RADIODETECTION®

SPX TECHNOLOGIES

MRX SG

Survey Grade RF Marker Locator

Technical specification

MRX SG Locator Specification

1. Product Summary

1.1 Product Descriptions	Multi-purpose Precision Locator Cable, Pipe and RF Marker Locator Locate System Receiver Multi-function Precision Locator
1.2 Intended Use	Locating and mapping the position/path of buried cables, pipes and RF Markers. Detecting and pinpointing insulation faults on buried cables and pipes Creating survey records of buried cables and pipes locations
1.3 Standard Equipment	Locator with lithium-ion battery pack Charger and mains lead Phone holder USB lead User Guide Rechargeable battery instruction sheet

2. Performance

2.1 Sensitivity	6E-15 Tesla 5µA at 1 meter (33kHz)
2.2 Dynamic range	140dB rms/√Hz
2.3 Selectivity	120dB/Hz
2.4 Depth measurement precision[1]	Cable / Pipe / Sonde: ± 3% RF Markers: ± 15% ± 5cm – RF Marker Type dependent. Depth precision valid to: Near Surface: 2' / 60cm Ball Marker: 4.9' / 1.5m Mid-Range: 5.9' / 1.8m Full Range: 7.9' / 2.4m
2.5 Locate accuracy	± 5% of depth
2.6 Active Locate filter bandwidth	± 3Hz, 0 < 1kHz ± 10Hz, ≥ 1kHz
2.7 Start-up time	<2.5 seconds
2.8 Maximum depth readout[2]	Cable / Pipe: 98' / 30m Sonde: 64' / 19.5m RF Markers: 16' / 5m

3. GNSS

3.1 Service Support	• GPS: L1C/A, L2C • GLONASS: L1OF, L2OF • Galileo: E1B/C, E5b • Beidou: B11, B21 • QZSS: L1C/A, L2C • SBAS2: L1C/A
3.2 Convergence time RTK	< 10 sec
3.3 Position accuracy RTK	0.01m + 1ppm CEP
3.4 Acquisition	Cold starts 24s Aided starts and reacquisition 2s *Timings stated are best case and dependent upon atmospheric conditions, baseline length, GNSS antenna, multipath conditions, satellite visibility and geometry*

3.5 SBAS	Augmentation Systems (where available)
3.6 RTK Correction Service	NTRIP and RTCMv3.X messaging standards
3.7 GNSS settings	RTK/Reset/Off
3.8 GNSS Antenna	Integrated, precision tuned helical antenna Built-in low-noise amplifier (LNA)
3.9 LED Indicator	Solid – RTK fix Flashing – RTK float Off – all other conditions

4. Locate Functions

4.1 Active Locate Modes	Seven: • Peak • Peak+™ (choice of combined Peak & Guidance or Peak & Null) • Guidance • Broad Peak • Null • RF Marker • Combined (Cable, Pipe and RF Marker)
4.2 Gain control	Guidance Mode: Automatic Other modes: Manual gain using "+" or "-" with one touch to return to center (50% of Full Scale)
4.3 Custom locate frequencies	Up to 5 additional frequencies in the range 50Hz to 1kHz at 1Hz resolution
4.4 Active locate frequencies	21 Frequencies: ELF (98/128Hz), 512Hz, 570Hz, 577Hz, 640Hz, 760Hz, 870Hz, 920Hz, 940Hz, 1090Hz, 1450Hz, 4096Hz, 8kHz, 8440Hz, 9820Hz, 33kHz, 65kHz, 82kHz, 83kHz, 131kHz and 200kHz* *Use of the 200kHz frequency is subject to radio licensing restrictions for Short Range Devices in the EU and possibly other countries. Users are responsible for complying with local regulations.

4.5 RF Markers

Utility	Display abbreviation	Color	Frequency
French Power	PFR	Natural	40.0 kHz
General / Non-drinkable water	PUR	Purple	66.35 kHz
Cable TV	CTV	Black / Orange	77.0 kHz
Gas	GAS	Yellow	83.0 kHz
Telephone / Telecoms*	TEL	Orange	101.4 kHz
Sanitary	SAN	Green	121.6 kHz
German Power	PDE	Blue / Red	134.0 kHz
Water	H2O	Blue	145.7 kHz
Electrical Power*	PWR	Red	169.8 kHz

*Use of the red Electrical Power (PWR) marker locate mode is subject to radio licensing restrictions for Short Range Devices in the EU and possibly other countries. Use of the orange Telephone/Telecoms (TEL) marker locate mode is restricted in Canada. Users are responsible for complying with local regulations.

4.6 Sonde Frequencies	4 Frequencies: 512Hz, 640Hz, 8kHz and 33kHz
4.7 Fault Find	8KFF and CDFF Locate insulation sheath faults on pipes and cables to 10cm / 4" accuracy using the accessory A-Frame and a compatible transmitter
4.8 Current Direction™ (CD) Signal Pairs	14 CD Pairs: 219.9/439.8Hz, 256/512Hz, 280/560Hz, 285/570Hz, 320/640Hz, 380/760Hz, 460/920Hz, 4096/8192Hz, 680/340Hz (INV), 800/400Hz (INV), 920/460Hz (INV), 968/484Hz (INV), 1168/584Hz (INV), 1248/624Hz (INV) Confirm operator is following the target pipe or cable with CD arrows and a compatible transmitter

4.9 Passive Locate Modes

- Power
- Radio
- CPS – cathodic protection system
- CATV – Cable TV
- Passive Avoidance – simultaneous locate of power and radio

4.10 Power Filters™ function

Switch out of sensitive Power Mode to locate on any of 5 individual mains harmonic frequencies:

HARMONIC	50 Hz regions	60 Hz regions
Primary	50 Hz	60 Hz
3rd	150 Hz	180 Hz
5th	250 Hz	300 Hz
7th	350 Hz	420 Hz
9th	450 Hz	540 Hz

4.11 Information displayed

- Signal strength – moving bar graph and numeric value
- Mode indication (Peak, Null, Guidance, Broad Peak, Peak+ with option of Guidance arrows or Null arrows)
- Line or Sonde locate type
- Proportional left/right indication
- Compass: full 360° line direction indicator
- Accessories in use indication
- Accessory specific custom screen
- Depth and current readout (Line location)
- Depth readout (Sonde location)
- Gain level (in dB)
- Frequency selected
- Battery condition
- Speaker volume
- Bluetooth® wireless technology status
- GPS satellites in view
- GPS status
- Configuration menu and submenus
- Software version
- Last calibration date
- Survey measurement counter
- Current Direction mode indicator
- Current Direction arrows
- Fault Find mode indicator
- Transmitter communication status
- Transmitter standby status
- Strike*Alert*® warning
- Overload warning
- Swing warning

4.12 Audio output tones

Volume level:
VOL0, VOL1, VOL2, VOL3, VOL4 and VOL5

Audio Level Pitch:
Low and High

Audio feedback for menu navigation

Strike*Alert* audio warning
Swing audio warning

Power / Passive Avoidance / Radio modes:
Real Sound derived from detected electromagnetic signal

Peak / Peak+ modes and CPS / CATV modes:
Synthesized audio tone proportional to signal strength

Guidance mode:
Continuous tone when locator is to the left of target, intermittent tone when to the right of target

Null mode:
Synthesized Audio tone proportional to signal strength. Low pitch to left of target, high pitch to right of target

4.13 Accessory locate functions

Locator clamps:
Used to identify individual target cable(s) in a bundle or cabinet using signal strength read-out

Stethoscopes:
Used to identify individual target cable(s) in a bundle or confined space such as a cabinet using signal strength read-out

CD / CM clamp:
Used to measure locate current and to confirm target cable using Current Direction

5. Locate Function Enhancements

5.1 Strike*Alert*	Audio and visual warning when a cable or pipe less than 30cm deep is detected. Operates in Active and Passive locating modes
5.2 Haptic Vibration	Handle vibrates when Strike*Alert,* Swing and Overload warnings activated
5.3 Swing Warning	Audio and visual warning when the user is swinging the locator excessively
5.4 Dynamic Overload Protection™	40dB, automatic • Automatically manages the system gain to compensate for strong signals e.g. from mains power or substations, to enable accurate locating
5.5 Overload warning	If the MRXSG becomes overloaded, users will be alerted by a flashing mode icon. Both the depth and current measurements will be disabled in the event of an overload.
5.6 Current Direction (CD)	• Measures the direction of current flowing in buried pipes or cables to ensure that an operator is able to identify and follow the target utility • Provides operator with arrows indicating the direction of current flowing in the located pipe or cable to confirm that they are following the target utility
5.7 SideStep®	Enables locating where other signals are interfering, and without compromising the optimum locate frequency Remotely shifts the locate and transmitter frequency by several Hz, out of the bandwidth of other locate signals that may be interfering with the locate
5.8 Simultaneous depth and current readout	Both utility depth and locate signal current are displayed simultaneously, giving the operator more information to help them to follow the target utility
5.9 Survey Measurements	Store up to 1,000 survey points within the locator, and append GPS data from internal GPS Export data immediately or as a batch over Bluetooth
5.10 Fault Find	Apply a Fault Find signal with a Tx-5 and Tx-10 transmitter, then use an accessory A-Frame to detect and pinpoint insulation faults. Fault find accuracy: Metric: 100mm US Customary: 4"
5.11 4kHz locate frequency and 4kHz CD	Designed for tracing higher impedance lines such as twisted pair telecoms or street lighting over distance Combine with Current Direction to help trace the target utility through dense or complex infrastructure
5.12 Peak+ mode	Use the accurate Peak bargraph, and add either proportional Guidance arrows for faster locating, or Null arrows to check for the presence of distortion
5.13 Integrated GPS option	Faster surveying using integrated GPS – no need for a separate hand-held device

6. Configurability

6.1 Phone operating system	Android™ iOS®
6.2 Option selection	All options can be enabled or disabled on the locator or using the RD Manager Online PC Software
6.3 Languages supported	Fourteen: English, French, German, Dutch, Polish, Czech, Slovakian, Spanish, Portuguese, Swedish, Italian, Turkish, Russian, Hungarian
6.4 Mains power network options	50 Hz or 60 Hz
6.5 Mode selection	All locate modes can be individually enabled or disabled
6.6 Active RF Marker Selection	All RF Markers can be individually enabled or disabled
6.7 Active frequency selection	All active frequencies available can be individually enabled or disabled
6.8 Passive mode selection	All passive modes can be individually enabled or disabled
6.9 Strike*Alert*	Enable / disable
6.10 Swing warning	Enable / disable
6.11 Haptic vibration	Enable / disable
6.12 Peak+ arrow selection	Guidance arrows or Null arrows Selected using the locator menu or with a long press of the antenna key
6.13 iLOC Connectivity	On / Off
6.14 Data export protocols supported	PPP / choice of 3 ASCII formats. Optionally append positional data
6.15 Time / date setting	Correct or update locator real-time clock using the RD Manager PC software or GNSS signals
6.16 CD Reset	Reset CD phase analysis with a single long press of the frequency key
6.16 Audio	Set audio tone frequency level high or low

7. Connectivity

7.1 Wireless connections	2 x Bluetooth 2.0 – SPP profile, class 1 2 x Bluetooth Low Energy 5.0
7.2 iLOC remote transmitter control range[3]	Metric: Up to 450m US Customary: Up to 1400'
7.3 iLOC remote transmitter control functions	Set transmitter frequency Set transmitter power output level Transmitter standby SideStep
7.4 Wired connections	**Type C USB (cable included as standard):** Connect to a PC to configure and update locator and to retrieve usage log data **3.5mm Stereo jack:** Connect wired headphones **Accessory port:** Connect Radiodetection accessories

8. Data capabilities

8.1 Usage-logging memory	4 Gb		
8.2 Usage-logging capacity	Over 500 days, measured at 8 hours use per day		
8.3 Usage-logging capture rate	1/second		
8.4 Usage parameters logged	Reference Real Time Clock Date-Time(UTC) Real Time Clock Date-Time(Local) Depth (cm) Current Gain GPS Fix Longitude Latitude FilePath Was Real-Time Clock Updated? Peak/Proportional Arrows Current Direction Compass Direction Is Swing Warning Active? Is Overload Warning Active? Alternating Current Voltage Gain or Fault-Finding Signal Strength Current Direction Phase Alternative Current Voltage Gain or Fault-Finding Phase Is Overload Protection Active? Is Spray Wand Active? Is GPS Reference Point Active? Antenna Compass Direction Magnetic Compass Direction	Keypad Button Events Main Battery Percentage Main Battery State Main Battery Voltage RTC Battery Voltage Temperature Is Electronic Certification Active? Is Self-Test Active? Is Current Direction Reset Active? Is Calibration-Safe Indicator Active? Is Peak Detector Active? Is PCMX Peak Detector Active? Is MRX Peak Detector Active? Number of Satellites Altitude Horizontal Dilution of Precision Session Reference Log Record Identifier Language Frequency Operating Mode Antenna Mode Accessory GPS Mode Bluetooth Mode	Bluetooth ASCII Format Bluetooth Low-Energy Mode Bluetooth Low-Energy ASCII Format Battery Type Volume Level TX Output Setting Power Mode Locator Mode Horizontal Cable Location Type TX Status Is Compass Enabled? Alerts Is Side-Step Enabled? Is Auto-Timeout Enabled? Is Spray Want Enabled? Is Cal-Safe Enabled? Is Vibration Feedback Enabled? Marker Type Utility Type Utility Selection Utility Owner Survey Measurement Log Event RX Ticketing Reference Number Sub-Ticket Reference ID GPS Heading GPS Ground Speed
8.5 Survey measurement capacity	Up to 1,000 data records		
8.6 Survey measurement data captured	Log Record Identifier Differential GPS ID Reference Real-Time Clock UTC Date-Time Real-Time Clock Local Date-Time Autonomous GPS UTC Date-Time Autonomous GPS Local Date-Time Differential GPS UTC Date-Time Differential GPS Local Date-Time Depth Marker Depth Current Current Direction Phase Gain Marker Gain Frequency Altitude Geoid Height Active Fault-Finding Signal Compass Angle Operating Mode Antenna Mode Accessory Longitude Latitude	GPS Fix GPS Mode GPS Distance Signal Strength Marker Signal Strength Number of Satellites Locate Mode Utility Selection Utility Type Peak/Proportional Arrows Horizontal Dilution of Precision Is Overloaded? Display Text Time Indicator Battery State Communication Protocol Volume Level Was Real-Time Clock Updated? Position Source Type (constellation)[4] Horizontal Accuracy[4] Vertical Accuracy[4] RTK FIX Date Time[4] RTK Correction Age[4] PDOP[4] VDOP[4]	

8.7 Survey measurement export options	RD Manager Online via USB Bluetooth – 'live' per measurement Bluetooth – batch export
8.8 Bluetooth survey measurement data protocol options	PPP ASCII (choice of 3 formats)

9. Power options

9.1 Rechargeable	Custom Lithium-Ion (Li-Ion) battery pack
9.2 Battery run-time	Li-Ion pack: 15 hours (50% duty cycle)* *Based on highest power marker, all features on. Battery run time will vary based on use of power marker, Bluetooth, backlight strength, GNSS and other features.
9.3 Charging options (Li-Ion pack)	Mains charger: 100-250 Volts AC, 50/60 Hz Automotive charger: 12-24V DC
9.4 Charging time (Li-Ion pack)	3 hours to 80% from empty with maintenance trickle charging thereafter
9.5 Charging temperature	Metric: 0°C to 45°C US Customary: 32°F to 113°F

10. Physical Characteristics

10.1 Design	Ergonomic, balanced and lightweight design for comfortable use during extended surveys
10.2 Construction	Injection Molded ABS Plastic
10.3 Weight	**Lithium-Ion battery pack fitted:** Metric: 2.6kg US Customary: 5.7lbs
10.4 Ingress Protection rating	IP65[5]* Protected against dust ingress and jets of water[5] applied from any direction *The antenna loop is IP55-rated. Minimal dust ingress can occur, this does not affect performance.
10.5 Display type	High contrast custom made monochrome LCD
10.6 Audio options	Built-in waterproofed speaker 3.5mm headphone socket
10.7 Operating temperature[6]	Metric: -10°C to 50°C US Customary: 14°F to 122°F
10.8 Storage temperature	Metric: -20°C to 50°C US Customary: -4°F to 122°F
10.9 Unit dimensions	Metric: 687mm x 350mm x 177mm US Customary: 27.0" x 13.8" x 6.9"
10.10 Shipping dimensions	Metric: 737mm x 284mm x 396mm US Customary: 29" x 11.2" x 15.6"
10.11 Shipping weight (kit)	Includes: • MRX SG with lithium-ion battery • Mains charger + lead • MRX SG Bag • Phone holder • User guide • MRX SG box Metric: 5.7kg US Customary: 12.6lbs

11. RD Manager Online Supporting PC Software

11.1 Operating System Compatibility	Microsoft® Windows® 10 64-bit
11.2 Locator system compatibility	Radiodetection RD7200, RD8200, RD8200SG and MRX SG Precision Locators
11.3 Functions	• Locator configuration • eCert® remote calibration certification • Factory calibration certificate retrieval • Usage-logging data collation and export • User account management • Locator software update • Survey Measurement retrieval • CALSafe® maintenance schedule enforcement • Product registration for extended warranty
11.4 Data export formats	.csv for database and spreadsheet applications .xls / .xlsx for Microsoft® Excel® .kml for Google Earth™

12. Warranty and Maintenance

12.1 Manufacturer's warranty duration	3 years standard, on registration
12.2 Recommended calibration and maintenance schedule	Annual, or at the beginning / end of a lease period if earlier
12.3 eCert remote calibration	• Remote calibration certification using an internet connection to Radiodetection • Recommended schedule: annual, or at the beginning / end of a lease period
12.4 CALSafe®	• Can be enabled to prevent the locator operating when beyond a defined calibration / maintenance schedule • Disabled by default • 30-day countdown to calibration due date
12.5 Enhanced Self-Test	On-unit Applies test signals to locate circuitry to confirm correct operation, as well as the typical tests for screen and DSP functions. Recommended schedule: weekly, or before each use.
12.6 Storage recommendation	Store in a clean and dry environment. Ensure all terminals and connection sockets are clean, free of debris and corrosion and are undamaged
12.7 Cleaning	Clean with a soft, moistened cloth. Do not use • Abrasive materials or chemicals • High pressure jets of water If using this equipment in foul water systems or other areas where biological hazards may be present, use an appropriate disinfectant.

13. Certification and Compliance

13.1	Standards	
	CE Safety:	EN 61010-1:2010 / A1:2019
	CE EMC:	EN 61326-1:2021
	CE Radio:	EN 301 489-3 V2.3.2 EN 301 489-17 V3.2.4 EN 301 489-19: V2.1.1 EN 300 330 V2.1.1 EN 300 328 V2.2.2 EN 303 413: V1.2.1
	CE SAR:	EN 50566 EN 62479 IEC 62209-1528:2020
	ENV (Environmental):	EN 60529 1992 A2 2013 EN 60068-2-64:2008 Test Fh ESTI EN 300 019-2-2:1999 (per table 6) EN 60068-2-27:2009 (Test Ea) EN 300 019-2-2:1999 (per table 6)
13.2	European directives	Radio Equipment Directive – 2014/53/EU Low Voltage Directive – 2014/35/EU EMC Directive – 2014/30/EU RoHS Directive – 2011/65/EU Battery Regulation – (EU) 2023/1542 Declaration of conformity is available from www.radiodetection.com
13.3	Radio FCC, IC	
	FCC EMC:	47CFR 15.107 47CFR 15.109 ICES-003 Issue 7, January 2020
	FCC RF:	47CFR 15.207 47CFR 15.209 RFC 15.247
	FCC SAR:	FCC 47 CFR part 2 (2.1093)
	ISED Certification No:	IC: 3893A-CLASSIC IC: 3147-BL652
	ISED SAR:	RSS-102 Issue 5, March 2015
13.4	Environmental	WEEE compliant ROHS compliant Altitude: up to 5000m Outdoor use Wet location
13.5	Manufacturing	ISO 9001: 2015

All specification are measured in test conditions, at 21°C / 70°F.

[1] Based on volumetric testing at a known fixed depth. True depth accuracy depends on factors such as ground composition, utility characteristics and the locate frequency / signal strength employed. Always follow local safe digging guidelines.

[2] The MRX SG will locate to greater depths in the right conditions, but depth accuracy will be compromised. Depth measurement will not be displayed beyond these depths.

[3] Tested with clear line-of-sight. Range is dependent on electrical environment and weather conditions. For optimum range, face the locator toward the transmitter and raise the transmitter 2' / 60cm from the ground.

[4] Only available via Bluetooth interface (ASCII – 1,2,3). Not supported by PPP protocol, RDMap+ or RD Manager Online.

[5] Water projected by a nozzle at a pressure of 30kPa /0.3 bar / 4.4 psi in accordance with BS EN 60529 1992 A2 2013.

[6] At very low temperatures, battery life will be degraded, LCD performance may slow and measurement precision may reduce.

RADIODETECTION®

SPX TECHNOLOGIES

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Provide best in class equipment and solutions, to prevent damage to critical infrastructure, manage assets and protect lives.

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To be the world's leader in the management of critical infrastructure and utilities.

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