



DESIGN BASIS/REQUIREMENTS

January 31, 2024

David King

Job Number:	23-0117-20
Job Name:	AKRR Passenger Car Wireless & Wi-Fi Design
Designer:	David King
Revision:	0



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BACKGROUND

Alaska Railroad passenger car consist, currently has a hardwired backbone network extending the length of the entire consist. The network enables the collection of Point-of-Sale data. During the configuration/reconfiguration of the consists, the cable connections between carriages frequently fail. This design modification will replace the hardwired connections between each carriage with a wireless Inter-Consist Link (ICL) solution.

In addition, this modification will add a Wi-Fi network that will cover each passenger car and connect to the backbone network. The Wi-Fi network will initially be used for Point-of-Sale data collection and should allow for future guest access and other improvements.

DESIGN REQUIREMENT

NETWORK BACKBONE

1. EN 50155 Railway applications – Electronic equipment used on rolling stock.
2. EN 45545-2 Fire Protection.
3. NFPA 130 Fire Protection.
4. Minimum IP66 Ingress protection
5. Minimum Layer 3, 12 port switch.
6. Minimum of one, 1 GBPS port for the backbone network
7. Switch provides PoE/PoE+
8. Operate on 72 VDC power.

INTER-CONSIST LINK

1. EN 50155 Railway applications – Electronic equipment used on rolling stock.
2. EN 45545-2 Fire Protection.
3. NFPA 130 Fire Protection.
4. Minimum IP66 Ingress protection
5. Wi-Fi 6.
6. PoE/PoE+
7. Operate in Bridge mode.
8. Auto configurable.
9. Shall meet PCI security standards for the transmission of credit card data.
10. Redundancy is not required.
11. Exterior antenna optimized for ICL and must meet IP67 and IP69K for outside mounting.
12. Exterior mounting hardware Stainless Steel.

INTERIOR WI-FI

1. EN 50155 Railway applications – Electronic equipment used on rolling stock.
2. EN 45545-2 Fire Protection.
3. NFPA 130 Fire Protection.
4. Wi-Fi 5 or Wi-Fi 6.
5. PoE/PoE+
6. Shall meet PCI security standards for the transmission of credit card data.
7. Low profile when mounting in the overhead of an Aisle to provide adequate passenger head clearance.
8. Radio and antenna can be all-in-one or separate units.
9. Redundancy is not required.

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DATA CABLE

1. Plenum rated.
2. CAT6A flexible.
3. M12 connectors.
4. Molded Hood.

COAX CABLE

1. Low loss, low PIM, 1/4" flexible coax cable.
2. Shielded.
3. Outdoor Rated.
4. 50-ohm impedance.
5. QMA Connectors to mate with ICC radio and antenna.

POWER CABLE

1. Power cable Arctic Ultraflex or equivalent.
2. Plenum rated.
3. 12 AWG, RHW-2, Copper Strand.

Special Regulatory Requirements and/or Permit Requirements:	None
Special Environmental Requirements:	<ol style="list-style-type: none"> 1. -40 to 158° F Operating Temperature 2. -140 to 167° F Storage Temperature
Applicable Codes:	None
Applicable Industry Standards:	<ol style="list-style-type: none"> 1. IEEE 802.11 (Wi-Fi 5 or 6) 2. IEEE 802.3af/at (PoE/PoE+) 3. EN 50155 4. EN 45545-2
Additional Performance Criteria (e.g. force, weight, strength, pressure, stress, time, temperature, flow rate, etc.)	Switch must operate with an input voltage on 72VDC. ARR1 power is 12VDC and will require either a power upgraded to at least 24VDC or some other solution.

Approved by:	Date:
David B. King	1/24/24