



# **GHOST GUNNER 3**

# **OPERATOR'S MANUAL**

An open source project by **DEFENSE DISTRIBUTED**

# Safety

Ignorance is dangerous. Read and understand this manual prior to using Ghost Gunner.

The following precautionary statements are used throughout this manual:

- Danger:** Indicates a hazardous situation that will result in death or serious injury.
- Warning:** Indicates a hazardous situation that could result in death or serious injury.
- Caution:** Indicates a hazardous situation that could result in minor or moderate injury.
- Note:** Indicates information considered important but not hazard related.

**Warning:** *Crush hazard. Ghost Gunner's gantry and table can crush, pinch and tear body parts. Do not reach into Ghost Gunner except as indicated, AND only when the machine is at a complete stop.*

**Warning:** *Extremely sharp rotating cutter inside. Secure spindle with wrench prior to servicing cutting tool, following the procedure outlined in this manual. The spindle will not spin when sufficient holding force is applied via wrench.*

**Caution:** *Ghost Gunner is computer controlled and can start automatically whenever power is applied and the emergency stop switch is not engaged. Keep hands away from all pinch points and cutting surfaces at all times.*

**Caution:** *Never use a dropped, visibly damaged, dull, or suspect cutting tool, as it could shatter. End mills are extremely brittle and should be discarded if dropped, to prevent latent failure while the tool is in motion.*

**Caution:** *The front entry guard is only intended to contain chips, and is not designed to contain an improperly secured work piece or shattered end mill. The front entry guard is not a substitute for safety glasses.*

**Caution:** *Always wear eye and ear protection when operating Ghost Gunner. Do not wear rings, watches, necklaces, loose clothing, or long hair down while operating Ghost Gunner. Wear gloves when handling parts and cleaning chips, but not while operating the machine. Steel chips produced during steel machining operations are razor sharp.*

**Caution:** *The software emergency stop button will only work if Ghost Gunner has a valid USB connection to the host and the host processes the emergency stop command. Due to the indeterminacy of modern operating systems, the software emergency stop button is not guaranteed to stop Ghost Gunner in a reasonable time period, or at all if Ghost Gunner isn't enumerated as a USB device and communicating with the host software.*

**Note:** *Ghost Gunner has a dedicated hardware emergency stop button, which always immediately disables motion.*

**Caution:** *Ghost Gunner's spindle and stepper motors generate considerable heat during operation and remain hot for several minutes after unplugging. Prolonged contact with these components could result in minor burn injuries.*

**Caution:** *Machined parts retain heat during the manufacturing process. Do not touch parts until cool.*

**Note:** *Ghost Gunner is not a consumer device. It is the user's responsibility to operate Ghost Gunner per OSHA 1910.212 - Milling Machine, ANSI B11.8-1983, and OSHA 3067, as amended.*

# Unboxing

Ghost Gunner 3 ships upside down. To remove Ghost Gunner from the shipping container and prepare for use:

- Remove the cardboard accessory box.
- Remove QTY4 foam corners.
- Lift GG3 out of box, using built-in handles on either side.
- Place GG3 (upside down) on a level surface.
- Remove shipping tape from clear chip cover.
- Gently rotate GG3 upright (large opening is bottom).  
**Note:** Do not rest GG3 on the emergency stop button (located on GG3's left side).
  
- Remove the large shipping foam insert from the cardboard box and place on a level surface.  
**Note:** Keep the cardboard box and all foam for future transportation needs; protecting a 43 pound precision milling machine during shipping is difficult without specific packaging. Replacement packaging can be purchased, if needed. Do not ship Ghost Gunner without OEM packaging!
  
- Place Ghost Gunner into the cutout in the large shipping foam insert.  
**Caution:** If the foam insert is not used, Ghost Gunner can 'walk' on low friction surfaces. If placed directly onto a low friction surface (e.g. stainless steel, glass, etc), Ghost Gunner could 'walk' off the table, falling to the floor below.
  
- Connect Ghost Gunner's power cable to a grounded power outlet.  
**Warning:** To ensure continued safe operation, Ghost Gunner MUST connect to earth ground via a three-pronged IEC power cord connected to a properly grounded outlet. Do not attempt to defeat Ghost Gunner's three-prong power cable. Defeating the ground protection prong on the included power cable poses an electrocution hazard. Ghost Gunner is a single-insulated electronic device with a metal enclosure that must be hardwired to earth ground. Removing the ground prong from the power cable defeats this safety feature, which could cause the entire enclosure to become energized if another fault then occurred (e.g. if a stray metal chip bridged from the internal power supply to the enclosure).
  
- Connect Ghost Gunner's USB cable directly into the host computer.  
**Note:** Ghost Gunner requires a low-latency connection to the host computer. While GG should operate properly when plugged into a powered USB hub, we recommend connecting directly to the host computer.
  
- Rotate the red emergency stop button clockwise until it pops out.  
**Note:** The host computer cannot communicate with Ghost Gunner if the emergency stop button is engaged.

# Packing List

Ghost Gunner ships with the following items:

Part	Quantity
Ghost Gunner 3 CNC	1
12 mm open-ended wrench	1
17 mm open-ended wrench	1
ER11 collet nut	1
USB A-B cable (2 meter)	1
NEMA 5-15/IEC C13 power cable	1
USB Flash Drive	1
Operator's Manual	1

Manufacturing 80% receivers requires additional parts, which are bundled into starter kits (purchased separately).

# Environment

Operate Ghost Gunner in a shop environment conducive to stray metal chips. Ghost Gunner's enclosure is not designed to retain all metal chips produced during the milling process. Metal chips are electrically conductive and can destroy computers. For this reason, do not place the host computer directly adjacent to Ghost Gunner. Ideally the computer should be placed:

- 1 meter away from Ghost Gunner (the included USB cable is 2 meters long), and;
- above Ghost Gunner (e.g. by placing the computer on a textbook, block, etc).

Ghost Gunner must operate in the upright position to prevent chip ingress into sensitive bearing components. Ghost Gunner's chip guards rely on gravity to safely route chips away from sensitive components.

**Note:** Always vacuum all stray chips from Ghost Gunner before turning upside down.

Do not use compressed air inside Ghost Gunner. Compressed air can blow chips past Ghost Gunner's gravity chip guards. This could cause linear bearings to seize and/or damage to electrical components within Ghost Gunner.

**Note:** Vacuuming is the only approved method to remove chips from Ghost Gunner.

# Software

## Background

Ghost Gunner is primarily intended for use with DDcut. DDcut replaces arduous CNC concepts with simple step-by-step instructions and automated milling code. This is accomplished via the '.dd' file format, which allows experienced users to create and distribute self-contained '.dd' files (e.g. AR15.dd, 1911.dd, P80.dd, etc). DDcut interprets these .dd files into physical objects, without any prior manufacturing knowledge. Thus, inexperienced users are able to manufacture previously designed objects with zero prior CNC experience.

**Note:** See "Creating .dd Files" for file format specifications and implementation-specific details.

## Installation

**Note:** DDcut is included on the USB Flash drive that shipped with your Ghost Gunner.

**Note:** DDcut is also available at [ghostgunner.net/downloads](http://ghostgunner.net/downloads).

To install DDcut in Windows:

- Double click on DDcutWindows.exe.
- Follow the installation instructions.
- Launch DDcut and follow the onscreen instructions.

To install DDcut in Mac OS:

- Double click on DDcut.dmg
- Drag DDcut.app into the Applications folder
- Double click on DDcut.app in the Applications folder.

**Note:** If the message "DDcut.app can't be opened because the identity of the developer cannot be confirmed" is displayed, click ok, then right click DDcut.app and select Open. A similar dialogue will appear, with an option to "Open".

## Running .dd Files in DDcut

- After launching DDcut, wait for DDcut to establish a connection to Ghost Gunner.

**Note:** DDcut cannot communicate with Ghost Gunner if the hardware emergency stop button is engaged.

- Click 'RUN' and then select a .dd file to manufacture.

**Note:** Due to ITAR regulations, firearms-related .dd files are not available online. Find them:

-On the USB drive included with Ghost Gunner

-On the USB drive included with each firearm starter kit.

-On a separate USB drive available for purchase at a nominal price at [ghostgunner.net](http://ghostgunner.net)

**Note:** We recommend only running .dd files obtained from trusted sources.

-See "Inspecting .dd Files for Malicious Content" for more information.

- Follow the onscreen instructions to manufacture the chosen object.

**USERS DESIRING TO MANUFACTURE ONLY EXISTING .DD FILES CAN STOP READING THE MANUAL HERE.**

## **Complete GG3 Manual Location**

This version is a quickstart guide only, for those users that do not intend to create their own .dd files.  
The complete GG3 Operator's Manual is accessible from within DDcut (Click on "Support>View Manual").