



CANADIAN SHIELD

SPECIFICATION SHEET
CDN-PROD-SPC-013 · R1.0 · Issued 2026-09-10

THE UNDERGROUND FAMILY

CS-430

THE BURIED LISTENING NODE

A sealed passive seismic and acoustic node that is buried once, goes silent, and reports only over a buried fibre.



~4.5 kg

ALL-UP NODE MASS

~90 × ~380 mm

SEALED HOUSING, DIAMETER BY LENGTH

0.3–1.0 m

BURIAL DEPTH, NOMINAL AND SITE-DEPENDENT

-40 to +50 °C

OPERATING TEMPERATURE CLASS

Under 1 s

REPORT TO HEAD-END OVER FIBRE

AT A GLANCE

BURIED ONCE, THEN SILENT. LISTENING UNTIL SOMETHING MOVES.

Five figures size the node. Four reasons explain why a buyer trades a standing post for a buried one.

A SENSOR, NOT A SENTRY

WATCH WITHOUT A POST

Every hour a node keeps silent watch on a chokepoint is an hour nobody stands a post there. Buried and closed over, it listens through a years-class standby on a primary lithium pack and speaks only when something crosses its threshold.

NOTHING TO FIND

IT SENDS NOTHING THROUGH THE AIR

Buried and spliced, the node puts nothing into the air in any wake state or configuration. Its position comes from the survey that placed it, so there is no radio link to jam and no satellite fix to spoof.

ONE ENVELOPE

THE ELEMENT INSIDE IS THE VARIANT

One sealed, coupled, fibre-linked body takes a vertical geophone, a three-element bearing set or an added acoustic pressure element. The same node watches a pipeline for leaks and third-party interference without a change.

ALONE OR IN A LINE

A LISTENING POST, OR A PICKET

Emplaced alone, it watches one approach nobody else has eyes on. Strung node to node on a fibre trunk, a run of them is the Trembler Line CS-435, which detects, localizes and cues a person at a console.

IN THIS SHEET

01	Specification	3
02	The architecture	6
03	The static case	6
04	Ground coupling	7
05	Emplacement	8
06	Power and dormancy	8
07	The housing	9
08	The link	10
09	Commissioning	11
10	Range and the line	11
11	Sensor variants	12
12	Doctrine and safety	12

01 · SPECIFICATION

BODY, SENSOR, LINK AND POWER. EACH FIGURE BESIDE ITS BASIS.

The product specification and the systems engineering behind it, grouped the way an integration lead reads an emplaced sensor: the body, what it senses, how it reports, what powers it, how it goes into the ground and what it is.

01 BODY AND MASS

PARAMETER	VALUE	BASIS
Configuration	Sealed cylindrical housing, direct-buried or augered in	the product specification table
Housing dimensions	~90 mm dia × ~380 mm length	design value, the product specification table
All-up mass	~4.5 kg	design value, the product specification table
Housing material	Moulded glass-filled nylon; recycled PET for non-structural parts only	no corrosion, no galvanic couples, electrically inert
Seal design case	Submersion, not splash	burial below the water table is the design case
Structural loads	Soil overburden · frost heave · sustained hydrostatic head	the loads the case carries for its whole buried life
Internal protection	Electronics conformally coated and potted; desiccant with a moisture telltale	against the condensation that thermal cycling produces in any sealed volume

02 SENSING

PARAMETER	VALUE	BASIS
Sensor package	Tri-axial geophone · MEMS accelerometer · acoustic sensor	the product specification table
Sensing mode	Passive only: no active seismic source, no acoustic projector, no electromagnetic emitter	the payload boundary, in every variant
Geophone power	0 W	a moving-coil geophone is a generator; its output is proportional to ground velocity
Detection range	Footsteps and digging: tens of metres; vehicles: farther, soil-dependent	the product specification table; any range figure states its soil and threat class
Threshold discrimination	Rejects wind, weather and passing wildlife; catches digging, footsteps, vehicles and tunnelling	the product specification table
Wake and report latency	Sub-second threshold trip; report to head-end under 1 s over fibre	the product specification table

03 LINK AND REPORTING

PARAMETER	VALUE	BASIS
Comms	Buried fibre only, node to node or direct to head-end; no radio	the product specification table
Emissions over the air	None, in any wake state or configuration	the product specification table
Fibre ports	Two: one up-line, one down-line	the daisy-chain line topology
Link state	Dark by default; energized only to report or to relay a neighbour's traffic	an idling optical transceiver would spend the battery
Reporting pattern	Wakes on threshold, classifies locally, reports once	the product specification table
Health data over the fibre	Battery voltage under load · coupling-spectrum snapshot · moisture telltale	the scheduled self-check, on a slow fixed cadence
Position reference	The install survey; no satellite receiver aboard	every node must know where it is for a line's solution

04 POWER AND DORMANCY

PARAMETER	VALUE	BASIS
Battery chemistry	Primary lithium, long-shelf-life cell class	the product specification table
Standby endurance	Years-class at ultra-low duty cycle	the product specification table
Duty cycle	Sleep and listen; wakes on threshold	the product specification table
Wake-up	Analog front end on the geophone output, not a continuously sampling digital stage	the power floor between events decides how long the watch lasts
Line power option	Tether tap from a line supply where a node sits near a bored conduit	removes the battery constraint for anchor nodes

05 EMPLACEMENT AND ENVIRONMENT

PARAMETER	VALUE	BASIS
Emplacement method	Auger or hand-buried at a surveyed position, on the group's directional-drilling survey discipline	the product specification table
Emplacement modes	Hand or auger burial · trenched with the fibre on a strung line · delivered down a CS-410 bore	the three emplacement modes

PARAMETER	VALUE	BASIS
Burial depth	0.3–1.0 m nominal, site-dependent	design value, the product specification table
Coupling features	Spike or cone · base plate · full burial, compacted or grouted	seismic-practice coupling options, chosen to the ground
Operating temperature	–40 °C to +50 °C class	design value, the product specification table
Tilt at commissioning	Read from the accelerometer, static	install-time self-knowledge
Recovery	Dug back along its own fibre lead, or logged and left in place by decision	the product specification table

06 ROLE AND CLASSIFICATION

PARAMETER	VALUE	BASIS
Chain role	Node of the Trembler Line CS-435 picket; also emplaced standalone as a listening post	the product specification table
Response scope	Physical response is CS-425, tasked on a person's decision; not this node	the product specification table
Payload	None: sensing electronics and battery only	the product specification table
Munitions classification	Passive sensing node: no warhead, no fuze, no energetic material; no offensive capability of any kind	the product specification table
Patent status	Patent pending	the product specification table
Export control	Export-controlled; international transfer subject to Canadian government permits; counsel first	the product specification table

02 · THE ARCHITECTURE

A SEALED BODY AND A PASSIVE EAR. THE FIBRE STAYS DARK UNTIL IT REPORTS.

CS-430 is a buried instrument restated as a fleet node: a sealed body couples a passive sensor to the ground, a low-power stack sleeps behind an analog wake-up, and a normally dark fibre carries the record out.

THE BODY

~90 MM BY ~380 MM, ~4.5 KG

A sealed cylindrical housing in moulded polymer, direct-buried or augered in. It is the pressure vessel, the corrosion barrier and the first element of the signal chain at once.

THE SENSOR

GEOPHONE, ACCELEROMETER, ACOUSTIC

A tri-axial geophone and a MEMS accelerometer read ground-borne vibration, and an acoustic sensor reads what travels through air and structure. Every element listens and nothing aboard emits.

THE LINK

TWO PORTS, ONE DARK FIBRE

Fibre only, node to node or straight to a head-end, in a daisy-chain line. Nothing goes over the air in any wake state or configuration.

The life cycle is short to describe. The position is surveyed, the node is augered or hand-buried and seated at depth, its fibre lead is spliced into the head-end or into the next node down the chain, and the pit closes. From then on it does nothing visible for a very long time: sleep and listen, wake on a threshold, classify the event locally, report once, sleep again.

It has two lives: a listening post on its own, or one node of Trembler Line CS-435.

03 · THE STATIC CASE

DEPLOYMENT IS ITS ONLY MOTION. EVERYTHING AFTER THAT IS LISTENING.

Every other platform in the fleet is engineered around something that moves. This one moves once, and each of the three things that replace motion in its design is harder than what it replaces.

- ✓ Ground coupling replaces aerodynamics: the transfer function between ground motion and sensor output is this node's flight envelope, and it is fixed at emplacement.
- ✓ The power floor between events replaces the fuel fraction: what the node draws while it waits, not what its battery holds, decides how long the watch lasts.
- ✓ The fibre picket replaces the launcher: reaching the position is a survey and a hole, and getting the record out is a wire.

On a Trembler Line the same buried node does three jobs at once. It is the detection element, it is a fibre relay for its neighbours, and it is the surveyed geometric reference the line's solution is computed against.

04 · GROUND COUPLING

COUPLING IS SET AT THE INSTALL.
NO LATER CORRECTION BUYS IT BACK.

Half of the coupling subsystem is hardware and half is procedure, and a poor installation colours everything the node reports for the rest of its life.



A buried case on soil is a sprung mass. Its coupling resonance rises with the stiffness of the soil contact and falls with the mass of the node, and it has to sit well clear of the band the node listens in. Two design rules follow: seat the coupling feature in undisturbed soil, and keep the node modest in mass. Loose backfill is the classic failure, because it lowers the contact stiffness and drops the resonance into the band.

Coupling also changes with the seasons, as saturation and freeze gaps alter the contact. A drift shows up first as a shift in the ambient spectrum the node reports, long before it shows up as a missed event. Inside the case, a rigid chassis ties the sensing element straight onto the coupling feature through a short, stiff load path with no soft interface, because every compliant joint subtracts signal.

COUPLING FEATURE	WHERE IT SUITS	WHAT IT BUYS
Spike or cone	Undisturbed soil at the bottom of the hole	The simplest hand-emplaceable seating
Base plate	Soft or organic ground	Bearing area where a spike would sink rather than seat
Full burial, compacted or grouted	Permanent installations	The ground itself clamps the case

05 · EMPLACEMENT

THREE WAYS INTO THE GROUND. ONE LEAVES NO SURFACE TRACE.

Burial depth is 0.3–1.0 m nominal and set per site rather than read from a catalogue, and the position is surveyed before the node goes in.

SURFACE ACCESS

HAND OR AUGER BURIAL

The coupling feature is seated in undisturbed soil. It gives the best-controlled coupling there is, and it asks for someone to walk the line.

STRUNG LINE

TRENCHED WITH THE FIBRE

Node and node-to-node fibre go in on one shallow trench pass, so emplacement and network build are a single operation. It is the natural mode for a planned line on owned or permitted ground.

DENIED SURFACE

DELIVERED DOWN A BORE

The node travels down a CS-410 tube bore and is emplaced at the head, with the fibre handed back out through the bore. Nothing marks the surface along the line.

Depth buys three things at once. It buys seasonal stability, because each freeze-thaw cycle reworks a seating near the surface. It buys rejection of surface noise, because wind, rain and traffic couple most strongly into the uppermost soil. And it buys concealment. Whatever the mode, every node must know where it is: a line's solution is only as good as the surveyed node positions it starts from, and the group's directional-drilling survey discipline is the one that puts each node where the survey says it goes. The bore used in the third mode is CS-410.

06 · POWER AND DORMANCY

THE SENSOR DRAWS NOTHING. THE FLOOR BETWEEN EVENTS SETS THE LIFE.

Deploy-and-forget is an energy claim before it is anything else, and three architectural rules carry it.

THE SENSOR IS FREE

A GEOPHONE GENERATES

A moving-coil geophone draws nothing and puts out a signal proportional to ground velocity, so the sensor costs nothing to leave switched on for the life of the node.

THE WAKE-UP IS ANALOG

NO SAMPLER LEFT RUNNING

The wake-up is an analog front end on the geophone output. A digital stage that never stops sampling would spend in months what the pack holds for years.

THE FIBRE IS DARK

LIT ONLY TO SPEAK

A conventional optical transceiver draws power even while idle, so the link is dark by default and energized only to report or to relay a neighbour's traffic. A neighbour's light wakes it.

The events themselves are almost free. What decides how long the watch lasts is what the node draws while it waits, so its endurance is an outcome of the electronics architecture rather than of battery size, and bigger cells cannot rescue a design that wastes power. Hold the analog wake-up and the dark fibre, and the node reaches the end of its cells' calendar life or of its seal before it reaches the end of its energy.

The pack is primary lithium of the long-shelf-life cell class, and standby endurance is years-class at an ultra-low duty cycle. Where a node sits near a bored conduit, a tether tap from a line supply removes the battery constraint altogether.

07 · THE HOUSING

NOTHING ACCELERATES IT. THE GROUND STILL LOADS IT FOR DECADES.

The case holds out soil pressure, groundwater, freeze-thaw and soil chemistry for a very long time, and passes ground motion to the sensor with as little colouration as it can.

Moulded glass-filled nylon is close to ideal for the duty. It does not corrode, forms no galvanic couples, is electrically inert and is mouldable on the group's own tooling. There is no radio aboard to shield, so the one property a polymer case normally costs is one this node never needs. Recycled PET is used for non-structural parts only.

- ✓ It excludes water at sustained hydrostatic head. Burial below the water table is the design case, so the seal specification is a submersion specification rather than a splash rating.
- ✓ It resists soil overburden and frost-heave loads without cracking.
- ✓ It carries the coupling feature that ties the case to the ground.
- ✓ It presents a service interface that preserves the seal, or the node is sealed for life.

Inside, the battery sits low and hard, where its inertia works for the coupling rather than against it. The electronics are conformally coated and potted against the condensation that years of thermal cycling produce in any sealed volume. A desiccant and a moisture telltale share the space, and the telltale is read over the fibre, a near-free health measure on a node nobody is going to open. The operating temperature is the $-40\text{ }^{\circ}\text{C}$ to $+50\text{ }^{\circ}\text{C}$ class.

08 · THE LINK

TWO PORTS AND A DARK FIBRE. NOTHING CROSSES THE AIR TO INTERCEPT.

The no-radio rule treats the link as the vulnerability, and this node is where the rule reaches its cleanest expression.



Once the fibre is spliced and the pit is closed, the node emits nothing over the air in any wake state or configuration: not a beacon, not a heartbeat, not a status ping. Nothing is sent, so there is nothing to intercept. There is no receiver to jam and no satellite fix to lose or spoof, because the node knows where it is from the survey that put it there. Two fibre ports carry the dark fibre, one up-line and one down-line, and on a line each node relays its neighbours' traffic as well as its own.

Reports go node to node or straight to a head-end: the event record when a threshold trips, and on a slow fixed cadence the battery voltage under load, a snapshot of the coupling spectrum and the moisture telltale.

DOCTRINE**NO RADIO. NO GPS. IT LISTENS, AND REPORTS ON A WIRE.**

No active seismic source, no acoustic projector and no electromagnetic emitter of any kind. A passive sensing node with no warhead, no fuze and no energetic material, and no offensive capability. Its output ends at data on a fibre.

09 · COMMISSIONING

ACCEPTED ON THE DAY IT GOES IN. CARRIED FOR THE LIFE OF THE NODE.

What a node learns about itself at the install is part of what is bought, because coupling and position cannot be recovered afterwards.

Tilt comes free from a static read of the accelerometer at commissioning. Absolute azimuth, which the bearing variant needs, has two routes: the install-time survey where the surface is worked, and a known-source calibration thump at a surveyed point where the node went down a bore. The thump doubles as the end-to-end acceptance check on coupling, and coupling quality is accepted on the day or carried for the life of the node.

There is no link check to run. The link is a wire, and it is either spliced or it is not. In service, a threshold trip is sub-second and the report reaches the head-end in under a second over the fibre.

10 · RANGE AND THE LINE

SOIL AND SOURCE DECIDE THE RANGE. THE SURVEY DECIDES THE SPACING.

Footsteps and digging read at tens of metres and vehicles farther, and any range figure states its soil and threat class.

Ground-borne amplitude falls with distance twice over, by geometric spreading and again by absorption in the soil it travels through, and high frequencies die first. Source strengths span orders of magnitude between a footstep, hand digging, mechanized tunnelling and a vehicle, and a site's noise floor spans orders of magnitude again. Node spacing is therefore an output of the site survey, and a line is delivered as a surveyed, commissioned system rather than as nodes at a fixed interval. Discrimination starts at the node, where the threshold detector rejects wind, weather and passing wildlife and catches digging, footsteps, vehicles and tunnelling.

The cue a line produces goes to a person at a console, not to a machine. Where a confirmed cue calls for a physical response, that response is CS-425, sent forward on a person's decision. This node's role ends at data on a wire, and no strike authority exists in the loop for it to command.

11 · SENSOR VARIANTS

SAME BODY, SAME MOUNT, SAME FIBRE. THE ELEMENT INSIDE CHANGES.

Every variant shares the envelope, the coupling, the power stack and the link, so a new element is a change of what sits inside rather than a new node.

VERTICAL GEOPHONE**A SINGLE-ELEMENT NODE**

A single vertical-axis moving-coil geophone, the workhorse of seismic practice, drawing nothing. It hears that something is happening, and roughly how energetically.

BEARING**THREE ORTHOGONAL ELEMENTS**

A three-element set, geophone or low-noise MEMS accelerometer, adds polarization and a single-node bearing, so a line solves position from arrival times and bearings together. It suits anchor positions in a mixed line among single-geophone nodes.

VOID LISTENING**A SEALED ACOUSTIC PRESSURE ELEMENT**

Fitted where a node sits near a tunnel, culvert or pipeline. Seismic and acoustic channels together separate source types: an engine in a void is acoustic-strong and seismic-weak, and digging is the reverse.

CIVIL TWIN**THE SAME NODE, UNCHANGED**

Pipeline leak and third-party-interference monitoring, and slope and seismic monitoring. Leak noise and an excavator strike are the same detection problem on the same hardware.

12 · DOCTRINE AND SAFETY

IT LISTENS AND REPORTS ON A WIRE. IT NEVER ACTS ON WHAT IT HEARS.

The lines that hold in every variant, in every emplacement and for every customer.

- ✓ Carriers, not munitions: CS-430 is a passive sensing node with no warhead, no fuze and no energetic material, and no offensive capability of any kind.
- ✓ Nothing aboard transmits by radio: once emplaced, the node sends nothing over the air in any wake state or configuration, and it carries no satellite receiver.
- ✓ No emitter of any kind: no active seismic source, no acoustic projector and no electromagnetic emitter, in every variant and for every customer.
- ✓ Human safety comes first, on every line: every hour a node keeps watch on a chokepoint is an hour nobody stands a post there, and any physical response is a person's decision, carried out by CS-425.

THE CONVERSATION

SHOW US THE APPROACH NOBODY WATCHES.
THE SURVEY STARTS THERE.

A first conversation needs the ground, the approach or chokepoint, and what a detection there has to set in motion.

Start a screened enquiry at cdnshield.ca/enquiries.

DOCUMENT	CDN-PROD-SPC-013 · CS-430 · Specification sheet
REVISION	R1.0 · issued 2026-09-10
WEB VERSION	cdnshield.ca/systems/underground/spec-sheets/cs-430 · carries the current revision
RELATED SHEETS	CS-410 · Aquifer CS-411 · CS-425 · Trembler Line CS-435 · CS-460
ISSUED BY	Canadian Shield · cdnshield.ca

Not an offer. Enquiries are screened, international transfer is subject to Canadian government permits taken per shipment, and all designs, systems and technologies shown are patent pending.