



CONTROL
SOLUTIONS™

TURRET SYSTEMS AND ACCESSORIES CATALOG

2017



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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* Patent Pending



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All specifications subject to change without notification.



Remote Suppressive Fire™ (RSF) System

Remote Operation of Turrets for Tactical Vehicles

Patent Pending

Features/Benefits

- Enables the existing turret to be remotely operated from inside the vehicle
- Gunner can be protected inside the vehicle cabin and not exposed to overhead/blast threats
- Provides stabilized suppressive fire via joystick trigger
- Target can be viewed via the video display
- Improves crew safety and survivability
- Cost effective and seamless upgrade to already fielded turrets/gunner protection kits

Description

The **Remote Suppressive Fire™ (RSF)** system allows the crew to remotely operate the gunner station while protected inside of the armored vehicle. The RSF is a simple add-on to existing manned turrets currently in use on up-armored HMMWV's and MRAPS. It provides critical "shoot-on-the move" suppressive fire capability and enables the gunner to be protected from high-threat scenarios such as sniper fire, artillery/mortar attacks, and IED environments.

When the gunner senses the need for better protection, he can move down inside the vehicle and switch to remote engagement mode by pressing a button on the control box. This locks the gun in alignment with the camera and activates the firing solenoid, camera, display, weapon stabilization, elevation drive, and joystick. The gunner then uses the joystick and trigger button to acquire and engage the target with suppressive fire.

The RSF is not a replacement for CROWS. Instead, the RSF fills a major capability gap between the GPK and CROWS by providing a suppressive fire capability in dangerous situations. Unlike CROWS, **RSF does not require an expensive ballistic computer, laser ranging** or CROWS-like precision. The RSF provides the gunner with the same functionality as a traditional manned turret but from inside the protected confines of the armored vehicle.

The RSF consists of commercial-off-the-shelf components. These "plug-and-play" components include a remote fire solenoid, gun elevation drive, day/night camera with infrared illuminator, simplified weapon stabilization, a display, and a joystick with trigger. All of these components are easily integrated into existing turrets. The RSF weapon system is simple to operate with minimal training.

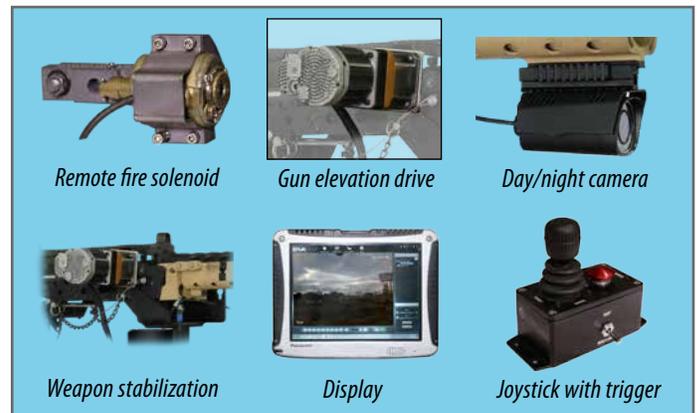
The RSF system provides a major tactical advantage by allowing the gunner to deliver suppressive firepower in critical situations.



Traditional turret operation



RSF enables remote operation of the turret while protected inside the vehicle



RSF System Components

About Us

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Remote Fire Option™ (RFO) System

Remote Operation of Turrets for Tactical Vehicles

Patent Pending

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
- View the threat environment on hi-res video display
- Major Improvement in crew safety and system effectiveness
- Ideal for turrets with heavy GPKs



Traditional turret operation

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, he can move down inside the vehicle and activate the RFO feature by flipping a switch on the control box. This locks the gun in alignment with the camera and activates the firing solenoid, camera, display, traverse and elevation drives, and joystick. The gunner then uses the joystick and trigger button to acquire and engage the target.

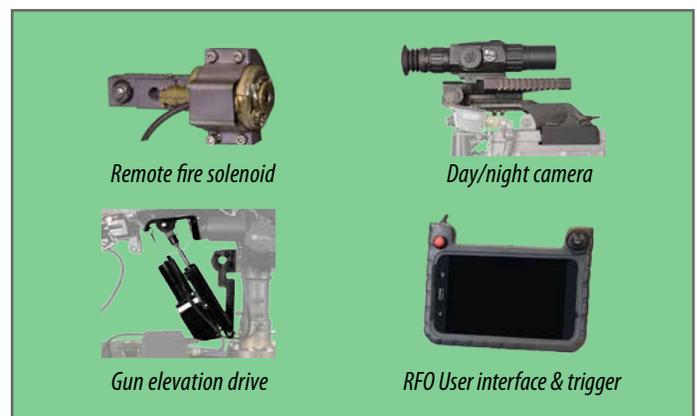
The RFO system consists of low-cost, commercial-off-the-shelf components. These “plug-and-play” components include a remote fire solenoid, traverse and elevation drives, day/night camera with infrared illuminator, user interface with color display, joystick and trigger, all of which are easily integrated 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.

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RFO enables remote operation of the turret while protected inside the vehicle

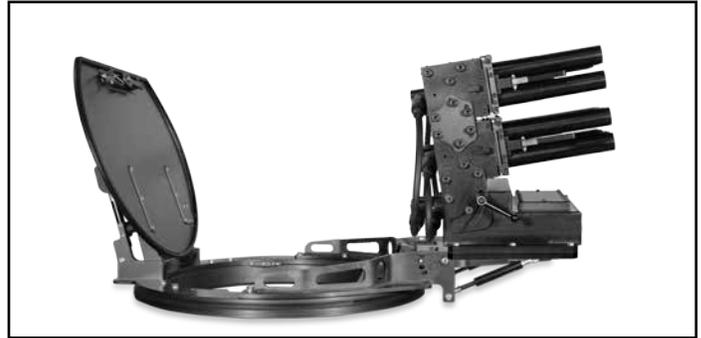


RFO System Components

Non-Lethal Remote Firing Option (RFO) For Riot Control Vehicles

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.



Non-Lethal launcher integrated with a Light Weight Turret



Non-Lethal launcher on riot control vehicle

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.



Non-Lethal RFO launcher components

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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



Shown full featured CS5200 Lightweight Motorized Gun Turret.

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 fingertip 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

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

All specifications subject to change without notification.



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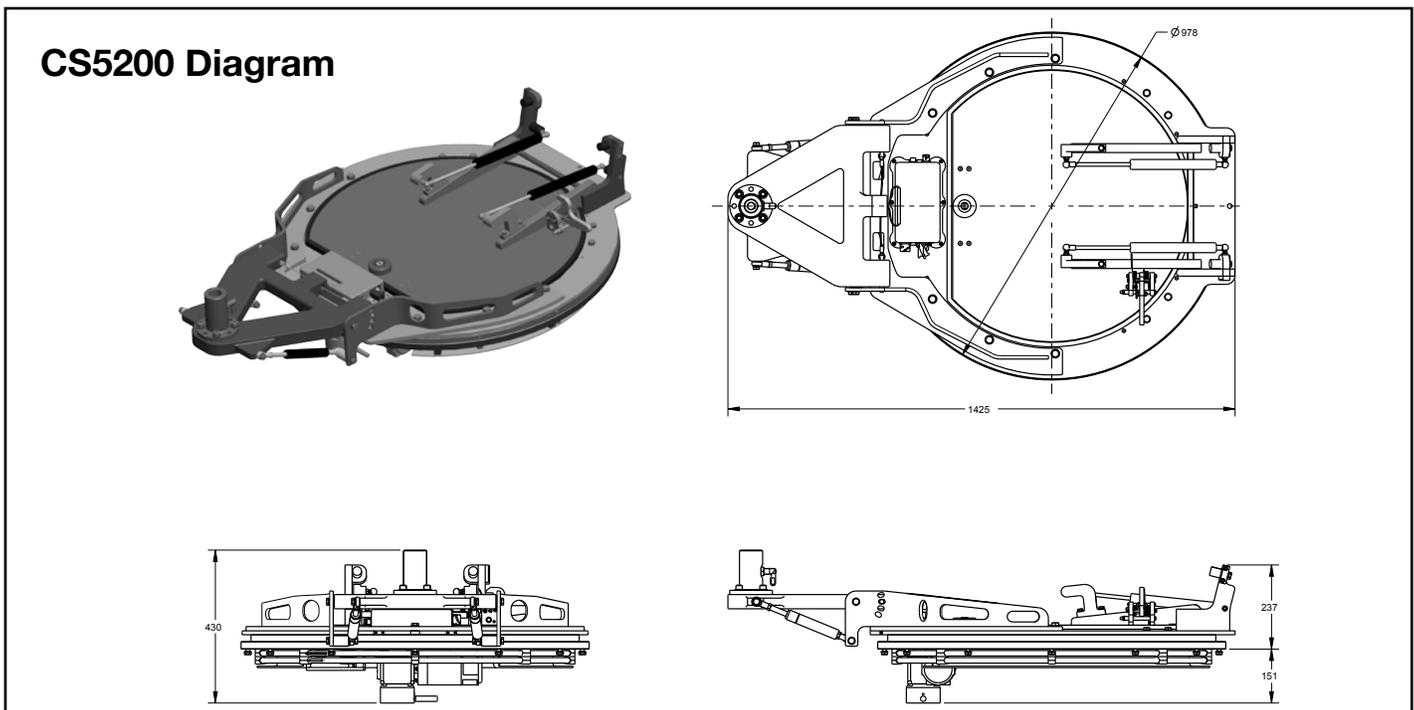
Lightweight Gun Turret

Specifications

Common for all models	
Voltage	24 VDC
Current	12A (nominal) – 40A (stall)
Overall weight, pounds (metric)	165 lbs (75kg) [without weapon or pintle mount]
Turret Ring Diameter, Inches (mm)	ID: 30.2 (768) – OD: 38.8 (978)
Vehicle rooftop mounting hole, Inches (mm)	36 (915) nominal using M10 bolts
Armament	Qualified with 7.62mm – 12.7mm – 40mm AGL, buffered mount recommended
Adjustable gun mount A-frame	-15° to + 30°
Manual operation	Yes (if vehicle power fails)
Safe zone	No-fire zone can be installed preventing traverse of the LMGT in this area
Protection for gunner	Can be modified to provide ballistic protection up to STANAG 4569 level 3
Overhead protection	Adjustable ballistic top cover protection can be installed

Model	Base	Power Train	Flex A-Frame	Fixed A-Frame	Hatch Cover	Hand Crank
CS5200	■	■	■	-	■	-
CS5210	■	■	■	-	-	-
CS5230	■	■	-	■	■	-
CS5240	■	■	-	■	-	-
CS5300	■	-	-	■	■	■
CS5310	■	-	■	-	-	■
CS5330	■	-	-	■	■	■
CS5340	■	-	-	■	-	■
CS5350	■	-	-	■	-	-

■ = assemblies included.



Note: Specifications are subject to change without notice.

Turret Assemblies

Assemblies	Description
	<p>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.</p> <ul style="list-style-type: none"> • Supports multiple weapon systems • Light weight aluminum construction
	<p>Fixed A-Frame Rigid sturdy frame</p> <ul style="list-style-type: none"> • Supports multiple weapon systems • Light weight aluminum construction
	<p>Hatch Cover Light weight hatch cover weighs only 35lbs.</p> <ul style="list-style-type: none"> • Light weight aluminum construction • Can be modified to provide ballistic protection up to STANAG 4569 level 3
	<p>Base Common on all CS5000 Series Light-Weight turrets.</p> <ul style="list-style-type: none"> • Smooth bearing operation. • Light weight aluminum construction
	<p>Power Train For all Motorized LWT</p> <ul style="list-style-type: none"> • 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
	<p>Hand Crank Manual hand crank for the CS5300 Series turrets.</p> <ul style="list-style-type: none"> • No power needed. • Light weight aluminum construction

CS5000 Series Turrets

CS5200 Series Lightweight Motorized Gun Turrets



CS5200 includes the following:

- 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 that connects to vehicles power source, eliminates the need for turret batteries
- One finger motorized operation using optional accessories CS3210A or CS3320 Weapon Mounted Turret controllers (WMTC)



CS5210 includes the following:

- Base Turret
- Flex A-Frame
- Power Train
- Flexible A-Frame provides gun tilt range from -15 to + 30 degrees.
- Built-in rotary slip ring that connects to vehicles power source, eliminates the need for turret batteries.
- One finger motorized operation using optional accessories CS3210A or CS3320 Weapon Mounted Turret controllers (WMTC)



CS5230 includes the following:

- Base Turret
- Fixed A-Frame
- Hatch
- Power Train
- Built-in rotary slip ring that connects to vehicles power source, eliminates the need for turret batteries.
- One finger motorized operation using optional accessories CS3210A or CS3320 Weapon Mounted Turret controllers (WMTC)



CS5240 includes the following:

- Base Turret
- Fixed A-Frame
- Power Train
- Built-in rotary slip ring that connects to vehicles power source, eliminates the need for turret batteries.
- One finger motorized operation using optional accessories CS3210A or CS3320 Weapon Mounted Turret controllers (WMTC)

CS5300 Series Lightweight Hand-Crank Gun Turret



CS5300 includes the following:

- Base Turret
- Flex A-Frame
- Hatch
- Hand-Crank
- Flexible A-Frame provides gun tilt range from -15 to + 30 degrees.



CS5310 includes the following:

- Base Turret
- Flex A-Frame
- Hand-Crank
- Flexible A-Frame provides gun tilt range from -15 to + 30 degrees.

CS5000 Series Turrets

CS5300 Series Lightweight Hand-Crank & Manual Gun Turret



CS5330 includes the following:

- Base Turret
- Fixed A-Frame
- Hatch
- Hand-Crank



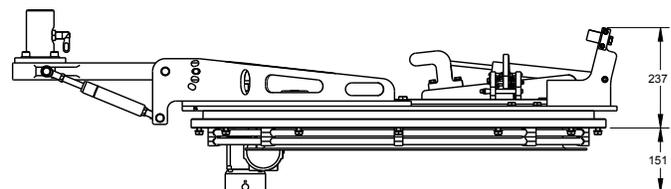
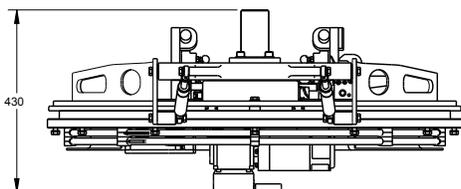
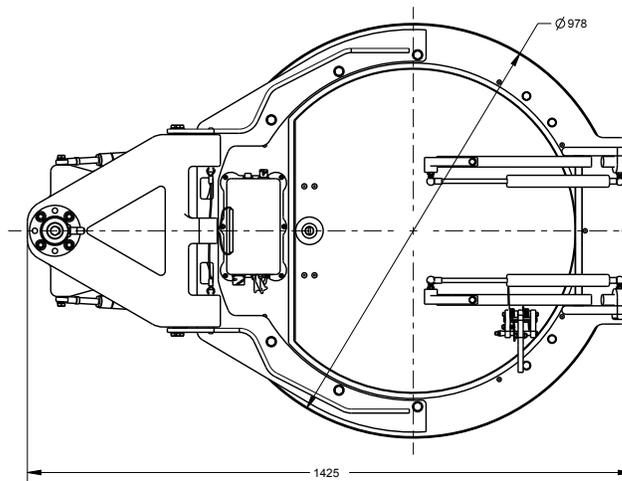
CS5340 includes the following:

- Base Turret
- Fixed A-Frame
- Hand-Crank



CS5350 includes the following:

- Entry level manual turret.
- Base Turret
 - Fixed A-Frame
 - Base Manual Locking Handle



Applications

Lightweight Turret Applications

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



Custom and Non-lethal Solutions

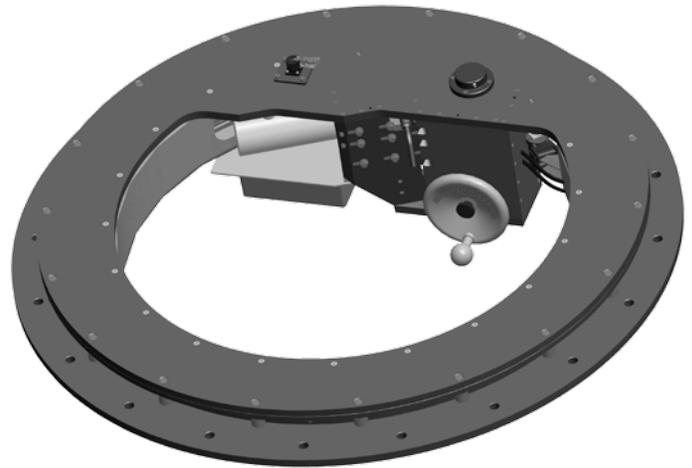
We can design and configure our turrets for non-lethal applications as well.



Heavy Duty Turret (HDT)

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.



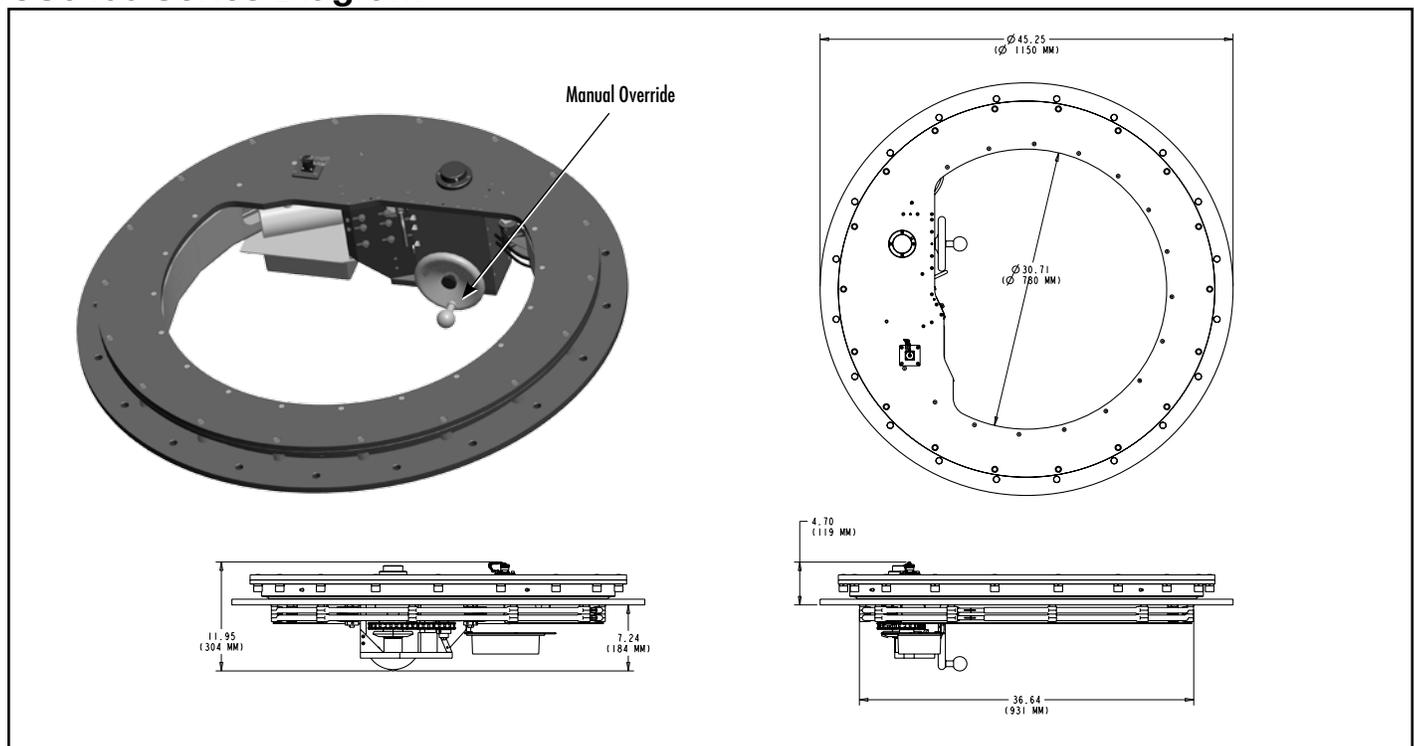
Smoothly rotate the HDT via CS3210A weapon-mounted turret controller.

Heavy Duty Turret (HDT)

Specifications

Heavy Duty Turret	
Maximum Supported Weight	2200 lbs.
Voltage	24 VDC
Overall weight, pounds (metric)	490 lbs (222) [without weapon or pintle mount]
Turret Ring Diameter, Inches (mm)	ID: 30.7 (780) – OD: 45.25 (1150)
Vehicle interface mount plate inches (mm)	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)
Gun Mount interface plate	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.
Height above vehicle mount interface (fay surface)	Top plate surface: 3.3" (84 mm), Top Plate Bearing Cap 4.7" (119).
Depth below vehicle mount interface (fay surface)	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.
Armament	Can be manufactured to: NATO or Non-NATO specifications
Manual operation	Yes (if vehicle power fails)
Protection for gunner	GPK can be provided per customers specifications
Overhead protection	Ballistic hatch cover can be provided per customer specification.

CS6400 Series Diagram



Note: Specifications are subject to change without notice.

Turret Applications

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.



Turret Drive System

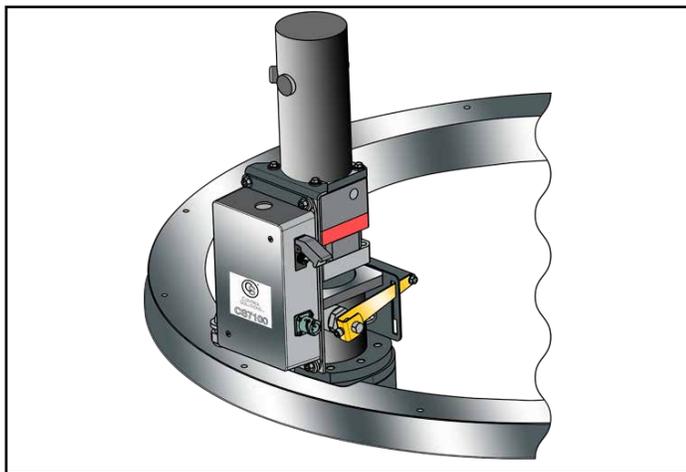
Features/Benefits

- 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.



Also available in horizontal configuration.



CS7100 Turret Drive System

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.

About Us

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CS7100 Turret Drive System Specifications	
Size (HxWxL) Inches (mm)	16.5 x 7.58 x 7.10 (419 x 193 x 180)
Weight, pounds (metric)	35 lb (16kg)
Operating voltage	24V
Operating current	<10A
Maximum supported payload weight, pounds (metric)	2000 lb, (910 kg)
Rotations per minute	6-8 based on configurations of turret.
Manual operation	Yes (if vehicle power fails)

All specifications subject to change without notification.

Weapon-Mounted Turret Controllers and Accessories

Accessories	
 CS3210A	<p>CS3210A Weapon Mounted Turret Controller</p> <ul style="list-style-type: none"> • 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	<p>CS3300 Series Weapon Mounted Turret Controllers</p> <ul style="list-style-type: none"> • 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	<p>CS3209B Joystick</p> <ul style="list-style-type: none"> • 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	<p>CS2152 TCS Auxiliary Power Module</p> <ul style="list-style-type: none"> • 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	<p>CS3460 Gun Turret Spotlight</p> <ul style="list-style-type: none"> • 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	<p>CS5400 Large-diameter Turret Slip Ring</p> <ul style="list-style-type: none"> • 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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