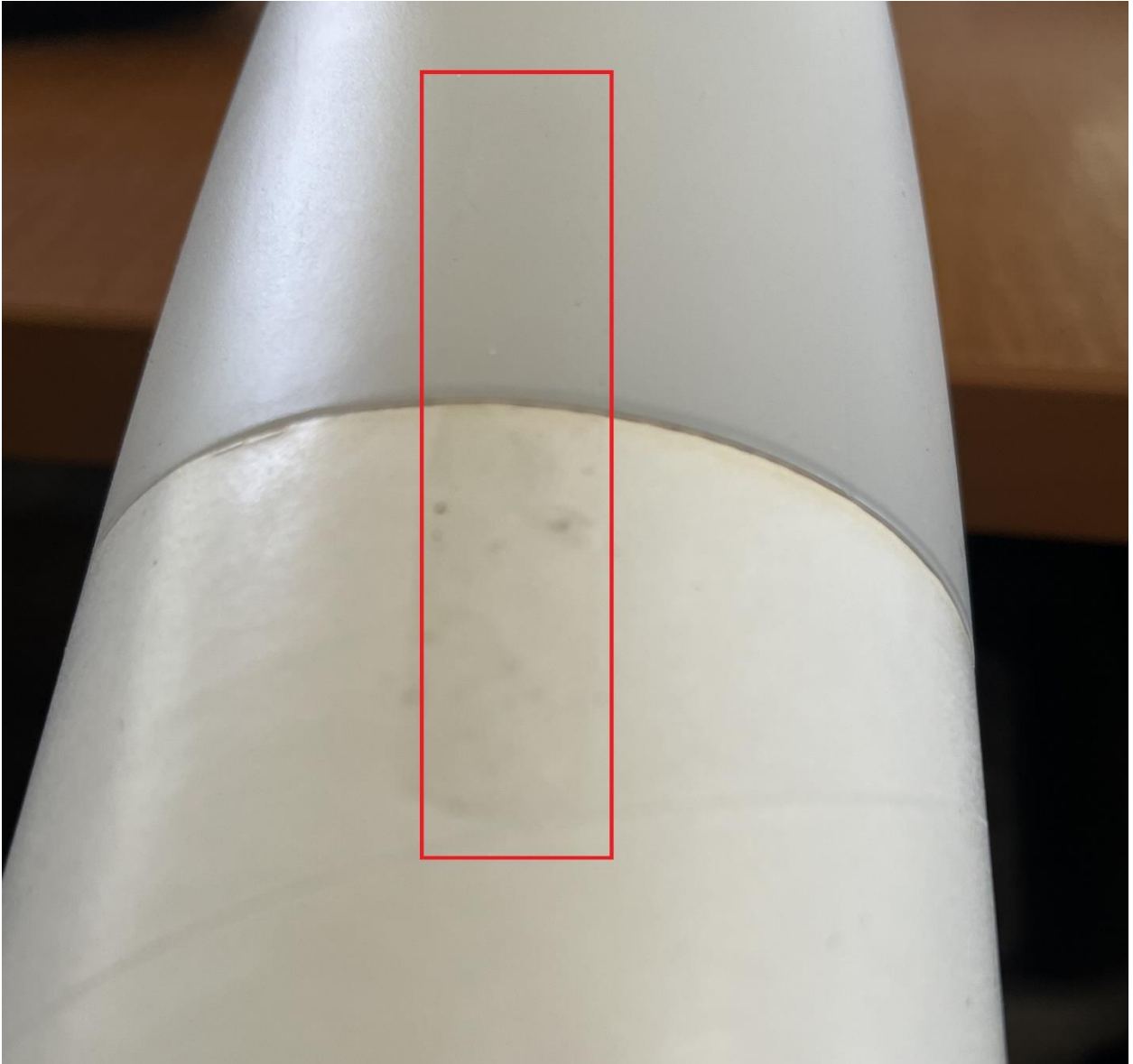
__ **Connect the ematches,**

Insert your ematch into the charge well, and bend the lead down the outside.   Wrap some masking tape around the charge well to hold it in.

Feed the wires loosely around the center of the bulkplate, bend them so that they go past the terminal block, then trim the wires so that they are about 1" past the terminal block.

Trim about ½" from each wire, then split the wires about 2".

Unscrew the terminal block screws so the metal "plate" on the screw has a gap, then feed one wire into the terminal block underneath the plate (NOT the screw).   Bend the wire so it's a "U", then pull it through the terminal block.   Tighten the screw, and trim any excess bare wire.
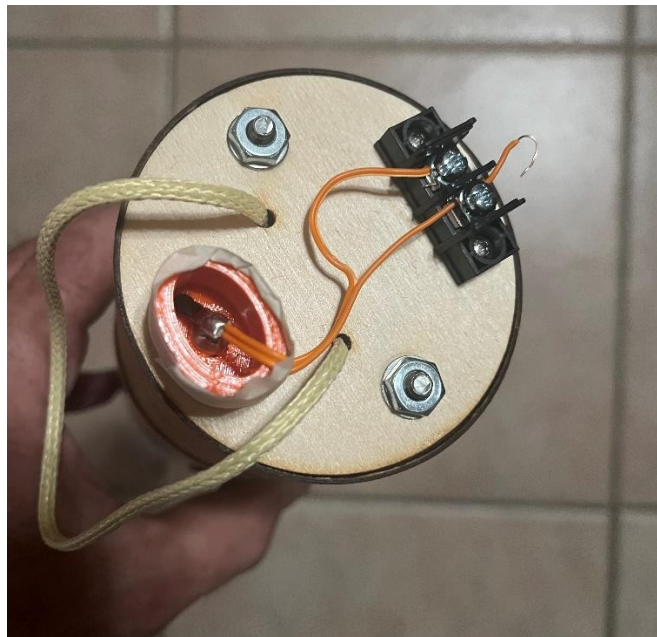
Repeat for the other terminal block screw.

With some masking tape, cover the terminal block completely, this will prevent powder residue from fouling the screws.
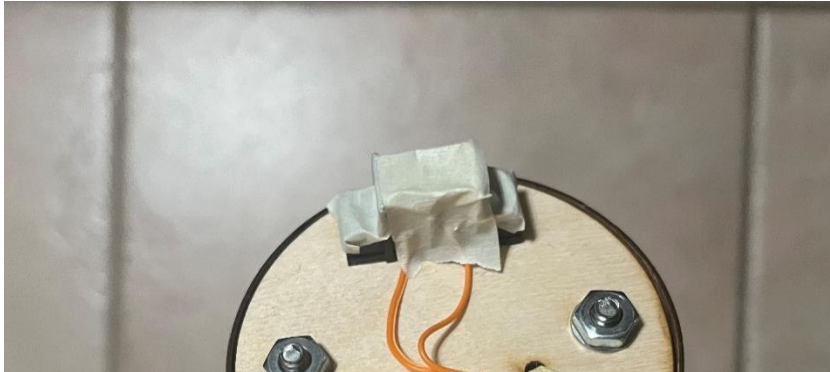
__ Turn ON the EZ-DD altimeter and confirm continuity and battery voltage

Insert the included ¼" diameter wooden stick into the access hole for the switch, it should go in about an inch before it touches the power switch.   Press it in lightly, you should feel a little "click" as the switch depresses.   The altimeter should immediately start beeping… if it does not, then you probably didn't hit the switch button.   Note that it's important that you line up the switch button with the hole when you put the sled in the AV bay coupler… we recommend putting alignment marks on the bulkplates and the coupler to help with this (see the EZ-DD Rocket Assembly Guide).

IMPORTANT SAFETY NOTE:
NEVER use a metallic instrument of any kind (such as a screwdriver) to access the switch! You can short out components on the altimeter board and damage it.   We have designed the EZ-DD altimeter so that if you do that, it shouldn't cause an unintended ground deployment, but that's going to be little consolation if you destroy your altimeter.

When you first turn on the EZ-DD, you'll get a 1-second beep to let you know that it's working. After about 5 seconds, you'll hear some additional beeps. That's the current battery voltage, which is tested and reported to you when you power-up so you know if your battery is safe to fly.

The beeps work like this:

1 Beep = 1
2 Beeps = 2
…..
9 Beeps = 9
10 Beeps = 0

The EZ-DD's circuitry will work with up to about 15V, but since your battery is only 9V you're probably going to hear a "zero" beep at the beginning. So, if you hear 10 beeps, 9 beeps, then 1 beep, your battery voltage is 091, or 9.1 volts.

If you're using a 9V battery, we recommend that you do not fly if your battery voltage is less than 8.0V.   Your battery is starting to get weak at that point, and you want to make sure that it has enough capacity left to fire your deployment ematches.

After the battery voltage is beeped-out, there will be a 5 second delay. After that, the EZ-DD runs some tests to make sure that the hardware is operational, and that you have continuity to both channels. If you do NOT have continuity, you will hear some beeps, continuously, and the EZ-DD flight sequence will not start until you fix this condition.

The beeps are:

1 Beeps – No Drogue Channel continuity
2 Beeps – No Main Channel continuity
3 Beeps – Internal hardware issue

If you get any of these beeps, **DO NOT FLY YOUR ROCKET UNTIL THE CONDITION IS CORRECTED** because the EZ-DD will not deploy your parachutes.

Assuming that the continuity checks pass, a few seconds later you will hear the EZ-DD start "chirping" rapidly. That is the "I'm ready" signal, and it will continue chirping until shortly after launch.

Once you hear the chirping, you know that the EZ-DD is good to fly, so at this point you should TURN OFF the power by holding the button down for about 5 seconds until the chirping stops, finish prepping the rocket, (Don't forget the powder in your charge wells! Don't ask us how we know about this…) and take it to the RSO/LCO along with whatever paperwork your particular club may require.

If you get any error beeps, you need to figure out why before you can fly.   Typically, it would be because you have a loose connection between the ematch and the terminal block, although it is remotely possible that you could have an "open" ematch too. Check your ematch connection, and try another ematch if the connection appears to be OK.

__ **Turn OFF the EZ-DD altimeter… and leave it off until you're on the pad!**

__ **Add powder to the charge wells**

Fill the APOGEE charge well with about 0.3 grams of black powder (the Aerotech BP containers are graduated, they're a good way to measure BP).   The BP should just cover the pyrogen on the tip of the ematch.   Add "dog barf" wadding to the top of the charge well.   Cover the long side of the charge well with a piece of masking tape, then cover it again with two pieces of tape in an "X" pattern.
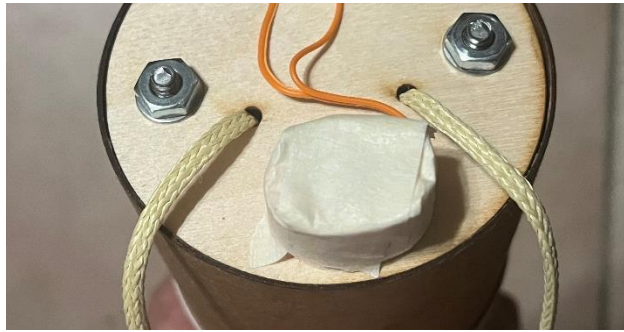
Repeat the procedure for the MAIN charge well, we recommend that you use 0.5 grams of BP.

__ **Button up the rocket**

Add "dog barf" wadding to the bottom of the payload bay, we recommend adding about one body tube (3") of wadding.   The wadding should NOT be packed tight… it's there to protect the parachute from powder "burns", not to act as a piston.

Feed the MAIN shock cord through the bottom payload bay, using a series of figure-8's about 4" long, then connect the AV Bay coupler to the payload bay tube so that the holes line up.   Insert the four plastic 6mm body nuts through the laser-drilled holes.

Now, feed the APOGEE shock cord into the top of the booster, using a series of figure-8's.   Attach the AV Bay-payload assembly to the booster, making sure that the access hole for the switch is centered between two fins but NOT lined up with the rail buttons (or you won't be able to access the switch hole!).

Your rocket should now be completely assembled… you're almost ready to fly!

__ **Check you rocket in with the RSO/LCO**

At the Pad

__   Put your rocket on the rail (Tilt it slightly away from the flight line!)

__   Turn on the EZ-DD Altimeter, and wait for the "I'm Ready" chirping.   IF YOU DO NOT GET THE CHIRPING (I.E. YOU GET REPEATING SHORT ONE-BEEP OR TWO-BEEP'S INSTEAD), DO NOT LAUNCH!   Take it back to the table and check your ematch connections.

__   Install your motor igniter, connect to clips, and check igniter continuity.

Return to the Safety Zone, and Launch!

If you're new to dual-deployments, you can see that it's a lot more involved than just stuffing some wadding and the parachute into the tube, popping in the motor, and hooking up the igniter. Multiple deployments require discipline in order to make them work reliably; we've seen way more than our share of failed deployments, on everything from a small mid-power E-size rocket all the way up to an M-sized 200 pound beast. We've seen deployments fail with the top-end flight computers and with the low-cost units, even with redundancy. The reality is that most deployment failures are not the fault of the electronics; it's usually something mechanical like a bad connection, a nose cone that's too tight, etc.   Having your blood, sweat, and tears free-fall from 10,000' bury itself in six feet of dirt is going to ruin your whole day.

We STRONGLY recommend that you use a checklist every flight so that you don't forget anything. We've made one up for you, it's and the end of this manual; feel free to make as many copies as you want.   We also recommend that you get a copy of the book Modern High Power Rocketry , it's full of good information too, and subscribing to a forum like The Rocket Forum (www.rocketryforum.com) is a really good idea, too.

After Landing…

__ Count the apogee beeps: _____

__ Turn off the EZ-DD Altimeter

The EZ-DD detects that your rocket is on the ground when there's no change in altitude for over 5 seconds. Once on the ground, the EZ-DD will start beeping out the maximum altitude continuously for anyone within earshot to hear. The beeps work like this:

1 Beep = 1
2 Beeps = 2
…..
9 Beeps = 9
10 Beeps = 0

So, if you fly to 2,360' you will hear:

Long Pause…
Long Beep… ("I'm going to give you're the apogee reading…")
Short Pause…

 2 Beeps (2 x 1000')
Short Pause

3 Beeps (3 x 100')
Short Pause

6 Beeps (6 x 10')
Short Pause

10 Beeps (no 1' reading)

<sequence repeats>

The beeps continue until you turn off the power, and also act as a verification that you had a successful flight, but getting your rocket back in one piece pretty much told you that, didn't it?

Appendix A – Testing

The EZ-DD has some special testing functions built in, in particular you can test the deployment channels with your battery and igniter combination to make sure that when it fires you aren't going to get any nasty surprises (such as the EZ-DD resetting in flight, or the igniter not firing because the battery can't source enough current). In addition, you can test the output of the barometric sensor to confirm that the altitude readings are reasonable.

Deployment Channel Testing

The EZ-DD altimeter is a barometric-pressure based device. That means that it senses the surrounding air pressure and corrects for temperature (using an internal sensor) to determine the "pressure altitude" that you're at.   It's not a weather station so there are some corrections that are not performed, however since we're measuring the relative difference in pressure between your ground altitude and the altitude in flight those factors wash out.

You can test your EZ-DD altimeter by pulling a vacuum across the pressure sensor.   The easiest way is to simply take a shop vacuum hose, hold it directly over the pressure sensor (the little silver part with a hole in the corner), then turning it on.   If you hold the hose steady for several seconds, the Drogue channel should fire (it requires the pressure to stay relatively constant for at least one second… similar to what would happen around apogee).   If you gently pull the hose back, the Main channel should fire almost immediately, since the vacuum will subside and the pressure will return to "ground" level.   After a few seconds, your EZ-DD will beep out the "apogee", just like on a real flight.   USE ONLY A PLASTIC HOSE, DO NOT USE A METAL HOSE!

You can test this indoors using a suitable resistive load, we recommend using miniature Christmas tree light bulbs (the incandescent ones, NOT LED's!).   The nice thing about using those as test loads is that you can visually see them "fire", and it's easy to repeat the test.

Since a video is worth 1,000 words, we have a YouTube video that shows you how to do this… it's actually pretty easy.

https://www.youtube.com/watch?v=YhpOUyR3KXg

You CAN test using ematches, if you do this do it OUTDOORS in a safe place; make sure the ematch wires are long enough that you have some distance between you and the ematch heads!

We recommend that you wear goggles or other eye protection when you are testing ematches.

DO NOT perform a deployment test using live black powder charges, there's no safe way to do this.   We have sized the charge wells on the EZ-DD rocket so that they will easily separate the parachute sections using the amount of black powder that the charges will hold.   If the ematches pass the deployment test, you can be assured that your rocket's deployment functions will operate.

Note: NEVER do a deployment test with just a piece of bare wire, you need to have some kind of resistive load such as an ematch, igniter, or small piece of fine nichrome wire (#36 or #40, for example). If you do, you may blow out the output transistors. We've designed the EZ-DD very conservatively, and the output drivers automatically provides current limiting to help protect the EZ-DD and your battery. Nevertheless, it is still possible to break something if you try hard enough.

Power-On and Barometric Sensor Testing (Optional)

The EZ-DD altimeter sends out some power-on diagnostics information out the serial port. You can use the Eggtimer USB-Serial interface and a serial terminal program such as Putty to view this information. Note that this is strictly an optional thing… the most important piece of information that you get is the battery voltage, which is beeped out whenever you power on the EZ-DD altimeter.

The interface uses a Silicon Labs CP2102 USB-Serial chip, you can get the drivers from their web site (Google "CP2102 drivers"). They have drivers compatible with virtually all common platforms… Windows, Mac, Linux, and they have a SDK for Android so there may be some Android drivers around too.

You'll also need a simple serial terminal program, such as PuTTY for Windows, or CoolTerm for the Mac. Set the data to 9600 baud, 8 bits, 1 stop bit, no parity, and no handshaking, and connect the cable to the 3-pin serial output connector as follows:

GND Wire → "GND" pin (Ground)
RXD Wire → "TXD" pin (Transmit)

Start the terminal program and connect to the interface's COM port. Power on the EZ-DD. You should see some numbers on the screen, such as

102
564
093

The first number is the software version… 102 is version 1.02.

The second number is the pressure altitude, it should be "close" to your actual above-sea-level altitude in feet. "Close" may be +/- 20%... don't fret if it's not 100% accurate, as we mentioned before this is not a weather station. The main thing that you're looking for is that it is not something outrageous… like 65535, for example.

The third number, 093, is your battery voltage. It's in 1/10ths of a volt, so 093 is 9.3V. For a 9V battery, we recommend that you do not fly if your battery voltage is below 8.0V… the EZ-DD altimeter will work just fine, but you want some error margin when your ematches fire, so you don't want to use a battery that is near the end of it's useful life.

Appendix B – Telemetry Using the Eggtimer Telemetry Module

During flight, altitude and other data are streamed out through the serial port as the readings are taken. This data can be sent to a serial wireless radio in order to get real-time altitude data, or logged to get a flight profile.

The 3-pin serial connector on the EZ-DD is designed to connect directly to an Eggtimer Telemetry Module transmitter.   This allows in-flight data to be transmitted to a receiver on the ground.   If you have an Eggfinder LCD receiver you can view the in-flight data directly on the LCD display, and if you also have the Voice Module for the LCD receiver it will speak out your altitude, apogee, and deployment events in-flight… which is very cool.

Telemetry data sent by the EZ-DD includes:

- Real-time Altitude (in 100' increments)
- Real-time Velocity
- Flight phase (i.e. waiting for launch, apogee reached, etc.)
- Deployment events (i.e. Drogue fired, Main fired)
- Apogee (sent after nose-over)
- Maximum Velocity (sent after nose-over)

Connecting an Eggtimer Telemetry Module is simple… just plug its connector into the 3-pin header on the EZ-DD altimeter.   Make sure that the black wire lines up with the pin marked "G" (for "Ground").   We recommend that you use a stubby helical antenna on the Eggtimer Telemetry Module rather than the included straight wire antenna, since the EZ-DD's AV bay isn't long enough for the standard antenna. (Send us an email if you need to find a suitable antenna).   You can mount the Eggtimer Telemetry Module on the top of the battery cover with double-sided foam tape (we recommend getting the strongest tape you can… black "servo tape" works really well.).   We also recommend putting a wrap or two of masking tape around the sled to hold the cable in place, so it won't work loose in flight.

Set your Eggfinder LCD receiver to the "Quark/EZ-DD" device type.   If you're using the Voice Module, we recommend that you set your Voice Period to 4 seconds, since EZ-DD flights are usually relatively short; you may want to set it to 6 seconds if you are using a bigger motor such as an Aerotech DMS I205W.

The LCD display will show:

R/T Altitude		R/T Velocity
Apogee	Flight Status	Max. Velocity

For example,

1200		-73
1374	DR	472

For more information on the data display format, see the Eggtimer Telemetry Module User's Guide on our web site, EggtimerRocketry.com.

Eggtimer EZ-DD Quick Start

Specifications

Battery
9V alkaline (6LR61) or Lithium battery, or 2S/7.4V LiPo battery recommended
Recommended capacity: at least 2x the "all-fire" current of your load
 (i.e. a 300 mAH 20C battery will put out 300 mAH x 20 = 6A, that would fire up to a 3A load)

Outputs
8A, current-limited
Firing time: 1 second

Flight Specs
Arming altitude: 200'
Maximum recommended altitude: 60,000'

Serial / Telemetry Port

Format: 9600 baud, 8 bits, no parity, 1 stop/start bit.   3.3V logic level, inverted (1=0V,0-3.3V)
Pinout:
GND – Ground (black wire on USB-Serial cable for testing)
3V3- 3.3V power output to Eggtimer Telemetry module (don't connect anything else here!)
TXD – Transmitted data (white wire on USB-Serial cable for testing)

Telemetry Capability
Real-time altitude, velocity, flight status, channel status, apogee, maximum velocity
See the Eggtimer Rocketry web site for details on the Eggtimer Telemetry format

Eggtimer EZ-DD Flight Checklist

Date: _____   Motor: _____

At Your Worktable

__ Choose and install your motor

__ Fold the Drogue parachute

__ Connect the ematches,

__ Turn ON the EZ-DD altimeter and confirm continuity and battery voltage

__ Turn OFF the EZ-DD altimeter… leave it off until you're on the pad!

__ Add powder to the charge wells, tape over the top (minimum 2 times, "X" pattern)

FROM THIS POINT ON, KEEP THE ROCKET POINTED AWAY FROM ANYBODY!

__ Button up the rocket… AV Bay body nuts to payload bay, MAIN shock cord/parachute, nose cone, connect AV Bay/Payload to booster

__ **Check you rocket in with the RSO/LCO**

At the Pad

__ Put your rocket on the rail (Tilt it slightly away from the flight line!)

__ Turn on the EZ-DD Altimeter, wait for the rapid "I'm Ready" chirping.

__ Install your motor igniter, connect to clips, and check igniter continuity

Return to the Safety Zone, and Launch!

After Landing…

__ Count the apogee beeps: _____

__ Turn off the EZ-DD Altimeter

Electronic-Deployment Safety Guidelines

Always wear eye protection when handling pyrotechnics.

This applies to when you're filling the charge wells and wiring the charges.   This protects your eyes against flash burns should the powder charge go off inadvertently.

Keep a safe distance from the charge wells when you're loading them with pyro powder.

Don't put your face right next to them.   Keep the charge wells pointed away from you when you are loading them.

Treat any rocket with a "live" charge as if it was a loaded gun.

- When you are putting it together after the charges are loaded, do it from the SIDE… do not stand immediately in front of or behind the rocket.
- Do not point it at anyone or anything, preferably it should be pointed straight up while you are carrying it to the RSO/LCO table or to the pad.
- When you are putting it on the rail, load the rocket from the SIDE… do not stand immediately in front of it or behind it.
- **NEVER** move a rocket with an armed altimeter… your altimeter(s) should be disarmed and incapable of firing pyrotechnics while you are transporting it, or anywhere except on the pad.

Always arm your altimeter BEFORE you connect the igniter to the pad box/launcher.

If you wait until after you have connected your igniter to arm your altimeter and it launches with the altimeter disarmed, your rocket is going to go straight up and come straight down into the ground… not a safe situation.

Be familiar with your altimeter BEFORE you go to launch.

Altimeters sometimes make a dizzying number of "beeps", you need to know what they all mean. On the pad is not the time to be trying to figure it out… one altimeter's "I'm Ready" sound may be the same as another altimeter's "DO NOT FLY ME!" sound, so you need to KNOW what they mean before you try to fly them.   Practice arming and disarming your altimeter at home, so you know what it sounds like… in the case of the EZ-DD altimeter (and other Eggtimer altimeters, too) the "I'm Armed" sound is a rapid "chirping" that sounds nothing like the other sounds that other altimeters make.   That makes it easy to tell that your Eggtimer altimeter is ready to fly.