DYNON AVIONICS

D1 Pocket Panel™

Portable EFIS

Pilot's User Guide

Copyright

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Registering Your D1

Please take a moment to register your D1 Pocket Panel at register.dynonavionics.com. Registering your product with Dynon ensures that your contact information is up-to-date. This helps verify product ownership, can expedite warranty claims, and allows us to notify you in the event a service bulletin is published for your product. You can also optionally sign up to receive other Dynon news and product announcements. Dynon will not share your contact information with third parties or send you announcements without your explicit consent.

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Dynon Avionics retains the exclusive right to repair or replace the instrument or firmware or offer a full refund of the purchase price at its sole discretion. SUCH REMEDY SHALL BE YOUR SOLE AND EXCLUSIVE REMEDY FOR ANY BREACH OF WARRANTY.

Dynon Avionics' products incorporate a variety of precise, calibrated electronics. Except for external accessories, this device does not contain any field/user-serviceable parts.

Units that have been found to have been taken apart may not be eligible for repair under warranty.

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1. SAFETY AND LICENSING INFORMATION

Important Safety Information

- Your Dynon Avionics D1 Pocket Panel contains a Li-Ion battery. Li-Ion batteries are safe when used as directed, but can also be hazardous if they are not used in accordance with their instructions.
- Only charge the D1 battery with Dynon Avionics chargers that are specifically intended for use with the D1. Using any other charger to charge the D1 battery could cause the battery to explode or cause damage to the D1.
- Do not expose the D1's Li-Ion battery to fire or otherwise expose them to excessive heat.
- Please dispose of non-functional batteries in a responsible manner. The battery for your D1 is very similar to mobile phone batteries and can likely be recycled wherever mobile phone battery recycling is available. For a list of recycling locations in your area (USA only), call 1-800-8-BATTERY or see the Call 2 Recycle website at www.rbrc.org.
- This device is designed to operate safely only with Dynon-supplied chargers that are specifically made for the D1.
- This device is not waterproof. It is not designed to be used in wet conditions.
- Do not operate this device below -15˚C (5˚F) or above 60˚C (140˚F). Prolonged sunlight exposure may result in excessively high temperatures.
- Do not drop this device, especially onto hard surfaces or from great height.
- Do not attempt to modify or repair this device. There are no user-serviceable parts inside. Doing so will void the warranty.

2. INTRODUCTION

Your new D1 Pocket Panel is a portable attitude indicator (artificial horizon) that is designed to be used by ALL pilots. The D1 utilizes the Dynon ARHS technology that has made us the leading supplier of EFIS (Electronic Flight Information Systems) for experimental and light sport aircraft. Unlike other portable devices and apps, the D1 displays actual aircraft attitude, along with additional auxiliary flight instruments that are derived from GPS and other sensors.

Features

- Proven Dynon MEMS-based attitude sensors
- Accurate pitch and roll: A true artificial horizon
- Internal high capacity Li-Ion battery and GPS for hours of portable use
- Versatile portable mounts: RAM suction mount and 3 ⅛” panel hole “pinch” mount both included
- GPS ground speed and ground track (direction)
- GPS altitude and vertical speed
- Turn rate
- Slip/skid ball
- Dimmable display for night flight
- Truly pocket sized - approximately 3½”Width x 3¼” Height x 1” Depth

3. INTENDED USE

The D1 Pocket Panel is a portable device that aids situational awareness. As the D1 does not have TSO authorization from the FAA or other regulatory body, is not suitable for permanent installation in type certificated aircraft.

The D1's Ground Speed, Altitude, Vertical Speed, and Ground Track (direction) instruments are GPS-derived. Their indications WILL BE DIFFERENT from the airspeed, altimeter, VSI, and heading instruments in your aircraft panel. The D1's GPS-based indications should not be considered replacements for any of these primary aircraft instruments. Details about each of these differences are described in the Product Tour section of this guide.

4. PRODUCT TOUR

On-Screen Elements

Aircraft Attitude is determined by combining information from internal solid state rotation rate sensors (gyros) and accelerometers. GPS information is additionally used to ensure the quality of the displayed attitude indication. When properly aligned to the aircraft, the D1's attitude will perform as well or better than a conventional mechanical gyro-based attitude indicator.

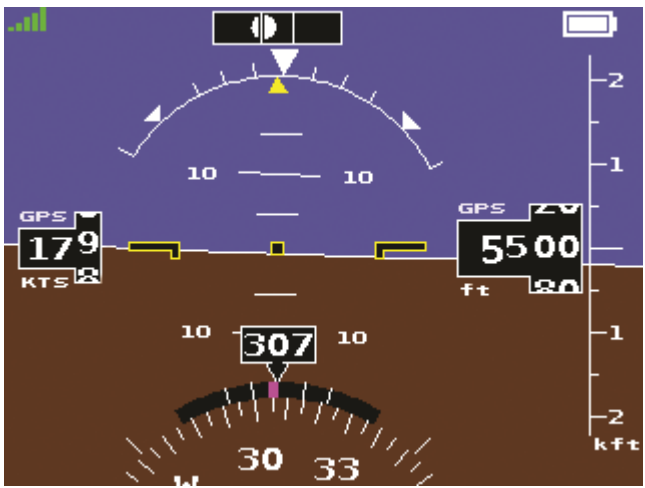

Figure 1- Full D1 Display with Attitude

Pitch angle is read by noting the position of the indexed pitch ladder against the centered yellow-outlined black square. There are extended pitch cues, also in yellow-outlined black to the left and right of the primary aircraft pitch indication. In the example above, the aircraft is pitched up approximately 1 degree.

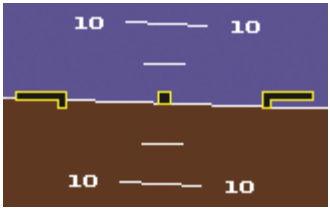

Figure 2 - Pitch

Roll angle is indicated by the position of the yellow triangular roll pointer with respect to the arc above it. There are tick marks on the roll arc at 10, 20, and 30 and 60 degrees of bank, and triangles at 45 degrees of bank. In the example above, the aircraft is banked approximately 2 degrees to the left.

Figure 3 - Roll

GPS Ground Speed is the aircraft's speed over the ground in knots, miles per hour, or kilometers per hour as determined by the D1's GPS. GPS ground speed will not match your pitot/static airspeed instruments due to wind. Since GPS ground speed does not take into account the dynamic pressure of the air acting on the aircraft, it does not provide the information necessary to determine if the aircraft is close to stalling. It should not be used as a reference when landing the aircraft.

Figure 4 - GPS Ground Speed

GPS Altitude is the aircraft's altitude in either feet or meters as determined by the D1's GPS. GPS altitude will not always match your aircraft's static system-based barometric altimeter, and should not be used as a replacement for one.

Figure 5 - GPS Altitude

GPS Ground Track is the direction that the aircraft is moving over the ground as determined by the D1's GPS. It is displayed both numerically and as a graphical arc. GPS ground track is adjusted for estimated magnetic variation rather than being aligned to true north. However, GPS ground

track will not always match the heading information provided by your aircraft's magnetic heading instrument or compass, and should not be used as a replacement for one.

Figure 6 - GPS Ground Track

GPS Vertical Speed depicts the rate of climb or descent of the aircraft in thousands of feet per minute or meters per second as determined by the D1's GPS. GPS vertical speed will not always match the indication provided by your aircraft's static-based vertical speed indicator, and should not be used as a replacement for one. In the example above, the GPS Vertical Speed is indicating a 400 feet per minute ascent rate.

Figure 7 - GPS Vertical Speed

The **Slip/Skid Ball** provides a visual representation of lateral acceleration. When the ball is within the two vertical lines, the aircraft is in coordinated flight. The slip/skid ball operates independently of GPS reception.

Figure 8 - Slip / Skid Ball

Turn Rate is displayed as a curved magenta bar along the top outside curve of the GPS ground track arc. The bar grows in the direction that the aircraft is currently turning. The inner white markings on the turn rate indicator indicate a half standard-rate turn of 1.5 degree per second. The outer white markings indicate a standard rate turn of 3 degrees per second. The example above depicts a half-standard rate turn to the left.

Figure 9 - Turn Rate

GPS Signal Strength is depicted in the upper left corner of the display. “Ext” is displayed to the right of the GPS Signal Strength indication when the external GPS antenna is connected.

Figure 10 - GPS Signal Strength

Battery Charge Level is depicted in the upper right corner of the display. This indication turns into an AC plug icon when connected to an external power source.

Figure 11 - Battery Charge Level / External Power Source Icons

Left Side

SD Card Slot: Used for software updates.

GPS: Connection port for optional external GPS antenna.

Reset: Recessed reset switch.

Mini-USB: Can be used to charge unit from any USB power source (USB cable not provided).

Figure 12 - D1 Left Side (left to right): SD Card , GPS, Reset, Mini-USB

Top

Menu Button: Hold to enter settings menu.

Power Button: Hold to power on and off.

Figure 13 - D1 Top Side (left to right): Menu Button, Power Button

Right Side

PWR: External power via AC Power Adapter or Vehicle Power Adapter.

Rocker: Used to adjust brightness, align D1 to aircraft, and adjust other settings.

Figure 14 - D1 Right Side (left to right): PWR Port, Rocker

5. BEFORE FIRST USE

Before you use your D1 for the first time, please complete the following initial setup and configuration steps:

- Fully charge the battery (see following section).
- Check for D1 software updates at www.dynonavionics.com.
- Choose settings (see following section).

6. USING YOUR D1

Power On/Off

Turn the D1 on and off by holding the power button on the top of the device. The D1 will also automatically power on any time an external power source is connected.

Charging the Battery

BATTERY INFORMATION

Only use chargers and power adapters specifically designed for the D1! Connecting other chargers **WILL CAUSE DAMAGE** to the D1 that will not be repaired under warranty.

The D1 is powered by an internal Li-Ion battery that provides at least 4 hours of use from full charge when not connected to an external power source. The amount of time that the battery will operate the D1 from a full charge will vary with temperature, GPS visibility, use of the external GPS antenna, and the brightness setting.

CHARGE USING THE AC POWER ADAPTER OR VEHICLE POWER ADAPTER

Only use chargers and power adapters specifically designed for the D1! Connecting other chargers **WILL CAUSE DAMAGE** to the D1 that will not be repaired under warranty.

- Plug the AC Power Adapter into a standard wall plug, or the Vehicle Power Adapter into a vehicle DC socket. The Vehicle Power Adapter is designed to work in cars, 14V aircraft, and 28V aircraft.

- Connect the Power Adapter to the PWR port on the right side of the D1.
- Leave connected for 4 hours to completely charge from empty. Less time will be needed if the battery is partially charged. The D1 may optionally be powered off while it is charging.
- To check for a full charge, disconnect the Power Adapter from the D1 and wait 60 seconds for the battery charge indicator to stabilize. Confirm that it is fully charged.

CHARGE VIA USB

The D1 may also be charged via the mini-USB port on its left side. Any standard mini-USB power adapter that outputs standard USB power (5V DC) may be used. Charging via mini-USB will take longer than when using an AC or Vehicle Power Adapter. The exact charge time will vary with the capability of the mini-USB power adapter used.

If you use a computer as your USB power source, the D1's file system can be seen on your computer. Changing any of the D1's files will likely cause it to become **unstable or inoperable.** Additionally, do not use the D1's file system as a storage device.

ADJUSTING SETTINGS

You can adjust settings such as ground speed units (KTS / MPH / KPH), altitude units (feet / meters), whether or not the D1 turns off when external power is removed/lost, and whether the D1 automatically shuts down after a period of inactivity. To adjust settings on your D1:

- Press and hold the Menu Button to enter the Settings Menu.
- Press the Rocker to advance through different settings.
- Move the rocker up and down to adjust a selected setting.
- When you are finished, press the Menu Button again to exit the Settings Menu.

Mounting Your D1

Mount in the aircraft using one of the provided removable, portable mounts. When mounting the D1, the following alignment constraints must be met:

- A very small amount of roll install error (+/- 6 degrees) can be corrected during the software-based alignment process.
- A much larger amount of pitch (+/- 30 degrees) can be accommodated via software alignment.
- For proper yaw alignment, the unit must be aligned so that the surface of the display is parallel with the lateral axis (wingtip to wingtip) of the aircraft. In other words, the D1 must not be pointed left or right to face you if it is not directly in front of you. Pointing the D1 left or right will cause the attitude, turn rate, and slip/skid ball indications to be degraded.

RAM Suction Cup Mount

- Attach the square RAM mount plate to the plastic D1 cradle using the included hardware.
- Connect the above assembly to the suction base via the included short connecting arm.
- Mount the suction cup to a surface that is capable of supporting the weight of the assembly. A canopy or windscreen that has a minimal amount of curvature is ideal.
- Loosen the knob on the arm to align the cradle so that it meets the roll, pitch and yaw mounting criteria above.
- Tighten the knob to set the orientation of the cradle. Check that the mount and cradle are secure.
- Clip the D1 into the cradle. Start with the bottom of the D1. The D1 will positively snap into the cradle as you press the top side in. The cradle's wings will sit flush along the top and bottom faces of the D1 when it is fully clipped in.
- Check that the D1 is secure.

- If you are using the Vehicle Power Adapter to provide continuous power to the D1, route the wire through the channel along the bottom right of the cradle.

Pinch Mount

- The pinch mount is designed to allow portable use of the D1 in an empty standard 3 ⅛” aircraft instrument hole.
- Retract the mount’s retention arms by pinching together the finger holes on the front of the mount.
- With the retention arms pinched together, place the pinch mount flush against the panel over the instrument hole.
- Let go to wedge the arms in the instrument hole.
- Ensure that the mount meets the roll, pitch and yaw mounting criteria above.
- Check that the mount and cradle are secure.
- Clip the D1 into the cradle. Start with the bottom of the D1. The D1 will positively snap into the cradle as you press the top side in. The cradle’s wings will sit flush along the top and bottom faces of the D1 when it is fully clipped in.
- Check that the D1 is secure.
- If you are using the Vehicle Power Adapter to provide continuous power to the D1, route the wire through the channel along the bottom right of the cradle.
- When using the pinch mount, Dynon highly recommends using the optional external GPS antenna as the D1’s view of the sky is likely to be obscured by aircraft structure.

Align the D1 for Flight

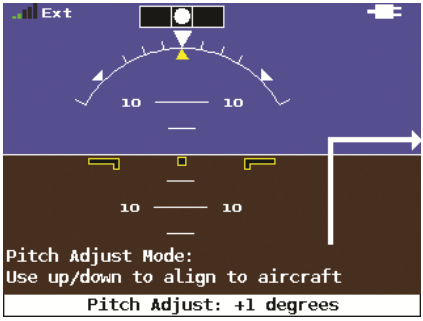

Figure 15 - Pitch Adjust Mode

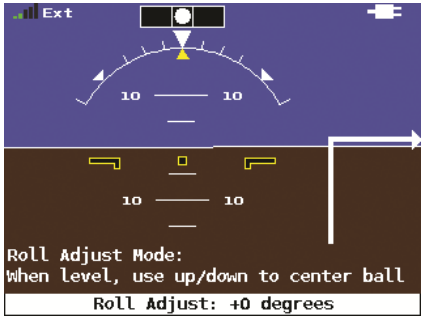

Figure 16 - Roll Adjust Mode

- With the D1 powered on, press the rocker to enter Pitch Adjust Mode. Move the rocker up or down until the displayed pitch matches the pitch of the aircraft.
- Depress the rocker again to adjust roll. Move the rocker up or down until the displayed roll angle indication matches the actual roll angle of the aircraft. If your aircraft is perfectly level, this means that that you want the horizon level and the ball centered.
- The roll and pitch adjust modes will automatically exit after a few seconds of inactivity.
- Wait for a GPS fix. When a GPS fix is attained, the upper left corner of the display will show GPS signal strength, and the main display will display flight instruments.
- If GPS lock takes too long to achieve, or you have the D1 installed in a place where it's internal GPS antenna is unlikely to get a lock (such as in the panel), plug in the external GPS antenna and ensure it has a clear view of the sky. The top of the panel glare shield is usually a good choice for GPS antenna placement.
- Go Fly! ™

- You may find that you need to re-adjust the roll and pitch a bit more in flight. Simply press the Rocker to re-adjust pitch and roll.

Adjusting Brightness for Night Flight

When not adjusting pitch, roll, or any other settings, moving the Rocker up and down will increase and decrease the backlight of the display.

7. PERFORMANCE NOTES

Attitude Performance

Optimal attitude performance depends on a number of environmental factors:

GPS REQUIRED

The attitude indication provided by the D1 is primarily created by combining information from solid state MEMS-type accelerometers and rotation rate sensors, and supplemented by GPS ground speed. In order to display as reliable an indication as possible, a GPS fix is required. The D1 will not display attitude until it has obtained a GPS fix. Once a GPS fix is obtained, it is important that the GPS fix be maintained by either mounting the D1 in a position that affords it a good view of the sky, or, if that is not possible (such as when using the pinch mount to panel-mount the D1), using the included external GPS antenna.

Loss of GPS

Lapses in GPS coverage may degrade attitude accuracy, depending on the length of the outage. During short lapses, the message GPS LOST: CROSS-CHECK HORIZON will appear at the bottom of the display to indicate that the D1's attitude indication may be degraded and should be interpreted cautiously. Additionally, the indications that rely solely on GPS will be replaced with red Xs. If the GPS signal is lost for a more substantial amount of time, the D1's attitude will also be replaced by a red X to indicate the D1's inability to determine attitude.

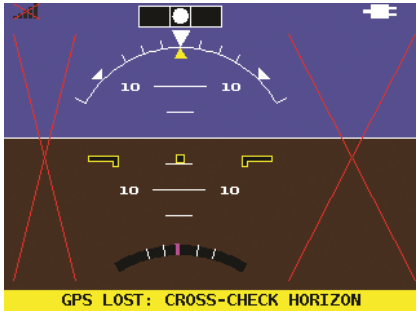

Figure 17 - GPS Lost

ROTATION RATE LIMIT

The D1 will operate normally with rotational rates of up to 150 degree per second around any axis. If a rate of 150 degrees per second is exceeded, HORIZON RECOVERING will be displayed along the bottom of the display. The D1 will continue to display attitude information, but it should be cross-checked against other instruments while in this recovery mode. After a few seconds of straight and level flight, the HORIZON RECOVERING message will automatically disappear when the D1 is confident that it is showing the correct attitude.

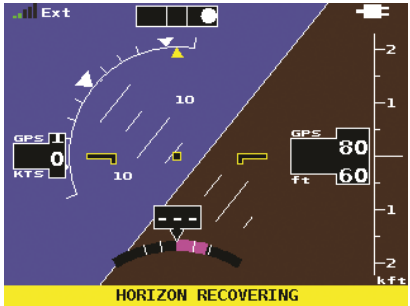

Figure 18 - Horizon Recovering After Rate Limit Exceeded

AEROBATICS AND NON-STANDARD MANEUVERS

The D1's attitude sensing algorithm is based on fixed wing aircraft flight dynamics. Using the D1 during aerobatics or other maneuvers that are not encountered during normal fixed wing aircraft flight may cause the D1's attitude indicator to lag the actual horizon or be otherwise incorrect. This will especially be true if the maneuvers being performed exceed 150 degrees per second as described above. However, once straight and level flight is resumed for a short period, the D1 will automatically recover and display the correct attitude. Additionally, no aerobatic flight maneuver will cause any permanent damage to the D1's attitude sensing ability.

8. SOFTWARE UPDATES

To update the D1's software:

- Check the version of software currently loaded on your D1. The software version is displayed for a few seconds at the bottom of the screen immediately after you press the rocker to acknowledge the safety message upon power on. It is also displayed in the Settings Menu.
- Check www.dynonavionics.com for the latest D1 software version.
- If the version number on the Dynon website is higher than the one your D1 currently has, download the current version from the Dynon website.
- Copy the downloaded .d1s file to an SD card (not included). Put the file on a blank SD card.
- Fully insert the SD card into the D1 until it clicks into place, with the SD Card label facing the back of the D1. You may need to use a small, thin tool – a US quarter works well – to fully engage and click the SD card in the slot.
- Power on the D1.
- The D1 will automatically update and display further instructions and status.
- Remove the SD card once the update is complete. Restart the D1 using the Power Button.
- Confirm that the software is up to date by confirming that the version number shown at power on matches the version you downloaded from the Dynon website.

9. ADDITIONAL MOUNTING OPTIONS

Other RAM® Mounts

The RAM® suction cup mounting system that is included with your D1 can be adapted and customized with the use of other components. These can be purchased directly from www.rammount.com or from any of RAM's authorized dealers. The RAM® components that come with the D1 use the B size (1" diameter) ball. Some specific RAM® components that may be useful in aircraft include:

RAM-B-259U: 1" x 1" glare shield clamp base with 1" ball (finger screws)

RAM-B-247U-15/17/2/25/3/4: Square rail clamp base with 1" ball, available in various widths (designated by numerical suffix)

Note that the FAA and other regulatory agencies do not permit permanent mounting of portable products in type certificated aircraft. All of the mounts included with the D1 can be fixed and removed without the use of tools.

Included RAM® Mount Components

Replacements for the included RAM® mounting system can be purchased directly from RAM® Mount and their authorized dealers. The RAM® components that come included with the D1 are:

RAP-224-1U: Suction cup base (3.3" diameter) with twist lock

RAM-B-201U-A: Short double socket arm for 1" ball bases

RAM-B-347U: AMPS square base with 1" ball

10. TROUBLESHOOTING

Problem Description	Possible Cause	Solution
The D1 does not power on	Battery is completely discharged	Charge the battery; Additionally, the D1 will automatically power on when external power is applied via the power port on the right side of the unit
	The brightness is turned all the way down	Move the Rocker up to brighten the display Alternatively, power cycle the D1. The D1 always turns on at a brightness setting that is high enough to see
	The unit needs to be reset	Plug the unit into external power Insert a paperclip or other similar tool in the small round RESET button hole on the left side of the unit
The D1 does not power on, even when power is applied to the charging port on the right side of the unit	D1 may be damaged	Contact Dynon Avionics technical support staff

Problem Description	Possible Cause	Solution
Battery life is too short	Battery is either not being fully charged, or is worn out	Confirm that you are fully charging the D1 before use. If this does not solve the issue, contact Dynon Avionics technical support staff
Battery display does not change to the plug icon when plugged in to the wall	No power at wall outlet	Check that power source is supplying power
Battery display does not change to the plug icon when plugged in to a vehicle	Fuse blown	Check the fuse in the body of the vehicle charger plug
	No power coming from vehicle	Check that vehicle is supplying power
The D1's attitude indication is incorrect	Improper alignment	Ensure that the D1 is correctly oriented in the yaw axis and is NOT pointed left or right towards the pilot Redo the alignment process to ensure that the displayed attitude is correct

Problem Description	Possible Cause	Solution
The ball is not centered, but the D1/aircraft is definitely level	Roll adjust is not correct for the current mounting position	With no menu displayed, depress the Rocker switch twice to enter the Roll Adjust mode. Adjust to center the ball
The horizon zero pitch line is not centered on the zero pitch indication, but the D1/aircraft is definitely level	Pitch adjust is not correct for the current mounting position	With no menu displayed, depress the Rocker switch once to enter the Pitch Adjust mode. Adjust until the displayed pitch matches the aircraft pitch attitude
The D1's speed, altitude, and/or track indication does not match my other aircraft instruments	This is expected behavior	The D1's instruments are GPS based and will not match the other permanently-mounted pneumatic and magnetic instruments in your aircraft
The D1's screen is too dim	Display brightness has been turned down	Move the Rocker up to increase the brightness level of the display
The D1 does not find a software update on an SD card	The SD card is not properly seated	Remove and reinsert the SD card. Ensure that the SD card positively "clicks" into place

11.SPECIFICATIONS

All specifications are subject to change without notice or obligation.

PHYSICAL

Dimensions (exclusive of projections/buttons/switches)

3.63 inches (92mm) W
3.26 inches (83mm) H
1.16 inches (29mm) D

Weight

7.1 oz (201g)

Temperature Range

Operating/Charging (allowable): -15˚C (5˚F) to 60˚C (140˚F)
Operating/Charging (for best battery lifespan): -15˚C (5˚F) to 45˚C (113˚F)
Short Term Storage (<3 months): -20˚C (-4˚F) to 45˚C (113˚F)
Long Term Storage (>3 months): -10˚C (14˚F) to 20˚C (68˚F)

POWER

Internal Li-Ion Battery

4+ Hours Run Time (worst case from full charge)

DC PWR Port Charging

5V DC (D1-specific chargers ONLY)

Mini-USB Port Charging:

Standard 5V USB power

12. REQUESTING SUPPORT / REPAIR

Before contacting Dynon Avionics Technical Support, please consult the Troubleshooting section of this guide for solutions to common issues.

In some circumstances, performing a reset may fix some issues. To reset the D1:

- Plug the unit into external power.
- Insert a paperclip or other similar tool in the small round RESET button hole on the left side of the unit. Push until you feel the reset button “click”.
- The D1 should now power on.

When contacting Dynon Technical Support, have your D1 at hand. If possible, have the AC Adapter (charger) also at hand to provide power if there is a battery issue.

DYNON AVIONICS TECHNICAL SUPPORT CONTACT INFORMATION

Phone: (425) 402-0433 7:00 AM - 4:00 PM (Pacific), Monday - Friday
Email: support@dynonavionics.com
Web: www.dynonavionics.com

13. NOTES

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