CDNS AUTONOMY

DEFENDER CS-820

THE DEFENCE PROFILE OF CDNS AUTONOMY

A removable operator for the plant and wheeled vehicles a force already fields: nobody in the seat, nothing cut into the host, never a weapon.

7	13	0	3	1	24 VDC
MACHINE FAMILIES, PLANT AND WHEELED	ACTUATOR MODULES, THE STEERING WHEEL INCLUDED	RADIOS ABOARD	GUIDANCE TIERS, NONE OF THEM OVER THE AIR	WIRE INTO THE MACHINE: A FUSED ACCESSORY FEED	FAMILY-WIDE; 12 V CONVERSION IN THE FIT KIT

AT A GLANCE

SEVEN FAMILIES, NO RADIO, ONE REFUSAL. AN OPERATOR FOR THE IRON ALREADY THERE.

Reach, lift, mass and endurance stay the host machine's own figures: the unit adds an operator, not a chassis. Defender's own figures are counted in families, modules, tiers and wires, and its case is the seat it empties.

THE SEAT, EMPTIED

ON GROUND WHERE THE SEAT IS THE EXPOSURE

Earthworks, obstacle reduction, route and rubble clearance, remote handling and driving, on ground under threat, contaminated, unstable or uncleared. The machine goes onto it; the person who authorizes the job stays clear.

THE FLEET ALREADY FIELDED

AN OPERATOR, NOT A VEHICLE

The capability arrives as a case and a fit kit, not as another vehicle, and the same iron takes a crew again the moment the unit lifts out. A machine with no CAN bus, no ECU and no firmware is worked exactly like new iron.

NO LINK TO DENY

PRESET, FIBRE OR ONBOARD, NEVER RADIO

Motion commands, the safety loop and the authorization all travel by wire, and the Tier 2 link is an optical fibre. A lost link ends in a defined stop or degrade.

CANADIAN AUTHORITY

KEYS HELD IN CANADA

Design authority, software signing and the keys stay in Canada. Repair, calibration and recovery are domestic, and nothing in core operations waits on a foreign cloud or service.

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01 · SPECIFICATION

FIT, CONTROL, AUTHORITY, SAFETY. GROUPED FOR A CAPABILITY DESK.

The functional specification of Defender CS-820. Every row is a property of the unit, its rule set or the way it is fielded; no row is a host machine's figure.

01 HOST MACHINES AND FIT

PARAMETER	VALUE	BASIS
DFC-E · Engineering plant	Excavators, dozers, loaders, graders and related equipment	hazardous earthworks, debris and rubble, fortification, route and airfield support; where Defender starts
DFC-L · Logistics and handling	Forklifts, telehandlers, material handlers, yard equipment	remote depots, hazardous and contaminated handling, resilient yard logistics
DFC-T · Terrain and base support	Tractors and implement carriers, where a defence need exists	firebreaks, snow and ice, terrain maintenance, base construction and support
DFC-S · Specialty support	Machine families a customer defines	a specific conversion, subject to engineering survey and qualification
DFC-V · Tactical and utility vehicles	Light and medium wheeled vehicles with a driver's seat	driving on closed ground and on routes closed to traffic: resupply and convoy, recovery and route support
DFC-H · Heavy logistics trucks	Heavy wheeled logistics and material-movement trucks with air brakes	resupply and material movement on closed routes; depot, airfield and route support; recovery
DFC-P · Protected mobility	Protected wheeled vehicles and their support variants	protected support driving from the driver's station: engineering support, route and resupply, casualty and recovery support
Military-pattern vehicles	In scope	each surveyed, fitted, calibrated and recorded like any other machine
Unit of sale	The machine family	a controlled list of the exact machines surveyed, fitted, calibrated and recorded sits behind each family
Reference machines	The group's own excavator, dozer and wheel loader; the group's own rock truck	the first reference iron for engineering plant, and the machine behind the heavy logistics family
Model year	Not a requirement	older iron counts the same as new, because the interface is the human interface
Changes to the host machine	None: nothing cut, tapped or flashed	nothing is wired into the vehicle, and the machine is standard again when the unit lifts out

02 SEAT, DOCK AND MOUNTING

PARAMETER	VALUE	BASIS
Operator's place	The operator's or driver's own seat	the unit's body in a cradle on the seat pan
Restraint	The machine's own lap belt	through a closed tunnel between the cradle rails
Dock	The machine's own seat-belt anchors and pins	fitted once, ahead of any job; until then the machine works as it always has
Restricted cabs	Packaging settled at the survey	on a protected vehicle, where a module can sit and how a coupler reaches its control, one driver's station at a time
Removal	Lifts out; back with a crew in minutes	nothing cut, wired or reprogrammed; the machine standard again
What travels	A case and a fit kit	one dock belongs to each machine and the unit goes to the work

03 CONTROLS WORKED

PARAMETER	VALUE	BASIS
Actuator modules	13	cover what a person's hands and feet reach, the steering wheel included
Interface families	6	dual-axis hand control, rotary control, linear foot control, discrete control, instrument observation, dynamic-state sensing
Plant controls	Joysticks, levers, pedals and switches	the machine's own controls, worked by the unit's own actuators
Steering	From the wheel's centre	through a machine-specific adapter plate that leaves the wheel undrilled and the rim free
Steering drive	Back-driveable through a mechanical torque limiter	wheel position sensed independently
Pedals	Accelerator and service brake	worked through the stroke and released the way the vehicle's own return intends
Selectors and switches	Transmission selector; range or transfer selector where fitted; the switches a person reaches	discrete controls, taken one position at a time
Heavy truck additions	Push-pull air-brake controls for park and trailer; axle, tire-pressure and power-take-off selectors where fitted	discrete controls: a heavy truck adds controls, not a kind of control
Parking-brake control	Only through a higher-integrity module	under a completed machine-specific safety case with independent state confirmation; never the unit's stop path
Steering and pedal loads	A finding of the survey	established on the vehicle before a kit is cut, never taken as a class figure
Weapon stations and firing controls	Never worked	the vehicle is driven; the weapon is never touched

04 ELECTRICAL, DATA AND SENSING

PARAMETER	VALUE	BASIS
Host bus connection	None	no link to the machine's CAN bus, ECU or firmware
Power from the machine	One fused feed from the accessory point	the only wire that crosses between the machine and the unit
Supply	24 VDC family-wide	a 12 V machine gets its conversion in the fit kit
Motion commands	CAN 2.0 and Ethernet, wired	wireless never carries a motion command
Safety loop	Its own wired loop	wireless never carries the safety loop
Authorization lease	By wire, or loaded at the dock	never by radio
Tier 2 command guidance	Optical fibre to a stand-off station	a person authorizes every decision that matters
Position	No GNSS aboard	onboard, local localization
Radios aboard	0	there is no fourth tier and no radio option
Instruments	Read by a camera aimed at the dash	nothing taken off the vehicle's own bus
Network segregation	Machine-control and safety networks kept apart from service and mission networks	a lost or compromised external link cannot create actuator authority
External mission systems	A mission gateway over a wired or at-the-dock interface	a fixed high-level vocabulary of mission objects, status, health and events; never actuator authority

05 GUIDANCE AND AUTHORITY

PARAMETER	VALUE	BASIS
Guidance tiers	3: preset at the dock, an optical fibre to a stand-off station, onboard optical-AI	none of them over the air; no fourth tier and no radio option
Authority modes	7: off, manual, assist, approach, teleoperation, autonomous, maintenance	maintenance held apart from the working chain
Mechanical states	5: OEM, installed and disengaged, armed, autonomous control, fault or safe	from standard with nothing fitted to fault-or-safe
Authority order	Independent safety first; every person above the software	authority runs one way; each layer is built with a limit it cannot cross, and sensing can remove authority but never create it
Task authorization	A named person	the job cleared before it runs; a person supervises it, and a person at the machine can take authority away at any moment
Line authorization	A lease, signed and time-limited	issued and withdrawable by Canadian Shield; delivered by wire or at the dock, never by radio

PARAMETER	VALUE	BASIS
Withdrawal or expiry	A safe stop at the next safe point, then the minimum-risk condition	the unit stays installed and will not run until re-authorized
Machine lock	Configured for one machine	on any other machine it has no authority to move anything until Canadian Shield sets it up again
Seating check	Wrong-side or wrong-configuration seating blocked	electronically, at the armed state
Rule sets and firmware	Signed and sealed	a hardware root of trust runs nothing unsigned; no debug access on a shipped unit
Tampering	Ends in a safe stop and a retained log	a property of the build, not a setting
Keys	Held in Canada	development, test and production signing kept apart
Mission runtime and safety functions	Execute on the unit	a bounded task continues without GNSS, a wide-area link, a cloud or an external map
Lost remote operator link	A defined stop or degrade	never uncontrolled continuation

06 SAFETY FUNCTIONS

PARAMETER	VALUE	BASIS
Stop	Wired straight into the unit's own safety controller	no software in the path; never part of the lease, whatever mode is selected
Manual release	On every actuator: one hand, no tool	never part of the lease, whatever mode is selected
Stop and pull-lanyard	At the machine, within reach of anyone working around it	every drive loses its energy; a person at the machine clears it, with a separate reset
Independent safety controller	Its own hardware, power and wiring	it can only take authority away; it cannot start, arm or grant authority
Task safe states	One of three per task, decided before the job	decided with the customer and never improvised during it; a vehicle under way carries its own, chosen for the route
After the safe state	The minimum-risk condition, then a person is called	fixed, whatever the state
Site role	A defined work area, a person present to authorize and watch, a person who can reach the stop	procedures, training, exclusion zones, recovery and maintenance are part of the safety system
Supervising view	Mode and authority chain, approval envelope, safety status, next planned action	under Tier 2 the supervising person is at the stand-off station
Safety case	Per machine, per task, per configuration	machine-specific hazards feed the hazard analysis and the test plan for each configuration

07 ENVELOPE AND SCOPE

PARAMETER	VALUE	BASIS
Ground	Closed to everyone the job does not need	ground under threat, contaminated, unstable or uncleared, where the seat is the exposure
Task scoring	Seat exposure, fixed task, closed ground, utilization	every task scored the same way before the first job
Earthworks, berms and revetments	Where a defence unit starts	a fixed task on closed ground, at moderate utilization
Obstacle reduction	Worth it to get a person out	partly fixed, on closed ground, at low utilization
Route and rubble clearance	Assessed, only with the route closed	partly fixed, on mostly closed ground, at low utilization
Remote handling	Assessed, never with a suspended load	partly fixed, on closed ground, at low utilization
Recovery and route repair	Assessed on the customer's own ground first	not a fixed task; low utilization
Driving on a route closed to traffic	Assessed, with the route closed end to end	partly fixed, on closed ground, at moderate utilization
Protected support driving	Assessed: the vehicle drives, the weapon is never operated	partly fixed, on closed ground, at moderate utilization
A route open to traffic	Refused	a member of the public cannot consent to the risk
Operating a weapon or firing anything	Refused without exception	the line's one refusal; not a configuration a customer can request
Fitment	Never permanent and unattended	outside the line's scope on every profile
Production rate or response time	Neither is guaranteed	outside the line's scope on every profile
Unsurveyed machines	No operator for one	each configuration is machine-specific

08 RECORD, SUSTAINMENT AND TRAINING

PARAMETER	VALUE	BASIS
Record	Every act on one chained record, nothing deleted	who authorized the job, what the unit was set up to do, what it did and where it stopped
Configuration record	13 domains	host platform, human controls, machine kit, energy, compute, sensors, harness, software, calibration, skills, safety, maintenance and release
Calibration	Every coupled control, before the first task of the day	through neutral, limits and return; controls wear and no two machines are alike
Commissioning	Closes the survey	a safety act, completed before the configuration is signed and sealed
New behaviour	By signed release only	a behaviour that breaks an engineering or safety constraint is rejected, even when an experienced person performed it

PARAMETER	VALUE	BASIS
Training	Operator, maintainer, depot and engineering-support packages	operators and maintainers trained without perpetual dependence on the vendor
Spares	By machine family	part of sustainment, with depot repair behind it
Service	Repaired, calibrated and recovered domestically	depot repair and secure re-image in Canada and selected allies
Foreign cloud or service	Not needed for core operations	mission runtime and safety functions execute on the unit
Data	A defined owner for each kind	machine data, operator data, derived skills and logs, written into the terms
Ownership	The customer owns the machine and the hardware	the configuration and application are Canadian Shield's, licensed and revocable

09 STANDARDS, PATENT AND EXPORT

PARAMETER	VALUE	BASIS
Standards named at design	ISO 12100 · ISO 13849 · ISO 17757 · ISO 19014	an architecture of ISO 13849 for the safety functions, with independent means of removing control; a safety design built toward ISO 17757
Enquiries	Screened before any discussion	export control requires it; Canadian Shield may decline any enquiry without giving a reason
Export	Canadian export permits issued per shipment	export posture counsel-first
Controlled Goods Program	Status disclosed to qualified enquiries	part of the export posture
Technical data	Released in steps after screening	program briefs, then an evaluation with its configuration records and integration requirements, then controlled technical data under NDA, export and security controls
Patent	Patent pending	the designs on the line

02 · THE PROFILE

AN OPERATOR, NOT A VEHICLE. NOBODY IN THE SEAT OF THE PLANT ALREADY THERE.

On a work site under threat the most exposed place is the operator's seat. Defender puts a machine on that ground with the seat empty, on plant and vehicles a force already has.

Defender CS-820 is a self-contained unit that sits in the operator's seat of a machine a defence unit already owns and works that machine's own joysticks, levers, pedals and switches with its own actuators. A camera reads the dash. It never connects to the machine's CAN bus, ECU or firmware; the only wire between the two is a fused feed from the accessory point. When the job is done it lifts out, and the machine is back with a crew in minutes, standard again.

Defender is a case and a fit kit, not a machine built from the frame up: nothing to procure, ship, park, fuel or train a crew on, for plant already in theatre or already in the yard. Older iron counts the same as new, because the interface is the human interface: if a person can work the controls, Defender can.

Responder CS-810 carries the emergency-services profile on the same dock, actuator modules and authority model; the rule set is what separates the two. Defender is the profile of the CDNS Defence Platform: one removable operator, seven machine families, and one way a force engages.

THE ONE REFUSAL

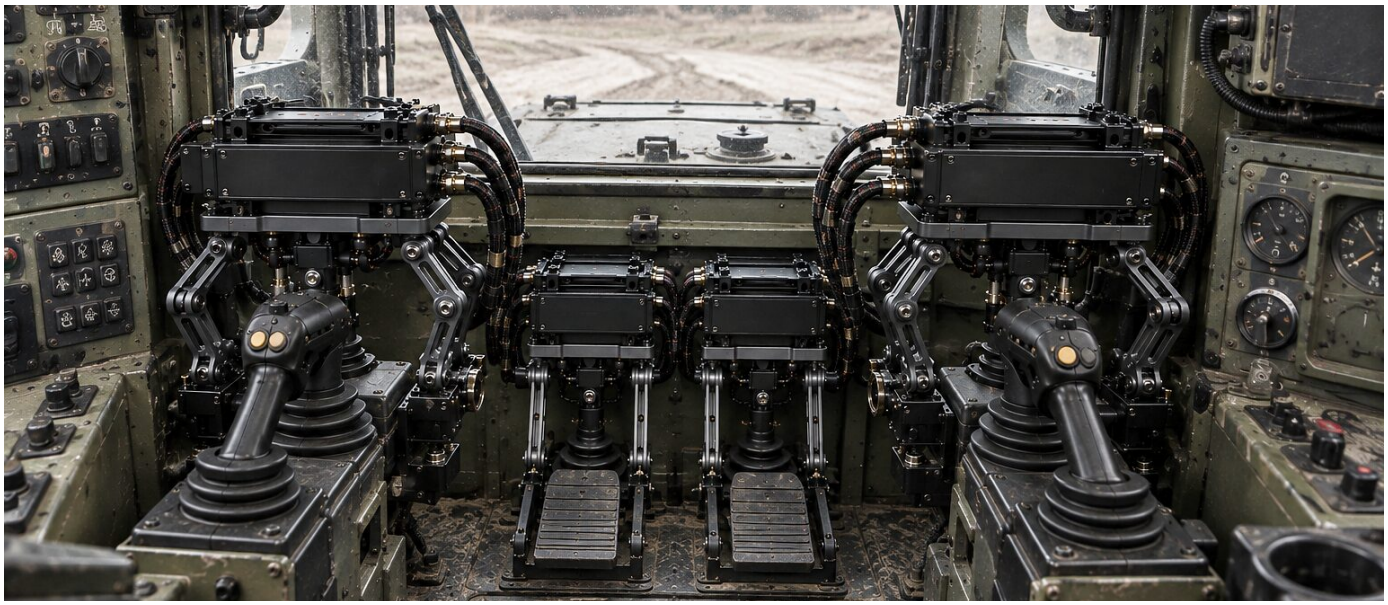
IT DRIVES THE MACHINE. IT NEVER FIRES ANYTHING.

Where a machine or vehicle carries a weapon, the unit drives the vehicle and never operates the weapon, and it never fires anything, on every machine and under every guidance tier. It is the line's one refusal, and human safety comes first, on every line.

03 · THE WORK

SCORED BEFORE ANY JOB. EARTHWORKS ON CLOSED GROUND COMES FIRST.

Every task is scored the same way before the first job: whether the seat is the exposure, whether the task is fixed, whether the ground is closed, and how much the machine would work.



EARTHWORKS

BERMS, REVETMENTS AND CUTS

Protective earthworks shaped with nobody on the ground doing it: berms, cuts, revetments and fortification. The task is fixed and the ground is closed.

OBSTACLE REDUCTION

REDUCING WHAT BLOCKS MOVEMENT

Clearing what closes a route or a site, on ground a machine is already built to work. Low utilization, high exposure: worth it to get a person out of the seat.

ROUTE AND RUBBLE

OPENING A ROUTE, CLEARING WHAT CLOSED IT

Damaged-infrastructure and debris removal, route and airfield support, assessed job by job and only with the route closed to traffic.

REMOTE HANDLING

POSITIONING AND PLACING

Moving and placing material or equipment from a machine's own seat with nobody in it, remote or contaminated handling included, and never with a suspended load.

RECOVERY

RECOVERY AND ROUTE REPAIR

Recovering a stuck or damaged asset and repairing the ground or route around it, with site remediation. Not a fixed task, so it is assessed on the customer's own ground first.

DRIVING

CONVOY, RESUPPLY AND PROTECTED SUPPORT

Driving on routes closed to traffic and protected support driving, scored on the same four columns as the engineering tasks.

TASK	FIXED TASK	CLOSED GROUND	NO PUBLIC TRAFFIC	UTILIZATION	VERDICT
Earthworks, berms and revetments	Yes	Yes	Yes	Moderate	Where we start
Obstacle reduction	Partly	Yes	Yes	Low	Worth it to get a person out
Route and rubble clearance	Partly	Mostly	Mostly	Low	Assess: only with the route closed
Remote handling	Partly	Yes	Yes	Low	Assess: no suspended load
Recovery and route repair	No	Mostly	Mostly	Low	Assess
Driving on a route closed to traffic	Partly	Yes	Yes	Moderate	Assess: the route closed end to end
Protected support driving	Partly	Yes	Yes	Moderate	Assess: the vehicle drives, the weapon is never operated
A route open to traffic	No	No	No	Low	Refused
Operating a weapon or firing anything	No	No	No	Low	Refused

04 · THE FAMILIES

SEVEN FAMILIES, ONE PATH. THE FAMILY IS WHAT A FORCE BUYS.

The line is engineered around seven machine families, and engineering plant comes first. Behind each family sits a controlled list of the exact machines surveyed, fitted, calibrated and recorded.

FAMILY	MACHINES	WHAT DEFENDER DOES WITH THEM
DFC-E · Engineering plant	Excavators, dozers, loaders, graders and related equipment	Hazardous earthworks, debris and rubble, fortification, route and airfield support. Where Defender starts.
DFC-L · Logistics and handling	Forklifts, telehandlers, material handlers, yard equipment	Remote depots, hazardous and contaminated handling, resilient yard logistics.
DFC-T · Terrain and base support	Tractors and implement carriers, where a defence need exists	Firebreaks, snow and ice, terrain maintenance, base construction and support.
DFC-S · Specialty support	Machine families a customer defines	A specific conversion, subject to engineering survey and qualification.
DFC-V · Tactical and utility vehicles	Light and medium wheeled vehicles with a driver's seat	Driving on closed ground and on routes closed to traffic. Resupply and convoy, recovery and route support.
DFC-H · Heavy logistics trucks	Heavy wheeled logistics and material-movement trucks with air brakes	Resupply and material movement on closed routes. Depot, airfield and route support, and recovery.
DFC-P · Protected mobility	Protected wheeled vehicles and their support variants	Protected support driving: engineering support, route and resupply, casualty and recovery support.

FAMILY	WHAT THE UNIT WORKS
DFC-E	Two joysticks, two travel controls, the throttle dial and the pilot lockout lever on a tracked excavator; steering, forward-neutral-reverse, the gear selector, the parking brake, the blade and the ripper on a dozer; wheel steering, the pedals and the implement joystick on a loader
DFC-L	Steering, directional control, throttle and brake and the mast levers on a forklift; steering, travel, the boom and the attachment controls on a telehandler
DFC-T	Steering, pedals, implement controls, the hydraulic valve bank and the power take-off
DFC-V	The steering wheel from its centre, the accelerator and service-brake pedals, the transmission selector, the parking brake under its own safety case, the range or transfer selector, and the switches a person reaches
DFC-H	The tactical and utility set, plus the push-pull air-brake controls for park and trailer and the axle, tire-pressure and power-take-off selectors where fitted
DFC-P	The driver's controls as fitted, in a restricted cab; how the modules sit around them is a finding of the survey
DFC-S	Established by survey against the six interface families

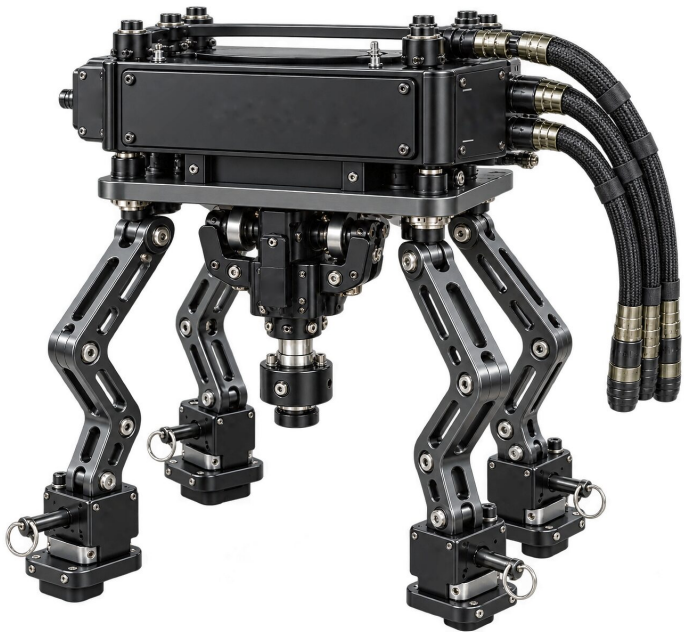
The public unit is the family and the class of machine, never a model. Defender starts in engineering plant, and the first reference machines there are the group's own excavator, dozer and wheel loader; the group's own rock truck stands behind the heavy logistics family. Every machine that follows is another qualified configuration rather than a fresh start, and a mixed fleet is one job of engineering repeated rather than one program per make and year.

Qualification is a property of a configuration: the host machine, the physical interface, the energy, the compute, the sensors, the software, the calibration, the skill, the safety configuration and the operating envelope freeze together, and change one and it is a different configuration.

05 · IN THE CAB

THIRTEEN MODULES ON THE CONTROLS ALREADY THERE. ONE FUSED FEED, AND NO OTHER WIRE.

In the cab, thirteen actuator modules cover what a person's hands and feet reach, the steering wheel included, and the architecture above them does not change from machine to machine.



The unit's body sits in a cradle on the seat pan, with the machine's own lap belt through a closed tunnel between its rails, and the dock is the machine's own seat-belt anchors and pins, fitted once ahead of any job. Couplers land on the controls already there and a camera is aimed at the dash. The steering wheel is driven from its centre through a machine-specific adapter plate that leaves the wheel undrilled and the rim free, back-driveable through a mechanical torque limiter, with wheel position sensed independently.

The modules run on 24 VDC family-wide, and a 12 V machine gets its conversion in the fit kit. The parking-brake control is worked only through a higher-integrity module under a completed machine-specific safety case, with independent confirmation of its state, and it is never the unit's stop path.

COMMON TO EVERY FAMILY	SET FOR THAT ONE MACHINE AT THE SURVEY
The unit: its body in a cradle on the seat pan, under the machine's own lap belt	Mounts, couplers and an adapter plate cut for that steering wheel
The authority order, ranked, with a limit written into every layer	The operating envelope the machine's own limits allow
An independent safety energy path, separated from the task software	Stroke, force and travel limits, established control by control
A wired stop with no software in the path, and a manual release on every actuator	The daily calibration sweep, and which controls it walks
One chained record, with nothing deleted	The configuration record for that machine

COMMON TO EVERY FAMILY	SET FOR THAT ONE MACHINE AT THE SURVEY
Sealed rules and a leased authorization, signed and time-limited	The safety case, per machine, per task, per configuration
Thirteen actuator modules and six interface families at 24 VDC	Which of the six the cab carries, and a conversion for a 12 V machine

What the survey measures.

- Machine identity: make, model, year and station trim, taken from the machine in front of the surveyor.
- The geometry of the station: the seat, the consoles, the floor, the pedals, the wheel, and the reach and travel of every control.
- Which of the six interface families are present, how each control is driven, and its force, stroke, travel, rate and return to neutral.
- Where each module and its bracket land, and the power available.
- The machine's own safeguards, and whether the public can come within reach.

What the survey decides.

- Which modules the fit kit carries, from the family of thirteen.
- Whether the parking-brake control is in scope, which takes a completed safety case and independent state confirmation.
- The operating envelope the machine's own limits allow, and the steps the daily calibration sweep runs.
- Which family the machine belongs to, and whether the ground can carry the work at all.

06 · DRIVING

CONVOY AND RESUPPLY, NOBODY AT THE WHEEL. THE ROUTE CLOSED END TO END.

Driving is the seat again: a route closed to traffic, a vehicle a force already runs, and the wheel, the pedals and the selectors worked by the same unit that works a bucket.

The controls are the ones a driver uses. The unit works the steering wheel from its centre, through a machine-specific adapter plate that leaves the wheel undrilled and the rim free, and it works the accelerator and the service brake, the transmission selector, the range or transfer selector where one is fitted, and the switches a person reaches. Nothing is wired into the vehicle; the fused accessory feed is the only conductor that crosses. A heavy truck adds controls rather than a new kind of control: the push-pull air-brake controls for park and trailer, and the axle, tire-pressure and power-take-off selectors where they are fitted.

The work is convoy and resupply on routes closed to traffic, route support and recovery. A road that has to be driven before anyone knows what is on it is a seat nobody should sit in. A route open to public traffic is refused, because a member of the public cannot consent to the risk, and neither a production rate nor a response time is guaranteed.

A vehicle under way carries its safe state the way a working machine does, decided before the job. Whatever the state, what follows is fixed: the minimum-risk condition, then a person is called. Uncertainty changes what the vehicle is permitted to do, so a leg run in falling visibility runs under a narrower envelope or not at all.

07 · CONTESTED GROUND

NO LINK TO DENY. NO EMISSION TO FIND.

Nothing on the unit transmits and nothing guides on a satellite. Every path that carries motion, safety or authority travels by wire or down a fibre.

PATH	HOW IT TRAVELS	OVER THE AIR
Motion commands	CAN 2.0 and Ethernet, wired	Never
Safety loop	Its own wired loop	Never
Authorization lease	By wire, or loaded at the dock	Never
Tier 2 command guidance	Optical fibre to a stand-off station	Never
Position	No GNSS aboard; onboard, local localization	None
Power from the machine	One fused feed from the accessory point	The only wire that crosses in
Radios aboard	0	None

There is no fourth tier and no radio option. Machine-control and safety networks stay segregated from service and mission networks. An external link that is lost or compromised cannot create actuator authority, and loss of a remote operator link ends in a defined stop or degrade, never in uncontrolled continuation. Mission runtime and safety functions execute on the unit, so a bounded task continues without GNSS, a wide-area link, a cloud or an external map.

Interoperability is not a wire into the machine. A force's own command-and-control system, or a prime's, reaches a mission gateway over a wired or at-the-dock interface, in a fixed high-level vocabulary of mission objects, status, health and events, and nothing else crosses. An external system never gets actuator authority: a request becomes a job when a named person authorizes it, and it is that person the machine answers to.

08 · SEALED RULES · LEASED AUTHORIZATION

THE RULES SHIP SEALED. AUTHORIZATION EXPIRES. THE STOP IS NEVER PART OF EITHER.

The unit does what its rule set allows and nothing else. The authority to run under it is issued for a period and can be withdrawn, and the stop sits outside both.

SIGNED AND SEALED

NOTHING UNSIGNED RUNS

Rule sets and firmware are signed; a hardware root of trust runs nothing unsigned; there is no debug access on a shipped unit. Tamper detection ends in a safe stop and a retained log, and the keys are held in Canada.

A LEASE, NOT A SALE

ISSUED FOR A PERIOD, WITHDRAWABLE

Authorization is time-limited and signed, issued and withdrawable by Canadian Shield, delivered by wire or at the dock, never by radio. Withdrawal or expiry ends in a safe stop at the next safe point, then the minimum-risk condition.

ONE MACHINE

IT RUNS ONLY WHERE IT WAS SET UP

Each unit is configured for one machine and checks that it is on it; on any other machine it has no authority to move anything until Canadian Shield sets it up again. Wrong-side or wrong-configuration seating is blocked electronically at the armed state.

THE RELEASE

THE LOCK IS ON THE LOGIC, NEVER ON SAFETY

A stop wired straight into the unit's own safety controller, with no software in the path, and a manual release on every actuator: one hand, no tool. Neither is part of the lease, whatever mode is selected.

- ✓ Independent safety outranks everything, and it depends on nothing in the planning computer for a safety action.
- ✓ A person comes next, and anyone at the machine can take control away with one hand, at any time.
- ✓ Every person outranks the software. The controller executes approved motion inside the machine's limits and cannot widen the envelope a person approved; the planner proposes and cannot energize an actuator or grant itself authority.
- ✓ External sensing can remove authority and never create it.

Ownership follows the same split as authority: the customer owns the machine and the hardware, and the configuration and application that turn it into Defender CS-820 are Canadian Shield's, licensed and revocable, so the operator can be withdrawn while the machine under it stays the customer's and untouched.

09 · THE CREW AND THE SITE

THE CREW LEAVES THE SEAT. IT NEVER LEAVES THE WORK.

The unit removes the crew from the seat, not from the work. A named person authorizes each job, a person supervises it, and a person at the machine can take authority away at any moment.

1. **Fit the dock** Onto the machine's own seat-belt anchors and pins, once, ahead of any job. Until then the machine works as it always has.
2. **Set the unit in** A cradle on the seat pan and the machine's own lap belt through a closed tunnel between its rails. Couplers land on the controls already there, and the camera is aimed at the dash.
3. **Calibrate every control** Each coupled control is walked through neutral, its limits and its return when released, before the first task of the day.
4. **Authorize the task** The lease arrives by wire or at the dock, a named person authorizes the job, the guidance tier is set, and the task's safe state is already in the rule set.
5. **Run inside the rules** Until the task is done, authorization is withdrawn or a limit is crossed. Under Tier 2 the supervising person is at the stand-off station on the far end of the fibre.
6. **Lift out** The unit unbuckles and lifts out. Nothing was cut, wired or reprogrammed.

- ✓ The supervising display shows the current mode and authority chain, the approval envelope and its termination conditions, the active skill, calibration health, perception confidence, independent safety status and the next planned action.
- ✓ The site role is part of the fit: a defined work area, a person present to authorize and watch, and a person who can reach the stop.
- ✓ Every act lands on one chained record, nothing deleted: who authorized the job, what the unit was set up to do, what it did and where it stopped.
- ✓ A new skill reaches a machine only by signed release, and a behaviour that breaks an engineering or safety constraint is rejected.

10 · SOVEREIGNTY AND SUSTAINMENT

CANADIAN DESIGN AUTHORITY, KEYS IN CANADA. SUSTAINED IN CANADA AND SELECTED ALLIES.

Sovereignty on this line is control and recoverability: who holds the design, who signs the software, who holds the keys, who owns the data, and who can repair and recover a unit.

- ✓ **Design and software authority.** Requirements, architecture, drawings, release, source, builds, signing and field versions are under Canadian control, with development, test and production signing kept apart.
- ✓ **Keys.** Held in Canada. The lease, the rule sets and every update are signed there, and a field software or model change has one defined, controlled authority.

- ✓ **Data.** Machine data, operator data, derived skills and logs each have a defined owner, written into the terms.
- ✓ **Service.** Units are repaired, calibrated and recovered domestically, with depot repair and secure re-image in Canada and selected allies, and core operations continue without a foreign cloud or service.
- ✓ **Configuration and training.** A customer can show exactly what hardware, software and skill set is fielded on each machine, and its operators and maintainers are trained without perpetual dependence on the vendor.

OPERATOR

RUNS THE JOB

Clears the job, completes the pre-start, chooses whose way of working is in the seat and holds the stop, trained on the machine class, the task and the display.

MAINTAINER

KEEPS IT STANDARD

Daily calibration and its record, module exchange and recalibration, field diagnostic tooling with bounded privileges, and the hand-back of the station.

DEPOT

REPAIRS AND RE-IMAGES

Serialized line-replaceable units, machine-family spares kits, repair-triggered recalibration and secure re-image from controlled recovery media.

ENGINEERING SUPPORT

ADDS MACHINES AND TASKS

The survey and qualification path that adds a machine to the supported list, and the signed release that carries a new skill to a unit.

For a Defender CS-820 fitted to an ally's plant, the design authority, the signing and the keys stay in Canada, operation is local, and depot repair and secure re-image sit in Canada and in selected allies. Offline updates carry authenticity, compatibility and rollback checks, recovery media are kept for every supported field version, and every field issue is linked to the exact configuration it arose on.

11 · HOW A FORCE ENGAGES

SCREENED FIRST, THEN SURVEYED. THEN ONE JOB ON THE CUSTOMER'S OWN GROUND.

One sequence runs from the first letter to sustainment, the same way for a Canadian ministry and an Allied one. Each step is one a force can stop at, and none of them is an offer.

1. **Screened enquiry** Screened before anything is discussed, because export control requires it.
2. **The program brief** Cleared, the Defender CS-820 program brief opens, with sanitized interface descriptions behind it.
3. **A fit, machine by machine** One driver's station at a time: the controls, the forces and travel, the mounting, the power and the machine's own safeguards.
4. **Fit, calibrate, record** The kit is adapted to that machine, calibrated against it and recorded as its own configuration.
5. **A first job on the customer's ground** One job, scored on the customer's own ground, before anything further is discussed.
6. **An evaluation lease** Bounded and time-limited, with support: a commercial arrangement, not the authorization a machine's motion runs under.
7. **The fleet, family by family** The supported list grows one qualified configuration at a time, offered by family.

8. **Sustainment** Operator and maintainer training, spares by family, and depot repair and secure re-image in Canada and selected allies.

- ✓ **The hardware.** The unit, the safety and sensor kit, and a machine-specific actuator and mount kit.
- ✓ **Machine engineering.** Survey, kit adaptation, drawings, calibration and validation for a new configuration.
- ✓ **Software and support.** Signed updates, diagnostics, configuration management and supported machine skills.
- ✓ **An evaluation lease or pilot.** Bounded, time-limited and supported.
- ✓ **A prime or OEM licence.** Core or subsystem, under field-of-use and IP terms.
- ✓ **Allied production partnership.** Qualified local assembly or manufacture where it is strategically appropriate.
- ✓ **Training and sustainment.** Operator, maintainer, depot and engineering-support packages.

Every enquiry on this line is screened, and Canadian Shield may decline any enquiry without giving a reason. Supply is subject to Canadian export permits issued per shipment, export posture is counsel-first, and Controlled Goods Program status is disclosed to qualified enquiries. Access to technical data escalates in steps behind the screening: program briefs, then an evaluation with its configuration records and integration requirements, then controlled technical data under NDA, export and security controls.

12 · GUIDANCE

THREE WAYS TO GUIDE IT. NONE OF THEM OVER THE AIR.

A defence unit is guided one of three ways. Nothing on the unit transmits, nothing guides on a satellite, and there is no fourth tier and no radio option.

TIER 1

PRESET AT THE DOCK

The task program is loaded when the unit is set into the dock and runs with no link of any kind. Nothing is emitted, so there is nothing to jam and nothing to geolocate.

TIER 2

OPTICAL FIBRE, A PERSON IN THE LOOP

An optical fibre back to a person at a stand-off station, authorizing every decision that matters: a physical line rather than a channel in the radio bands.

TIER 3

ONBOARD OPTICAL-AI, SEALED RULES

Perception and planning on the unit, inside the sealed rule set, with no emissions, no link and no GPS. The planner proposes, the rules bound it, a person authorized the task and safety keeps its veto.

13 · DOCTRINE AND SAFETY

IT DRIVES THE MACHINE. IT NEVER FIRES ANYTHING.

The lines that hold on every Defender task, on every family and under every guidance tier.

- ✓ The line's one refusal: Defender never operates a weapon and never fires anything. Where a machine or vehicle carries a weapon, the unit drives the vehicle and the weapon is never touched.
- ✓ Human safety comes first, on every line. Nobody in harm's way: the seat is the exposure, and the person who authorizes and watches the job stands clear of it.
- ✓ AI plans, rules govern, humans authorize, safety has veto. The wired stop and the manual release on every actuator are never part of the lease, whatever mode is selected.
- ✓ Every task runs on ground closed to everyone the job does not need. A route open to traffic is refused, because a member of the public cannot consent to the risk.
- ✓ Nothing in the host machine is cut, tapped or flashed, and the machine is standard again when the unit lifts out.
- ✓ No radio and no GNSS anywhere on this line. Motion commands, the safety loop and the authorization travel by wire, and a lost link ends in a defined stop or degrade, never in uncontrolled continuation.

THE CONVERSATION

SEND THE IRON YOU RUN. NAME THE GROUND YOU CANNOT PUT A PERSON ON.

Send the machines you run and the ground you cannot put a person on. The reply says which of them can go uncrewed with nothing cut, tapped or flashed in the host. It starts with a screened enquiry; cleared, it moves to the program brief, then to a fit assessed machine by machine, then to a first job scored on your own ground. Supply is subject to Canadian export permits issued per shipment.

Start a screened enquiry at cdnshield.ca/enquiries.

DOCUMENT	CDN-PROD-SPC-017 · Defender CS-820 · Specification sheet
REVISION	R1.0 · issued 2026-09-10
WEB VERSION	cdnshield.ca/cdns-autonomy/spec-sheets/defender · carries the current revision
RELATED SHEETS	Responder CS-810
ISSUED BY	Canadian Shield · cdnshield.ca