

# MDS ORBIT RCL SERIES

## Remote Control Locomotive Solution

GE Vernova has a strong history of collaboration with rail operators and partners to overcome the unique challenges the industry poses. Whether it be novel applications using the MDS Orbit Platform or developing completely new designs to meet rail specific operations, GE Vernova endeavors to be the solution provider that the industry relies on.

GE Vernova has once again partnered with Wabtec Corporation to develop a modern communication solution for existing and new Remote-Control Locomotive (RCL) systems. RCL is used in freight rail switching yards, allowing one or two operators with remote control packs to operate a locomotive from the ground to push and pull rail cars together for building trains for cross-country travel.

The new MDS Orbit RCL solution provides direct connectivity between the yard operator, via the Wabtec OCU, and the LCU installed in the locomotive. The MDS Orbit RCL Repeater system provides more reliable locomotive connectivity in the yard. With repeaters, the operator's control is independent of their proximity to the locomotive.

In addition to the 220 MHz operation, the new MDS Orbit RCL series provides the ability to operate RCL functions outside the yard via 4G cellular connectivity. The ability to perform RCL functions without relying on 220MHz has expanded the application possibilities and has made RCL available to many more operators who may not have access to the AAR channels.

### Key Benefits

- Backwards-compatibility with legacy MDS RCL series
- New 4G cellular connectivity for out-of-yard or non-AAR RCL applications and remote access to LCU
- Additional functionality for forward migration of legacy networks, which include IP Ethernet Data, networking, and security features
- Modern and time-saving diagnostic tools including local performance and alarm logging, PulseNET NMS support, and web-based configuration and monitoring.

### Types of RCL Radio Units



**LCU:** Locomotive Control Unit (LCU) resides in the locomotive and interfaces with its tractive power and air brakes. The LCU relays commands that govern the speed and braking of the locomotive while sending metrics about the locomotive back through the RCL system.



**OCR:** Operator Control Radio (OCR) is the transceiver installed in the OCU belt packs, known as Operator Control Units (OCU). The OCU is used by the yard operator to send speed and braking commands to the LCU, either directly or through the RCL-Repeaters in the yard.



**RCL-Repeater:** An RCL yard's infrastructure is made up of one or up to fifteen repeaters covering the yard and facilitate connectivity between OCUs and their respective locomotive's LCUs. Each repeater is made up of two Orbit-RCL Repeater modules that provide transceiver functions as well as RF monitoring. With repeaters, OCUs can connect to LCUs much further away than a direct connection providing reliable communication within the yard.



**Hump Gateway:** A Hump Gateway provides connectivity between the RCL system and a Hump Controller.



### Backwards Compatibility and Forward Migration

- Compatible with legacy MDS RCL systems and will work seamlessly with newer MDS Orbit RCL series products over-the-air.
- 4G cellular for out-of-yard, non-AAR, and remote applications
- Supports IP Ethernet and future network upgrades.

### Flexible Operation in Direct and Infrastructure Modes

- Peer-to-peer communication (Direct Mode) and Infrastructure Mode support.
- Effective in small switching yards and large railyards with repeater networks.

### Improved Safety and Efficiency

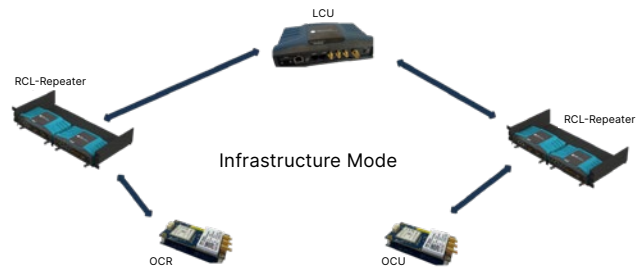
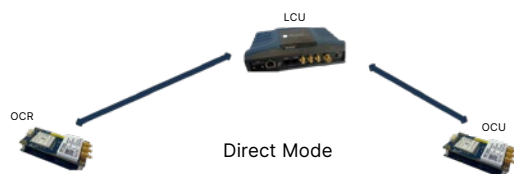
- Provides messaging redundancy to ensure continuous communication.
- Error control mechanisms reduce downtime and operational failures.
- High reliability standards support both freight and passenger rail.
- Enhances safety by maintaining reliable control, logistics, and monitoring systems.

### Industrial Strength Equipment

- Built to withstand harsh environmental conditions, with an operational temperature range from -40°C to 70°C.
- Designed and tested to meet AAR, AREMA, and ETSI industry standards.
- Ideal for rugged deployments in challenging rail environments.



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## Technical Specification

NETWORKING	
Data Rate	9.6 kbps raw over-the-air
Frequency Band	217 – 222 MHz
Timing Mode	Over the Air
Over-the-Air frame structure	TDMA, 47 timeslots per second, 7 payload bytes per slot
TX Power	2 Watts (33 dBm) (+/- 1.5 dB)
Output Impedance	50 Ohms
Channel Bandwidth	12.5 kHz
Channel Spacing	12.5 kHz
Modulation	GMSK Bandwidth Time = 0.3, 9615 bps
RX Sensitivity	-110 dBm
RX Co-Channel	-15 dB
RX Adjacent Channel	1st: 54 dB 2nd – 5th: 55 dB
Intermodulation Rejection	500 kHz / 1 MHz: 55 dB
Blocking	> 1 MHz: -30 dBm
Frequency Stability	1.0 ppm (-30 °C to +60 °C)

AGENCY APPROVALS	
FCC/ISED	CFR 47 Parts 15 and 90 ISED RSS-119

MAXIMUM RATINGS	
RF Power Level into Antenna Jack	0 dBm

SECURITY	
IPSec VPN Server (responder) and Client (initiator) with DMVPN	
Authentication Public Key, EAPTLS, Pre-Shared, Ike 1-2	
Encryption : 3DES, CBC, CTR, CCM, GCM, SHA 256/384/512 HMAC	
Firewalling: Stateful Layer 3-4 Firewall with MAC Filtering, NAT, Source NAT (Masquerading), Static NAT, Port Forwarding, rule violation notifications	
Device Security : Secure Boot, Secure Firmware, Digitally Signed Hardware and Software, Magnetometer Tamper Detection	
Certificate Management: X.509, SCEP, PEM, DER, RSA	
Automatic certificate renewal/re-enrollment	
User Authentication: Local RBAC, AAA/RADIUS, 802.1x	

PHYSICAL INTERFACE	
Main interface	J701 – 20 pin Samtec, LSS-110-01-L-DV-A
Legacy interface	J703 – 16 pin Samtec, STMM-108-02-T-D-SM-K-TR
Dual SIM	J403 –20 pin Molex, 2035662007
220 MHz Antenna	J200 – SMB (male)
Cellular Antenna	J400 and J401 SMB (male)

MECHANICAL	
Dimensions	3.45" L x 1.825" W x 1.175" H
Weight	0.15 lb
Weight	J403 –20 pin Molex, 2035662007

ENVIRONMENTAL	
Temperature	40 °C to +70 °C (-40 °F to +158 °F)
Humidity	95% at 40 °C (104° F) non-condensing
Input Power	6 to 12 VDC, 1.25W Typical

PROTOCOLS	
Management	Serial console
Payload	Basic Serial Protocol (BSP)

NETWORKING	
IPv4 Routing OSPF, EBGp, RIPv2 with performance-based route failover	
Full managed switch capability, IEEE 802.3, 802.1Q/VLANs, 64 VLANs, STP	
Concurrent Bridging & Routing	
GRE Tunneling with Layer 2 (Ethernet) and Layer 3 support	
Route/path failover between any two wireless/Ethernet interfaces based on link loss, latency degradation, or packet loss thresholds	
Quality of service: 16 egress queues, priority queuing, fair queuing, traffic shaping, classification based on DSCP, 802.1p and layer 2-4 classifiers	
IP Protocols TCP, UDP, ARP, DHCP, ICMP, NTP, FTP, SFTP, TFTP, DNS, configurable HTTP and HTTPS, SSH	
Serial TCP server, Modbus/TCP, Modbus RTU, TCP client, UDP	
Unicast and Multicast, BSAP, and DNP3	
Dual APN, VRF, Open VPN, FlexVPN, and VPN DPD*	

For more information  
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