Control Solutions has been providing military systems for over 20 years. Our Turret Control System (TCS) has been fielded on over 70,000 platforms including all of the HMMWVs and MRAPs in use by the U.S. Military.

The Warfighter relies on our products to reduce gunner fatigue and improve their safety, while keeping their eyes on the mission and hands on the weapon.

Control Solutions LLC is your one-stop solution provider for tough motion control problems. Our team of engineers and ISO-certified manufacturing personnel stand ready to quickly solve, design, and manufacture your custom solution today.
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</tr>
</tbody>
</table>

All specifications subject to change without notification.
Remote Fire Option (RFO) System
Remote Operation of Turrets for Tactical Vehicles

Features/Benefits
- Enables existing powered turrets to be remotely operated from inside the protection of the vehicle
- Allows threat engagement while providing maximum protection during overwatch
- Remote target engagement via joystick trigger
- RFO user interface options available
- View the threat environment on hi-res video display
- Major Improvement in crew safety and system effectiveness

Description
The Remote Fire Option (RFO) system is a simple add-on to existing manned turrets currently installed in MRAPs and other tactical vehicles. It allows the gunner to remotely operate the gunner station during “overwatch” while protected inside of the armored vehicle, thus reducing gunner exposure to sniper fire, indirect fire, and enemy assaults.

When the gunner senses the need to switch to remote fire operations, they can engage the RFO functionality and move into the protected hull of the vehicle.

When engaged, the RFO:
- Locks the gun in alignment with the camera
- Enables the firing solenoid
- Activates camera, display, traverse and elevation drives, and remote joystick for control of the turret
- The gunner then uses the camera/joystick to locate the target and the trigger button to engage the target.

The RFO system consists of low-cost, commercial-off-the-shelf components. These “plug-and-play” components include a remote fire solenoid, traverse and elevation drives, day/night camera with infrared illuminator, user interface with color display, joystick and trigger, all of which are easily integrated into existing turrets. The RFO weapon system is simple to operate with minimal training while providing a major tactical advantage by allowing the gunner to deliver suppressive firepower from a protected position.

About Us
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Remote Fire Option Operation

**Pull**
Pull the RFO handle towards you until you feel it clear the indent slot from the manual position.

**Target**
Acquire the target by using the joystick on the user’s interface.

**Turn**
Turn the RFO handle clockwise until it engages the RFO elevation drive. The system is now activated. *(Reverse the procedure to return to manual position.)*

**Fire**
Fire the weapon by using the red fire button on the user’s interface.
Features/Benefits

- Non-Lethal launcher integrated with a Light Weight Turret
- The turret hatch provides easy access to the launcher to be able to quickly reload or change the non-lethal cartridge as needed.
- Turret provides a stable platform for the launcher that can be remotely operated from inside the vehicle, improving crew safety and survivability.
- Turret provides azimuth and elevation motion control to focus launcher on target without having to point vehicle at target.
- Large capacity launcher provides capability to address larger crowds or utilize different types of rounds.
- Rotates 360 degrees in less than 7 seconds.
- Camera system calibrated with turret elevation to show targeted area.
- Camera/video assists and aiming non-lethal cartridges toward the highest threats.
- Weapon mount can accommodate both/either lethal and non-lethal weapons systems to changing levels of threat.

Description

The CS5280 Non-lethal Remote Firing Option (RFO) for riot control vehicles integrates a light weight turret with a non-lethal launcher, camera, and remote control system can be easily mounted to a riot/crowd control vehicle.

By integrating the non-lethal launcher onto a turret system, the user is easily able to control the point of aim (azimuth and elevation) independent of the orientation of the vehicle. This is a significant advantage over a static launcher installation which is only able to target one point, addressing only a single threat directly in front of the vehicle. The elevation control of the turret allows the crew to be able to target threats at various distances on the move as needed.

The base camera provides situational awareness as well as general aiming of the launcher. Optional cameras can be installed to provide infrared or thermal views of the area to be able to see in low light or smoke obscured conditions.

The crew is able to reload or change the canisters loaded in the launcher easily through the hatch of the turret, without having to climb on the exterior of the vehicle, enhancing the safety and security of the crew.

As an option, a lethal weapon can be accommodated on the same platform to address various threat levels. The lethal weapon can also be remotely controlled from inside the safety of the vehicle.

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CS5000 Series Lightweight Gun Turret

Features/Benefits
- Lightest powered turret on the market (165 lbs.)
- Motorized, hand-cranked and manual models available
- Common ring-mount solution for various vehicles
- Fixed or Flexible A-Frame Available
- Flexible A-Frame provides gun tilt range from -15 to +30 degrees
- Easy vehicle integration and installation
- Supports multiple weapon systems
- Optional gun shield and gunner protection kits in steel, ceramic or composite armor

Description
The CS5000 Series Turrets are the lightest turrets on the market today. The Lightweight Gun Turret (LGT) provides a one-piece system that can be easily mounted on almost any vehicle. The base turret weight is only 165 lbs (75kg) making it an ideal choice for tactical vehicles. Reducing the vehicle weight will continue to be a key requirement of military and police forces worldwide.

We have many configurations to choose from to fit your budget and needs. We have our base, hand-cranked version to a fully motorized turret with weapon mounted turret controllers, which allows the gunner to operate via a finger-tip or thumb controller without taking their eyes off the target.

The CS5000 table below shows the base unit and common specifications. This is a good starting point when trying to spec a turret for your vehicle.

CS5000 Series Common Specifications

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall weight, pounds (metric)</td>
<td>165 lbs (75kg) [without weapon or pintle mount]</td>
</tr>
<tr>
<td>Turret Ring Diameter, Inches (mm)</td>
<td>ID: 30.2 (768) – OD: 38.8 (978)</td>
</tr>
<tr>
<td>Vehicle rooftop mounting hole, Inches (mm)</td>
<td>36 (915) nominal using M10 bolts</td>
</tr>
<tr>
<td>Armament Qualified with 7.62mm – 12.7mm – 40mm AGL, buffered mount recommended</td>
<td></td>
</tr>
<tr>
<td>Safe zone No-fire zone can be installed preventing traverse of the LGT in this area</td>
<td></td>
</tr>
<tr>
<td>Protection for gunner Can be modified to provide ballistic protection up to STANAG 4569 level 3</td>
<td></td>
</tr>
<tr>
<td>Overhead protection Adjustable ballistic top cover protection can be installed</td>
<td></td>
</tr>
</tbody>
</table>

All specifications subject to change without notification.

Visit our website: www.controls.com
## Specifications

### Common for all models

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage</td>
<td>24 VDC</td>
</tr>
<tr>
<td>Overall weight, pounds (metric)</td>
<td>165 lbs (75kg) [without weapon or pintle mount]</td>
</tr>
<tr>
<td>Turret Ring Diameter, Inches (mm)</td>
<td>ID: 30.2 (768) – OD: 38.8 (978)</td>
</tr>
<tr>
<td>Vehicle rooftop mounting hole, inches (mm)</td>
<td>36 (915) nominal using M10 bolts</td>
</tr>
<tr>
<td>Armament</td>
<td>Qualified with 7.62mm – 12.7mm – 40mm AGL, buffered mount recommended</td>
</tr>
<tr>
<td>Adjustable gun mount A-frame</td>
<td>-15° to +30°</td>
</tr>
<tr>
<td>Manual operation</td>
<td>Yes (if vehicle power fails)</td>
</tr>
<tr>
<td>Safe zone</td>
<td>No-fire zone can be installed preventing traverse of the LMGT in this area</td>
</tr>
<tr>
<td>Protection for gunner</td>
<td>Can be modified to provide ballistic protection up to STANAG 4569 level 3</td>
</tr>
<tr>
<td>Overhead protection</td>
<td>Adjustable ballistic top cover protection can be installed</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model</th>
<th>Base</th>
<th>Power Train</th>
<th>Flex A-Frame</th>
<th>Fixed A-Frame</th>
<th>Hatch Cover</th>
<th>Hand Crank</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS5200</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>—</td>
<td>■</td>
<td>—</td>
</tr>
<tr>
<td>CS5210</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>CS5230</td>
<td>■</td>
<td>■</td>
<td>—</td>
<td>■</td>
<td>■</td>
<td>—</td>
</tr>
<tr>
<td>CS5240</td>
<td>■</td>
<td>■</td>
<td>—</td>
<td>■</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>CS5300</td>
<td>■</td>
<td>—</td>
<td>—</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>CS5310</td>
<td>■</td>
<td>—</td>
<td>■</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>CS5330</td>
<td>■</td>
<td>—</td>
<td>—</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>CS5340</td>
<td>■</td>
<td>—</td>
<td>—</td>
<td>■</td>
<td>—</td>
<td>■</td>
</tr>
<tr>
<td>CS5350</td>
<td>■</td>
<td>—</td>
<td>—</td>
<td>■</td>
<td>—</td>
<td>■</td>
</tr>
</tbody>
</table>

■ = assemblies included.

---

**Note:** Specifications are subject to change without notice.
<table>
<thead>
<tr>
<th>Assemblies</th>
<th>Description</th>
</tr>
</thead>
</table>
| Flex A-Frame   | Flexible frame provides gun tilt range from -15 to +30 degrees. The Flexible A-frame is ideal for urban or mountainous operational environments where engagement of the enemy from an elevated position is a concern. The Flexible A-Frame allows for easy/quick weapon height adjustment for gunners of varying height profiles.  
  • Supports multiple weapon systems  
  • Light weight aluminum construction |
| Fixed A-Frame  | Rigid sturdy frame  
  • Supports multiple weapon systems  
  • Light weight aluminum construction |
| Hatch Cover    | Light weight hatch cover weighs only 35lbs.  
  • Light weight aluminum construction  
  • Can be modified to provide ballistic protection up to STANAG 4569 level 3 |
| Base           | Common on all CS5000 Series Light-Weight turrets.  
  • Smooth bearing operation.  
  • Light weight aluminum construction |
| Power Train    | For all Motorized LWT  
  • Built-in rotary slip ring that connects to vehicles power source, eliminates the need for turret batteries  
  • Rotate 360° in less than 7 seconds  
  • One finger operation using Control Solutions Weapon Mounted Gun Turret controllers  
  • Light weight aluminum construction |
| Hand Crank     | Manual hand crank for the CS5300 Series turrets.  
  • No power needed.  
  • Light weight aluminum construction |
### CS5200 Series Lightweight Motorized Gun Turrets

<table>
<thead>
<tr>
<th>Turret</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS5200</td>
<td>Base Turret, Flex A-Frame, Hatch, Power Train. Flexible A-Frame provides gun tilt range from -15 to +30 degrees. Built-in rotary slip ring connects to vehicle's power source, eliminates the need for turret batteries. One finger motorized operation using optional accessories CS3210A or CS3320 Weapon Mounted Turret controllers (WMTC).</td>
</tr>
<tr>
<td>CS5210</td>
<td>Base Turret, Flex A-Frame, Power Train. Flexible A-Frame provides gun tilt range from -15 to +30 degrees. Built-in rotary slip ring connects to vehicle's power source, eliminates the need for turret batteries. One finger motorized operation using optional accessories CS3210A or CS3320 Weapon Mounted Turret controllers (WMTC).</td>
</tr>
<tr>
<td>CS5230</td>
<td>Base Turret, Fixed A-Frame, Hatch, Power Train. Built-in rotary slip ring connects to vehicle's power source, eliminates the need for turret batteries. One finger motorized operation using optional accessories CS3210A or CS3320 Weapon Mounted Turret controllers (WMTC).</td>
</tr>
<tr>
<td>CS5240</td>
<td>Base Turret, Fixed A-Frame, Power Train. Built-in rotary slip ring connects to vehicle's power source, eliminates the need for turret batteries. One finger motorized operation using optional accessories CS3210A or CS3320 Weapon Mounted Turret controllers (WMTC).</td>
</tr>
</tbody>
</table>

### CS5300 Series Lightweight Hand-Crank Gun Turret

<table>
<thead>
<tr>
<th>Turret</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS5300</td>
<td>Base Turret, Flex A-Frame, Hatch, Hand-Crank. Flexible A-Frame provides gun tilt range from -15 to +30 degrees.</td>
</tr>
<tr>
<td>CS5310</td>
<td>Base Turret, Flex A-Frame, Hand-Crank. Flexible A-Frame provides gun tilt range from -15 to +30 degrees.</td>
</tr>
</tbody>
</table>
## CS5300 Series Lightweight Hand-Crank & Manual Gun Turret

### CS5330 includes the following:
- Base Turret
- Fixed A-Frame
- Hatch
- Hand-Crank

### CS5340 includes the following:
- Base Turret
- Fixed A-Frame
- Hand-Crank

### CS5350 includes the following:
Entry level manual turret.
- Base Turret
- Fixed A-Frame
- Base Manual Locking Handle
Lightweight Turret Applications

The CS5000 Series of lightweight turrets are ideal for many uses including but not limited to, military police, SWAT, boarder guard posts and other vehicle applications where weight and center of gravity issues are of primary concern.

Custom and Non-lethal Solutions

We can design and configure our turrets for non-lethal applications as well.
**Features/Benefits**

- Supports payloads up to 2200 lbs.
- One finger motorized operation on the move
- Ideal for APC’s with ballistic steel gunner protection kits.
- Common ring-mount solution for various vehicles
- Easy vehicle integration and installation
- Supports multiple weapon systems
- Self contained power slip ring allows turret to be powered from vehicle, eliminates the need for external batteries.
- Manual Override

**Description**

When your tactical wheeled vehicles need a larger turret capable of supporting heavier weapon systems, the Heavy Duty Turret (HDT) by Control Solutions meets those specifications.

With our line of turret accessories, slip rings, hatches, gun mounts, weapon-mounted controllers, spotlights, auxiliary power modules, gunner protection kits and more, the HDT system has the flexibility you can spec for your tactical vehicle.

**About Us**

Designing and manufacturing field-hardened systems to meet the challenges of the military for over 20 years. Control Solutions LLC, your rapid-response provider of motion control solutions.
Heavy Duty Turret (HDT)

Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Supported Weight</td>
<td>2200 lbs</td>
</tr>
<tr>
<td>Voltage</td>
<td>24 VDC</td>
</tr>
<tr>
<td>Overall weight, pounds (metric)</td>
<td>490 lbs (222) [without weapon or pintle mount]</td>
</tr>
<tr>
<td>Turret Ring Diameter, Inches (mm)</td>
<td>ID: 30.7 (780) – OD: 45.25 (1150)</td>
</tr>
<tr>
<td>Vehicle interface mount plate inches (mm)</td>
<td>Overall OD: 45.25” (1148 mm), Vehicle Mount BC. Dia.: 42.25” Dia. (1073 mm) Qty. 20 clearance holes: .65” (16.51 mm). Required ID clearance: 37.25” (946 mm)</td>
</tr>
<tr>
<td>Gun Mount interface plate</td>
<td>Overall OD: 41.25” (1048 mm), B.C. Interface 40.13” (1019 mm) Qty. 18 0.50”-13UNC. Internal gunner clearance 30.7” (780 mm) Dia. minus gear drive train provisions.</td>
</tr>
<tr>
<td>Height above vehicle mount interface (fay surface)</td>
<td>Top plate surface: 3.3” (84 mm), Top Plate Bearing Cap 4.7” (119).</td>
</tr>
<tr>
<td>Depth below vehicle mount interface (fay surface)</td>
<td>Slip ring guard: 2.1” (53 mm), Bottom of drive unit: 6” (152 mm), Note: Distance manual drive wheel extends below bottom of drive unit depends on wheel diameter selected.</td>
</tr>
<tr>
<td>Armament</td>
<td>Can be manufactured to: NATO or Non-NATO specifications</td>
</tr>
<tr>
<td>Manual operation</td>
<td>Yes [if vehicle power fails]</td>
</tr>
<tr>
<td>Protection for gunner</td>
<td>GPK can be provided per customers specifications</td>
</tr>
<tr>
<td>Overhead protection</td>
<td>Ballistic hatch cover can be provided per customer specification.</td>
</tr>
</tbody>
</table>

CS6400 Series Diagram

Note: Specifications are subject to change without notice.
Heavy Duty Turret Applications

The CS6400 HDT turret is ideal for the larger MRAPS and Armored Personnel Carriers that can support payloads up to 2200 lbs.
CS7100 Turret Drive System

Features/Benefits
- Turret Drive System for tactical vehicles
- Provides power to move turrets with payloads up to 2000 lb /910 kg (dependent upon gunner protection kit (GPK)/weapon geometry).
- Easy to use engagement/disengagement handle
- Manual Override
- Ideal for driving manual turrets with heavy GPKs/ cupolas
- Cost effective and efficient solution for automating existing manual turrets

Description
The CS7100 Turret Drive System (TDS) provides smooth, proportional acceleration and control of tactical vehicle turrets. This fully integrated proprietary system combines a rugged military-grade variable speed motor and battle-tested DC motor controller into one easy to install assembly. Operation of the turret is via our CS3209 Joystick, CS3210A Thumb Drive or the CS3310 Fingertip Drive Actuators.

The Problem: Tremendous physical effort is required for the gunner to manually rotate turrets with heavy GPKs and cupolas. Manually operated turrets also require the gunner to disengage the target while slewing the weapon.

The Solution: The CS7100 TDS enables the following:
1. Quicker target acquisition = Increased lethality
2. With the CS3210A or CS3310, the gunner never has to remove hands from weapon to traverse turret and can maintain a constant sight picture during engagements.
3. Better control over weapon positioning than non-powered solutions
4. Less gunner fatigue. The turret can be easily operated under high slope/gradient conditions.

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CS7100 Turret Drive System Specifications

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size (HxWxL Inches (mm))</td>
<td>16.5 x 7.58 x 7.10 (419 x 193 x 180)</td>
</tr>
<tr>
<td>Weight, pounds (metric)</td>
<td>35 lb (16kg)</td>
</tr>
<tr>
<td>Operating voltage</td>
<td>24V</td>
</tr>
<tr>
<td>Operating current</td>
<td>&lt;10A</td>
</tr>
<tr>
<td>Maximum supported payload weight, pounds (metric)</td>
<td>2000 lb, (910 kg)</td>
</tr>
<tr>
<td>Rotations per minute</td>
<td>6-8 based on configurations of turret.</td>
</tr>
<tr>
<td>Manual operation</td>
<td>Yes (if vehicle power fails)</td>
</tr>
</tbody>
</table>

All specifications subject to change without notification.

Also available in horizontal configuration.

CS7100 Turret Drive System
## Accessories

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
</table>
| **CS3210A** Weapon Mounted Turret Controller | • Maintain positive control through simultaneous turret and weapon control  
• Smooth two-direction turret slew control  
• Left-side or right-side mounting configurations on the M2 or MK19)  
• Directly cabled to BPMTU/ITDS controller via Mil-C-5015  
• No tools needed to mount WMC |
| **CS3310, CS3320, CS3330** CS3300 Series Weapon Mounted Turret Controllers | • Durable hook & loop fastening system allows for secure mounting to different weapon stock shapes  
• Directly cabled to BPMTU/ITDS controller  
• CS3310 mounts to the right-hand side of the stock of the M240B weapon.  
• CS3320 mounts to the right-hand side of the stock of the M249 weapon  
• CS3330 mounts to the right-hand side of the M249 collapsible buttstock. |
| **CS3209B** Joystick | • Waterproof and dustproof  
• Gasket-sealed aluminum enclosure with magnetic base  
• EMI hardened  
• Designed and manufactured in the U.S.A.  
• Designed to comply with U.S. and European safety standards and regulations  
• Single axis, non contact hall-effect technology for long life  
• Used in conjunction with CSLLC's CS3248 improved Turret Drive System motor controller, CS3208 BPMTU controller and all CS5200 Series Turrets |
| **CS2152** TCS Auxiliary Power Module | • Provides in-turret power for gunner accessories  
• Includes 12V and 24V protected circuits for gunner station accessories  
• Includes 5V USB power outlet  
• Power is independent of vehicle battery  
• Sealed Connections allow for all-weather day and night operation  
• Compatible with weapons mounted controller |
| **CS3460** Gun Turret Spotlight | • High-intensity white LED light and night-vision in same unit  
• Powerful LED white light visible for over 150 meters  
• Wide-angle IR light for use with night vision devices  
• Single-switch operation from Turret Auxiliary Module  
• Mounts easily onto either side of the O-GPK |
| **CS5400** Large-diameter Turret Slip Ring | • Allows turret to be powered from vehicle batteries; eliminates turret batteries and reduces weight  
• Multiple data and video channels; simultaneous uplink & downlink  
• Floating design; isolated from vehicle vibrations  
• Environmentally sealed; retrofittable |
Founded in 1989, Control Solutions designed the first microprocessor-based DC motor controller used in the scooter industry. Since then, Control Solutions has grown to become the industry leader in motion-control solutions.

Today, that technology is used in our military products such as our Turret Control System (TCS) and Powered Door Systems (PDS). We have over 70,000 turret motion control systems fielded to the U.S. Government.

- Located in Aurora, IL USA
- 75 employees, 20 engineers
- Integrated design & manufacturing facility: 130,000 sq. ft.
- Products are “Made in USA” using an international supply chain
- Rapid growth has resulted from selection of CSLLC’s motion control technology for commercial and military markets
- Urgent operational requirements in Iraq and Afghanistan created a need for rugged, safety and survivability systems for tactical wheeled vehicles
- Rapid design, prototyping and delivery to meet extreme performance and environmental demands
- Fielded over 70,000 turret motion control systems to the U.S. Government
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Business Development Manager
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Email: bflorack@controls.com