



# TRANSPORTATION COMMUNICATION SOLUTIONS

**SINCLAIR**  
A DIVISION OF NORSAT INTERNATIONAL INC.



## THE SINCLAIR STANDARD

With over 60 years of transportation communications experience on a global scale, Sinclair has the product line and technical experience to keep your communications running smoothly. Many of Sinclair's antennas are low profile for discreet implementation and can fit into virtually any type of land mobile, transit, or transport vehicles. These antennas are designed to withstand harsh outdoor conditions anywhere in the world ensuring there is no service interruption. Sinclair antenna and filter products provide solutions for data collection, tracking and controlling on a real-time basis, and supporting multiple services. Sinclair sets industry performance standards based on the following cornerstones:

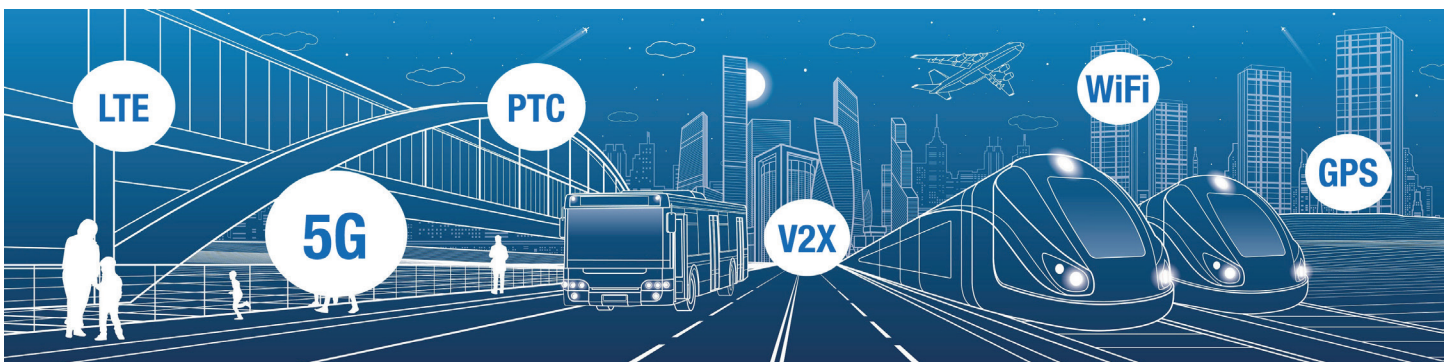
- › A Broad Range of Products in the low Bands, VHF, UHF, and up to 6000 MHz Bands
- › Providing technical assistance to help our customers select the right products
- › Ability to customize products fast to satisfy our customer's unique requirements

## EXPERIENCE IN THE TRANSPORTATION INDUSTRY

**Automotive and Heavy Transportation Solutions** - Our extensive line of automotive antennas range from covert, low profile models to versatile units to connect your entire transport fleet. The SM Series antennas have been deployed successfully in massive urban transit companies.

**Rail Solutions** - Sinclair's rail antennas are built to operate in extreme conditions like harsh weather, high-speed travel and vibration. Sinclair is the inventor of the Excaliber model of rail antennas which are recognized as the standard component for railway communications worldwide. We've maintained a dominant position by supplying the ST Series antennas in large-scale railway communication systems worldwide.

**Aviation Solutions** - For your aviation requirements, we have developed a line of rugged and durable collinear, dipole and base station antennas, as well as combining and multicoupling solutions.





This multi-band, multi-port transport antenna platform is designed to provide the full access to multiple wireless networks simultaneously. The SM2601D comes with 5 ports, one for PTC band, one for GNSS, one for WiFi and two broadband ports for 694-2700 MHz full band. They feature a low profile and unobtrusive black housing that is perfect for mounting to a typical metal vehicle rooftop with minimal visual impact.



## KEY FEATURES

- › **Broadband/Multi-Band**  
From VHF throughout to 6000 MHz
- › **Durable**  
Heavy duty base plate equipped with a weather resistant and fire tested radome
- › **Easy Installation**  
A single side/bottom exit point to avoid multiple access holes
- › **Low Profile**  
Fits tight height constraints on vehicles & other applications

## CUSTOMIZABLE OPTIONS

- › Combinations of PTC, cellular, WiFi/WiMax, GPS elements are available
- › Bottom or side port exit options for ease of installation
- › 220 MHz or 256 MHz frequencies for PTC
- › Dual 694-2700 MHz elements for diversity, LTE MIMO or different radios
- › Expandable to support additional radio systems using Sinclair's combining solutions\
- › Custom feed cable lengths and connectors are available

- The two broadband ports have identical broadband radiation element, which can be used for diversity or MIMO purpose. They can also be used for different radios providing maximal flexibility for a multiple radio system.
- The PTC port covers 219-223MHz. WiFi port covers 2400-6000MHz full band applicable for various WiFi systems. The GNSS module features a high-gain low noise amplifier and a saw filter, and it supports GPS, Galileo, GLONASS, and Beidou.



# MD MOBILE DUPLEXERS

Sinclair's new line of MD mobile duplexers feature six resonators for outstanding performance. These duplexers allow bi-directional communication over a common antenna and are ideal for applications that call for a compact rugged unit, such as in vehicles, or where space is constrained.



## KEY FEATURES

- › Compact and rugged design, ideal for mobile applications
- › Low insertion loss for optimal system performance
- › High isolation to minimize interference
- › Tx-Rx spacing of 4.5 to x MHz, or y to 10 MHz

	MD256 Series	MD356 Series
<b>Electrical Specifications</b>		
Frequency Range	136 to 174 MHz	380 to 480 MHz
Connector	Type N Connector	Type N Connector
Input VSWR (max)	1.5:1	1.5:1
Insertion Loss (max) Tx to Ant	1.5 dB	1.4 dB
Impedance	50 Ω	50 Ω
Average Input Power (max)	50 W	50 W
Isolation (min)	80 dB	75 dB
<b>Mechanical Specifications</b>		
Width	154 mm (6.05 in)	154 mm (6.05 in)
Depth	179 mm (7.03 in)	227 mm (8.92 in)
Length/ Height	32 mm (1.25 in)	28mm (1.1 in)
Weight	1 kg (2.2 lbs)	1.23 kg (2.7 lbs)
Mounting configurations	Mounting holes on unit	Mounting holes provided
<b>Environmental Specifications</b>		
Temperature range	-30 to +60°C (-22 to +140°F)	-30 to +60°C (-22 to +140°F)

# EXCELSIOR WHIP ANTENNAS

Sinclair presents next-generation SW models as part of the EXCELSIOR™ mobile omni whip antennas. These new VHF antennas are compatible with NMO mounts and they feature an optimized mechanical design and rugged material. The antennas are constructed with a new material that gives it an outstanding operating temperature, allowing their usage in broader applications. Fittings are constructed of stainless steel to inhibit rust and corrosion and are molded into the housing without the use of glue or fasteners to ensure a long-lasting, reliable product, even in harsh environments.

## KEY FEATURES

- › Impact Resistant
- › 100% Weather-proof
- › Rugged Public Safety Grade
- › Sleek Design
- › Reliable Magnetic Mounting



### SW-1482 Series

### SW-1560 Series

Electrical Specifications	SW-1482 Series	SW-1560 Series
Frequency Range	132 to 174 MHz	138 to 174 MHz
Bandwidth (typical)	26 MHz	36 MHz
Gain (nominal)	4.1 dBi (2 dBd)	2.1 dBi (unity dBd)
Input VSWR (max)	1.5 : 1	1.5 : 1
Pattern	Omni-directional	Omni-directional
Average Input Power (max)	150 W	100 W
Mechanical Specifications	SW-1482 Series	SW-1560 Series
Length / Height	1080 mm (42.5 in)	622 mm (24.5 in)
Mounting Configurations	Upright	Upright
Environmental Specifications	SW-1482 Series	SW-1560 Series
Temperature Range	-45 to +60°C (-49 to +140°F)	-45 to +60°C (-49 to +140°F)

# TRANSEON MOBILE ANTENNAS

The compact and low profile TRANSEON SM601, SM701 and SM300 series are ideal for vehicle roof-top mounting, covers all the bands for 2G, 2.5G, 3G and 4G cellular, LTE 700 MHz and LTE 2600 MHz, as well as ISM, GPS, WLAN, and broadband internet access. The SM300 covers additional UHF bands for TETRA, NMT 450, TV and DVB applications and SM701 extends the band coverage to 6000 MHz. They are designed to withstand harsh environments and constant vibration without compromising performance.



## KEY FEATURES

- › **Broadband/Multi-Band**  
Covers the full frequency band from 350 MHz to 2700 MHz (SM300), 694 MHz to 2700 MHz SM600) or 6000 MHz (SM700)
- › **Extremely Low Profile**  
Ideal for vehicle roof-top mounting with a 1.95 -3.3” white radome
- › **Easy Installation**  
One single 3/4” mounting plate (For the SM601 & SM701 only)  
No ground plane required for SM701
- › **Durable**  
Excellent design for waterproofing and vibration  
Adaptive to curve surfaces.

## CUSTOMIZABLE OPTIONS

- › Various connector options
- › GPS option for the SM300 and SM600

Models	SM300	SM601	SM701
Frequency Range	350 to 2700 MHz	694 to 2700 MHz	694 to 6000 MHz
Height	3.3 in (83.8 mm)	1.95 in (49.5 mm)	2.6 in (66 mm)
Overall Diameter	9.75 in (247.65 mm)	5.8 in (147.3 mm)	6.3 in (160 mm)
Weight	2.75 lbs (1.24 kg)	0.9 lbs (0.4 kg)	1.35 lbs (0.6 kg)
Ground Plane	24 x 24 in (610 x 610 mm)	14 x 14 in (355 x 355 mm)	Not Required

# STEALTHWAVE COVERT ANTENNA

Sinclair's StealthWave SHA111 covert antennas, are designed for covert operations of any kind, such as law enforcement vehicles. StealthWave antennas feature a unique modular design that integrates all the components into a compact waterproof housing, making it possible to install the antenna with minor modifications to the vehicle. A fine-tuning adjustment permits performance optimization during installation. StealthWave series antennas are extensively used and perform well in various applications. Available in VHF, UHF and 700 to 800 MHz ranges.



## KEY FEATURES

- › **Low Profile**  
Completely hidden, independent to any existing vehicle antennas
- › **Easy Installation**  
Easy installation and tuning for optimum performance and durability
- › **Many Applications**  
Applicable for both covert and overt law enforcement vehicles, military and non-covert commercial transportation systems etc.
- › **Field Tunable**

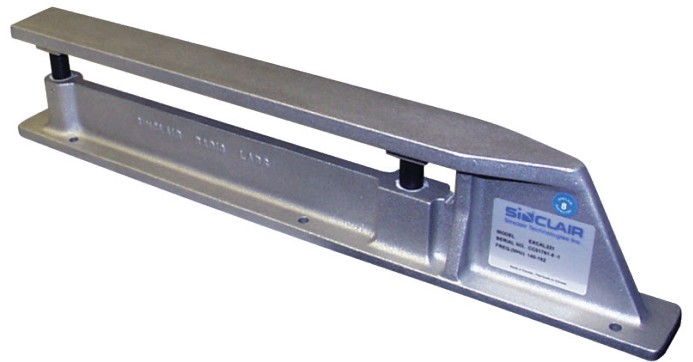
## CUSTOMIZABLE OPTIONS

- › N male, UHF male and mini UHF male connector options
- › Single or dual configuration
- › Can be adapted to various types of vehicles

Models	SHA211	SHA311	SHA411
Frequency Range	138 to 174 MHz	380 to 512 MHz	746 to 869 MHz
Bandwidth (Typical)	3 to 6 MHz	20 to 50 MHz	40 to 70 MHz
Average Power Input (W)	150 (single) or 300 (dual)	150 (single) or 300 (dual)	150 (single) or 300 (dual)
Dimensions (D x H x L)	2 x 22 x 3 in (51 x 559 x 76 mm)	2 x 19.5 x 3 in (51 x 495 x 76 mm)	2 x 10.5 x 3 in (51 x 266 x 76 mm)

# EXCALIBER RAIL ANTENNAS

Excaliber ST221 and ST321 series of low profile VHF antennas have become the North American standard antenna for railroad locomotive service. They are designed for a wide range of mobile transportation applications such as trains, taxis, police cars, emergency vehicles, buses and trucks. The rugged cast aluminum design ensures consistent dependable performance, relatively inconspicuous appearance and is resistant to damage.



## KEY FEATURES

### › Low profile

As low as 2.5 inches and suitable for a wide range of compact mobile transportation applications

### › Durable

Made from cast aluminum which is resistant to damage under extreme weather conditions

## CUSTOMIZABLE OPTIONS

› N-Female or UHF-Female connector option

› Extremely low profile option

Models	ST221	ST221-LP	ST321	
Frequency Range	138 to 174 MHz	217 to 223 MHz	159.5 to 225 MHz	380 to 520 MHz
Bandwidth	2.5 MHz	6 MHz	2 MHz	15 to 20 MHz
Height	4 in (101.6 mm)	4 in (101.6 mm)	2.5 in (63.5 mm)	2.5 in (63.5 mm)
Weight	7 lbs (3.17 kg)	6.3 lbs (2.85 kg)	3.9 lbs (1.76 kg)	3 lbs (1.36 kg)



# EXCALIBER RAIL ANTENNAS



Excaliber ST221R, ST321R and ST421R are rugged radome-enclosed antennas specifically designed for rail and heavy transport applications. The ST421R covers both the public GSM and railway GSM-R frequency bands. The ST221R and the ST321R cover VHF and UHF bands respectively. The low profile makes them ideal for train use where antenna height is limited.



## KEY FEATURES

- › Low profile
- › Suitable for both fixed and mobile installations
- › Proven performance in harsh environments

## CUSTOMIZABLE OPTIONS

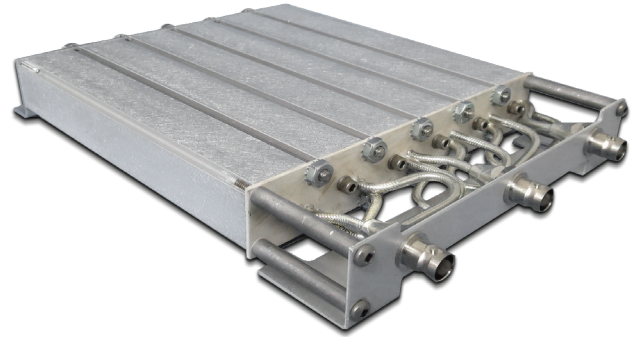
- › N-Female or UHF-Female connector option
- › Fire retardant radome option

Models	ST221R	ST321R	ST421R
Frequency Range	132 to 174 MHz	380 to 512 MHz	764 to 960 MHz
Bandwidth	1, 1.3, 2 MHz	14 to 20 MHz	42, 64, 90 MHz
Height	4.8 in (122 mm)	3 in (76.2 mm)	2.1 in (53.3 mm)
Weight	3 lbs (1.36 kg)	5 lbs (2.26 kg)	2.5 lbs (1.13 kg)

# COMPACT DUPLEXER

The MRx54 and MRx56 series are compact mobile duplexers for use in the VHF, UHF and 800-900 MHz frequency bands. They utilize four or six rugged, temperature-compensated resonators housed in a lightweight, aluminum extrusion. Their size and versatility make them an ideal unit for use where space is limited. Original equipment manufacturers of bi-directional amplifiers and coverage extenders find these products simple to integrate into their product.

The MR2222, MR2332 and MR3332 series are the extreme compact mobile duplexers in VHF and UHF frequency bands, suitable for the situations where space is very limited. Their depth can be as small as 4 inches.



## KEY FEATURES

- › Rugged, temperature compensated resonators
- › Lightweight but durable aluminum extrusion enclosure
- › 50 Watts with up to 80 dB Tx to Rx isolation
- › Compact in size, suitable for restricted spaces

## CUSTOMIZABLE OPTIONS

- › BNC-Female or N-Female connector options
- › 4 or 6 cavity configurations
- › Field tunable within the sub-band

Models	MR2222	MR2332	MR3332
Frequency Range	138 to 174 MHz	148 to 174 MHz	406 to 512 MHz
No. of Cavities	4	6	6
Insertion Loss (max) Tx to Ant	1 to 1.5 dB	1.5 to 1.8 dB	1.5 dB
Isolation (min)	50 dB	70 dB	65 dB
Dimension (D x H x L)	4.06 x 1.31 x 4.3 in (103 x 33 x 109 mm)	4.06 x 1.31 x 6.25 in (103 x 33 x 158 mm)	4.75 x 1.3 x 6.25 in (120 x 33 x 158 mm)
Weight	1.00 lbs (0.45 kg)	1.04 lbs (0.47 kg)	1.03 lbs (0.46 kg)



Models	MR254	MR256	MR354	MR356
Frequency Range	138 to 174 MHz	138 to 174 MHz	380 to 512 MHz	350 to 512 MHz
No. of Cavities	4	6	4	6
Insertion loss (max) Tx to Ant	1.2 dB	1.5 dB	1 dB	1.4 dB
Isolation (min)	60 dB	80 dB	50 dB	75 dB
Dimensions (D x H x L)	7 x 1.31 x 4.13 in (178 x 33 x 105 mm)	7 x 1.31 x 6.26 in (178 x 33 x 159 mm)	9 x 1.3 x 4.1 in (228 x 33 x 104 mm)	9 x 1.3 x 6.25 in (228 x 33 x 159 mm)
Weight	1.8 lbs	2.0 lbs	1.8 lbs	2.5 lbs

Models	MR454	MR456
Frequency Range	806 to 960 MHz	746 to 960 MHz
No. of Cavities	4	6
Insertion Loss (max) Tx to Ant	1 dB	1 dB
Isolation (min)	50 dB	60 dB
Dimensions (D x H x L)	5.75 x 1.25 x 4.1 in (146 x 32 x 104 mm)	5.8 x 1.31 x 6.25 in (147 x 33 x 159 mm)
Weight	1.6 lbs (0.72 kg)	1.8 lbs (1.81 kg)

# FP161R-200 & FP220R-161



Sinclair's FPxxxRxxx-(C) series band pass / band reject lumped element filters are compact, making them convenient to be installed with other RF devices. These filters provide superior performance for channel isolation between close frequency bands. They can be used both for transportation vehicle and base station applications.



## KEY FEATURES

- > Suitable for close frequency band signal isolation
- > Designed for panel surface mount
- > Compact construction with one N-male connector and one N-female connector
- > 100 Watts power handling capability

Models	FP161R220/098-NMF	FP220R161/098-NMF
Frequency Range - Pass Band	160 to 162 MHz	217 to 223 MHz
wFrequency Range - Reject Band 1	217 to 223 MHz	160 to 162 MHz
Frequency Range - Reject Band 2	88 to 108 MHz	88 to 108 MHz
Bandwidth	2 MHz	6 MHz
Pass Band Insertion Loss - max	0.7 dB	0.7 dB
Rejection Level	70 dB	70 dB
Dimension (H x L x W)	0.96 x 4.83 x 1.45 in (24 x 122 x 37 mm)	0.96 x 4.83 x 1.45 in (24 x 122 x 37 mm)
Weight	0.2 lbs (0.09 kg)	0.2 lbs (0.09 kg)



Sinclair's line of antenna and filter products for the transportation industry are the best in the business. Each antenna is highly configurable depending on the customer's requirements. Our engineering design team will work closely with you to ensure a perfect fit with your application.

Many of our antennas are low profile for discreet implementation and can fit into virtually any type of land mobile, transit or transport vehicles. These antennas are designed to withstand harsh outdoor conditions anywhere in the world ensuring there is no service interruption.



# SINCLAIR CONTRIBUTES TO TIMELY COMPLETION OF ASIA METRO RAIL PROJECT THROUGH QUICK CUSTOMIZATION CAPABILITY



## Asia Rail Transportation

One of Asia's largest provider of rail transportation control systems had placed an order of ST221 series VHF transportation antennas from Sinclair at the end of 2018 for an overseas project. When Sinclair received the frequencies from the customer, it was quickly realized that something didn't seem right. Based on the quantity ordered, Sinclair was able to deduce that the customer had planned to use only one antenna on each train. The frequency plan showed a 1.9MHz TX span and a 1.9MHz RX span with a 4.6MHz TX/RX separation. Essentially, the customer wanted to have one antenna to cover the entire RF system frequency range that is 6.5MHz wide.

The issue was that the VHF band antenna ordered only has a 2.5MHz bandwidth, which isn't wide enough to cover a 6.5MHz frequency span. Sinclair notified the customer immediately of the issue. Upon some clarifications with the customer's system designer, the following details were uncovered:

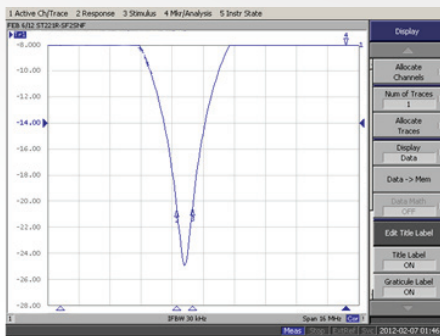
1. The land mobile radio system design was completed by a local partner who was a global leading LMR OEM company specifically appointed by their end customer.
2. Due to limited train roof space and cost consideration, the TX and RX paths would have to share the one antenna on the train.
3. The system designer did understand the bandwidth issue. Given the constraints, it was decided to optimize the antenna for the TX frequencies only - a common practice for mobile device antennas.
4. The project had already commenced and no fundamental changes could be made because this was a public tender.
5. There is a penalty clause for any project delay due to any acceptance test failures.

# SINCLAIR TECHNOLOGIES OFFERED A QUICK CUSTOMIZATION

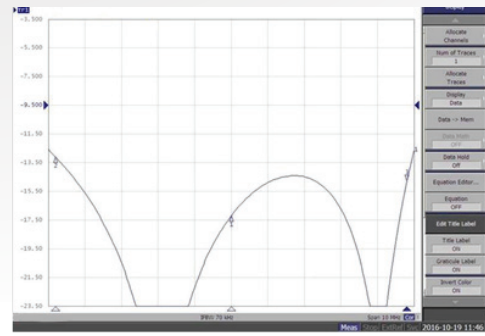
At first glance, it appeared that there would be no risk for the customer to do what the system designer had proposed. However, Sinclair pointed out there was an underlying clause that very likely could expose them to a penalty if they were to proceed with this plan. This was related to the maximum VSWR value of 1.5:1 in the antenna specifications. The customer would not be able to satisfy this requirement at RX frequencies by having the antenna optimized only for the TX frequencies.

This posed a major dilemma for the customer. They would not be able to pass the acceptance tests based on the current system design, and could face an expensive penalty if they were to follow their system designer’s advice. Concurrently, it would be challenging to persuade their end customer to implement a system change to a closed deal, especially when the change required additional costs and time.

Fortunately, Sinclair had in-depth knowledge of the application and was able to develop a customized solution to address the issue, not only without causing delay to the project, but also at a nominal cost which was significantly lower than the potential penalty. To overcome the physical limitation that made it impossible for the antennas to cover the specified TX and RX frequencies with a 6.5MHz bandwidth, Sinclair was able to quickly develop a quasi-broadband solution that optimized the antenna for both TX and RX frequencies.



Standard antenna (illustration)



Customized antenna (illustration)

To the delight of the customer and their end client, Sinclair’s professional advice and quick customization capability contributed significantly to the timely completion of the project. A grand opening ceremony was held in earlier 2020 to inaugurate the client’s metro line.

## Company Overview: Sinclair Technologies

With close to 70 years of transportation communications experience on a global scale, Sinclair has the product line and technical experience to keep your communications running smoothly. Many of Sinclair’s antennas are low profile for discreet implementation and can fit into virtually any type of land mobile, transit, or transport vehicles. These antennas are designed to withstand harsh outdoor conditions anywhere in the world ensuring there is no service interruption. Sinclair antenna and filter products provide solutions for data collection, tracking and controlling on a real-time basis, and supporting multiple services.



## SINCLAIR TECHNOLOGIES

Sinclair Technologies is a global leader in the design and manufacture of high-quality fixed and mobile antennas, filters, combiners, and related products. Designed to function in extreme conditions, Sinclair's products have a globally recognized reputation for quality, reliability, durability, and value. For over 60 years, Sinclair has provided custom-designed antennas and RF signal conditioning products to fit our customer's unique requirements. From simple to complex issues, Sinclair offers antenna and RF signal conditioning solutions for utilities industry paired with the industry's best RF expertise.

### CONTACT

**Sinclair Technologies**

85 Mary Street - Aurora, Ontario - L4G 6X5  
Canada

**TEL** +1 800 263 3275  
marketing@sinctech.com

Visit [www.sinctech.com](http://www.sinctech.com)  
for more information

