Probabilities of Detection for Sensors

	No Equipment	Hand Tools	Power Tools	High Explosives	Land Vehicle
Exterior Sensors					
Seismic Buried Cable	0.5	0.5	0.5	0.5	0.9
Electric field	0.5	0.3	0.3	0.5	0.9
Infrared	0.8	0.4	0.4	0.5	0.8
Microwave	0.8	0.7	0.7	0.7	0.9
Video motion	0.8	0.6	0.6	0.7	0.9
Multiple non-complementary	0.9	0.8	0.8	0.8	0.99
Multiple complementary	0.99	0.95	0.95	0.99	0.99
Interior Sensors					
Sonic	0.5	0.5	0.5	0.5	N/A
Capacitance	0.5	0.5	0.5	0.5	N/A
Video Motion	0.5	0.5	0.5	0.5	N/A
Infrared	0.5	0.5	0.5	0.5	N/A
Ultrasonic	0.5	0.5	0.5	0.5	N/A
Microwave	0.5	0.5	0.5	0.5	N/A
Multiple non-complementary	0.75	0.75	0.75	0.75	N/A
Multiple complementary	0.9	0.9	0.9	0.9	N/A
Position Sensors					
Position Switch	0.5	0.2	0.2	0.2	N/A
Balanced Magnetic Switch	0.8	0.8	0.8	0.8	N/A
Fence Sensors					
Taut Wire	0.5	0.25	0.25	0.75	0.85
Vibration	0.5	0.1	0.1	0.75	0.85
Strain	0.1	0.1	0.1	0.1	0.9
Electric Field	0.5	0.4	0.4	0.75	0.9
Multiple Sensors	0.75	0.5	0.5	0.8	0.9
Barrier Sensors					
Vibration	0.9	0.4	0.4	0.9	N/A
Glass Breakage	0.9	0.6	0.6	0.9	N/A
Conducting Tape	0.8	0.2	0.2	0.9	N/A
Grid Mesh	0.9	0.6	0.6	0.95	N/A
Multiple Sensors	0.99	0.9	0.9	0.99	N/A

Probability of Detection

Intrusion Mode	Probability of Detection								
	Electric-Field	Microwave	Infrared	Fence Motion	Taut Wire	Seismic	Seismic-Magnetic	Ported Coax	Video Motion
Fence Climbing	—	—	—	H	H	—	—	—	—
Crawling	H	M-H	M-H	—	—	M	M	VH	M-H

Key

0.95 VH = very high
0.8–0.9 H = High
0.5–0.7 M-H = Medium to High
<0.5 M = Medium
L-M = Low to Medium
L = Low
VL = Very Low
L-H = Low to High
— = not applicable

Susceptibility to Nuisance Alarms

Environment	Susceptibility to Nuisance Alarms								
	Electric-Field	Micro-wave	Infrared	Fence Motion	Taut Wire	Seismic	Seismic-Magnetic	Ported Coax	Video Motion
Wind	M	L	L	H	VL	M	M		M
Rain	L-H	L	L	M	VL	L	L	M	L
Standing Water	VL	M-H	L	L	VL	L	L	H	M
Small Animals		M-H	M	L	VL	L	L	VL	L
Large Birds	M	M	M	L	VL	VL	VL	VL	
Buried Power Lines	VL	VL	VL	VL	VL	M	H	VL	VL

Estimates of Probability of Detection

Intruder	System Type										
	Electric Field	Microwave	Active Infrared	Passive Infrared	Fence Motion	Taut-Wire	Seismic	Seismic/ Magnetic	Ported Coax	Fiber Optic Cable	Video Motion
Walking	VH	VH	VH	H	N/A	N/A	VH	VH	VH	M	H
Slow Walk	VH	H	VH	M-H	N/A	N/A	H	H	H	L-M	M
Running	VH	H	VH	H	N/A	N/A	H	H	VH	VH	H
Crawling	H	M-H	M-H	L-M	N/A	N/A	M	M	VH	M	M-H
Rolling	VH	M-H	M-H	L-M	N/A	N/A	M	M	VH	H	M-H
Jumping	VH	M-H	H	H	VH	VH	M	M	H	H	H
Tunneling	VL	VL	VL	VL	L	VL	L	L	M	L	VL
Trenching	L	L-M	L	L-M	L	VL	M	M	VH	VH	L-M
Bridging	L	L	VL	M	VL	VL	L	L	L	VL	M
Cutting	N/A	N/A	N/A	N/A	M-H	H	N/A	N/A	N/A	N/A	N/A
Climbing	N/A	N/A	N/A	N/A	H	H	N/A	N/A	N/A	N/A	N/A
Adverse Environment	Surface snow	Surface snow		Body Temp.	Ice coat		Frozen ground			Frozen ground	Shadows, snow, fog, heavy rain
Defeat Methods	Trench	Trench	Bridge trench	Tunnel	Bridge trench	Bridge trench	Bridge	Nonmagnetic materials	Stilts	Bridge	
Characteristics											
Active or Passive	A	A	A	P	P	P	P	P	A	P	P
Converter Visible	V	V	V	V	V	V	C	C	C	C	V
TF or LOS	TF	LOS	LOS	LOS	TF	TF	TF	TF	TF	TF	LOS

Key

VL = very low	H = high	P = passive	TF = terrain-following
L = low	VH = very high	C = covert	LOS = line-of-sight
M = medium	A = active	V = visible	N/A = not applicable

Relative Susceptibility to Nuisance Alarms

	Electric Field	Microwave	Active Infrared	Passive Infrared	Fence Motion	Taut Wire	Seismic	Seismic Magnetic	Ported Coax	Fiber Optic Cable	Video Motion
Weather											
Wind speed <47 km/hr	L	VL	VL	VL	L	VL	L	L	VL	L	L
Wind speed (WS) 47 km/hr < WS <115 km/hr	M	L	L	L	H	VL	M	M	VL	M	M
Wind speed >115 km/hr	M	L-M	L-M	L-M	VH	L	H	H	VL	H	M
Rain	L-H	L	L	L	M	VL	L	L	M	L	L
Runoff, Standing Water	VL	M-H	L	L	L	VL	L	L	H	L	M
Snow	M	L-M	M	L	L	VL	L	L	L	L	M
Fog	VL	L	M	L	VL	VL	VL	VL	VL	VL	L
Hail	M	L	L-M	L	L	VL	H	M-H	M-H	M-H	M
Animals											
Small (Rabbits, Squirrels)	M	M-H	M	M	L	VL	L	L	VL	L	L
Large (Dogs, Deer)	VH	VH	VH	L-H	M	L	VH	VH	M	M	H
Small Birds	L	VL	L	L	L	VL	VL	VL	VL	VL	L
Large Birds	M	M	M	M	L	VL	VL	VL	VL	VL	M
Electrical Interference											
Lightning	M	L-M	L	L	L	VL	L	H	M	L	H
Overhead Power Lines	VL	L	VL	VL	VL	VL	L	M	VL	L	VL
Buried Power	VL	VL	VL	VL	VL	VL	M	H	VL	M	VL

Interior Sensors Suitable for Fixed-Site Applications

Application	Operating Principle	Detection					Factors That Cause Unreliable Detection	Typical Defeat Methods	Major Causes of Nuisance Alarms									
		Portal Opening	Break through Wall/Floor\Ceiling	Radial Motion	Transverse Motion	Touching Object			Humidity/Temp/ Velocity (wind)	Localized Heating (sunlight)	Movement Greater than 0.025 m/sec	Movement Outside Area (Vibration)	Fluorescent Lights	Loose-Fitting Doors	Mount Vibration	Ambient Acoustic Noise (lightning/thunder)	Animals	RFI-radio transmitter
Boundary Penetration	Balanced Magnetic	X					Improper installation	Stay behind intruder or enter through unprotected area						X				
	Vibration		X									X			X			
	Continuity		X															
	Infrasonic	X	X						X				X					
Motion	Sonic	X		X	X		Acoustic background	Disable electronics	X		X			X	X	X		
	Ultrasonic	X		X			Air movement	Cover when sensor is in access	X		X			X	X	X		
	Microwave	X		X			RFI				X	X	X		X		X	X
	Infrared				X		Unstable thermal background			X					X		X	X
Proximity	Capacitance					X	Gross changes in relative humidity, temperature, or pressure	Disable electronics	X								X	
	Strain					X											X	
	Pressure Pad					X											X	

Entry Control and Contraband Detection Estimates

	Probability of Detection	Delay Time
Visual ID Check (ID)	0.5	5 sec
Metal Detector (ME)	0.9	5 sec
Explosives Detector (EX)	0.1	5 sec
Special Nuclear Materials (SNM) Detector (Personnel)	0.9	5 sec
Special Nuclear Materials (SNM) Detector (Vehicles)	0.5	5 sec
Guard at Post	0.5	30 sec