



PTC Radio Hardware Specification



Disclaimer

This work was funded in whole or in part by the Federal Railroad Administration, US Department of Transportation under U.S. Government Grant FR-TEC-0003-11-01-00, and is therefore subject to the following license: The Government is granted for itself and others acting on its behalf a paid-up, nonexclusive, irrevocable worldwide license in this work to reproduce, prepare derivative works, distribute copies to the public, and perform publicly and display publicly, by or behalf of the Government. All other rights are reserved by the copyright owner.

By downloading, using, or referring to this document or any of the information contained herein you acknowledge and agree:

Ownership

This document and the information contained herein are the property of Meteorcomm LLC (“MCC”). Except for the limited rights granted under the above license, you obtain no rights in or to the document, its contents, or any related intellectual property all of which are the property of MCC.

Limited Use and Non Disclosure

This document is protected by copyright, trade secret, and other applicable laws.

Disclaimer of Warranty

This document and all information contained within this document or otherwise provided by MCC, and all intellectual property rights within, are provided on a an “as is” basis. MCC makes no warranties of any kind and expressly disclaims all warranties, whether express, implied or statutory, including, but not limited to warranties of merchantability, fitness for a particular purpose, title, non-infringement, accuracy, completeness, interference with quiet enjoyment, system integration, or warranties arising from course of dealing, usage, or trade practice.

Disclaimer

Assumption of Risk

You are responsible for conducting your own independent assessment of the information contained in this document (including without limitation schematic symbols, footprints and layer definitions) and for confirming its accuracy. You may not rely on the information contained herein and agree to validate all such information using your own technical experts. Accordingly, you agree to assume sole responsibility for your review, use of, or reliance on the information contained in this document. MCC assumes no responsibility for, and you unconditionally and irrevocably release and discharge MCC and its affiliates and their respective officers, directors, and employees (“MCC Parties”) from any and all loss, claim, damage or other liability associated with or arising from your use of any of the information contained in this document.

Limitation of Liability & Disclaimer

This document is disseminated under the sponsorship of the Department of Transportation in the interest of information exchange. The United States Government assumes no liability for its contents or use thereof.

In no event shall MCC or the MCC parties be liable for any indirect, incidental, exemplary, special, punitive, or treble or consequential damages or losses, whether such liability is based on contract, warranty, tort (including negligence), product liability, or otherwise, regardless as to whether they have notice as to any such claims.

Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the view of the Federal Railroad Administration and/or U.S. DOT

Trade or manufacturers' names any appear herein solely because they are considered essential to the objective of this report.

Disclaimer

Hazardous Uses

None of the information contained in this document may be used in connection with the design, manufacture or use of any equipment or software intended for use in any fail safe applications or any other application where a failure may result in loss of human life or personal injury, property damage, or have a financial impact or in connection with any nuclear facility or activity or shipment or handling of any hazardous, ultra hazardous or similar materials (“Hazardous Uses”). MCC disclaims all liability of every kind for any Hazardous Uses, and you release MCC and the MCC Parties from and shall indemnify MCC and the MCC Parties against any such liability, including, but not limited to, any such liability arising from MCC’s negligence.

Copyright and Trademark

Meteorcomm® and ITCnet® are registered trademarks of Meteorcomm LLC., and may not be used without express written permission of Meteorcomm LLC.

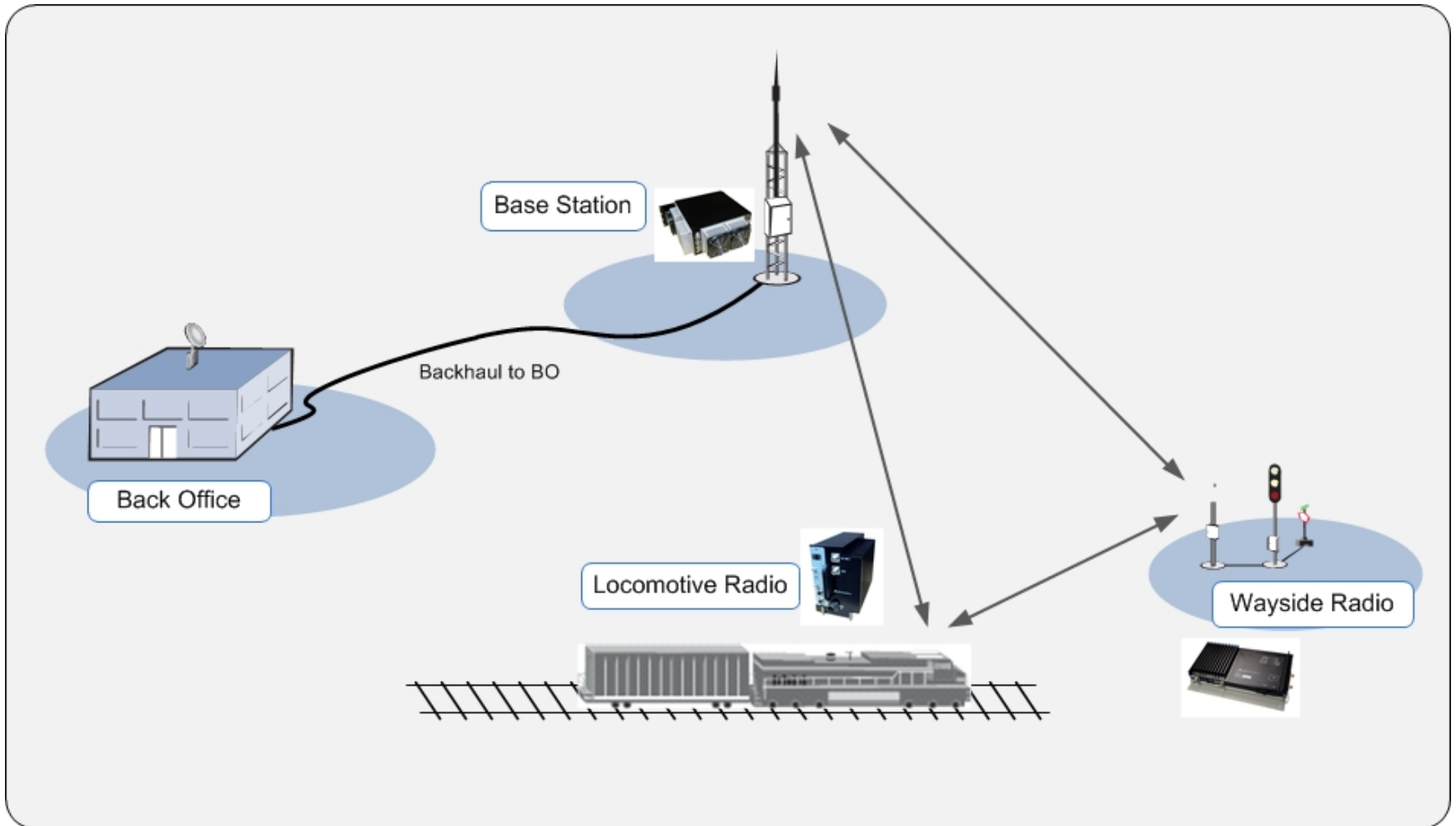
Trade or manufactures name may appear herein solely because they are considered essential to the objective of this report. The United States Government does not endorse products or manufacturers.

Document Number: 00002384-A

220 MHZ PTC Radio System Overview

- Radio types:
 - **Base Station Radio** – Installed at fixed locations to provide radio network coverage
 - **Locomotive Radio** – Remote mobile radio elements of the ITC 220 MHz network
 - **Wayside Radio** – Remote fixed-location radios installed at waysides
- Primary purpose:
 - Ensure that the locomotive receives timely track status messages

220 MHz PTC Radio System



Base Station Radio



- Installed at fixed locations
- Provides RF connectivity between the Back Office and remote areas

Locomotive Radio



- Mobile radio elements of the ITC 220 MHz network
- Installed in the cab of locomotives

Wayside Radio

- Remote, fixed-location radio installed at waysides
- Provides wayside signal status, switch position, and track integrity information to locomotives via a 220 MHz RF link



PTC Radio Hardware Specification

Meteorcomm Document:

ITC 220 MHz Radio Hardware Specifications, MCC DCN 00001040-E, August 29, 2011.

- This document defines the 220 MHz PTC radio hardware specifications. Specs include:
 - Electrical
 - Mechanical
 - RF performance
 - Regulatory requirements
 - Operational environment

Specifications & Primary References

ITC Requirements

- Scope and Requirements, *ITC Scope and Requirements – Prod Specs Version*, version 2.1, December 10, 2009
- ITCC Release 1.0 Requirements Baseline, MCC DCN REQ-PTC-00001174-E

AAR Standards

- AAR Standard S-5702, ver. 5.0, March 1, 2005
- AAR Standard S-590, ver. 5.0, December 1, 2005

Radio Industry Standards

- ANSI/TIA-603-C-2004, *Land Mobile FM or PM Communications Equipment Measurement and Performance Standards*, revision C, 12/2004
- ETSI EN 300 113-1-1 v1.6.1 (2007), *Land Mobile Service; Part 1: Technical characteristics and methods of measurement*

Regulatory

- FCC: CFR47 Parts 2, 15, and 90
- Industry Canada SRSP-512:

External Interfaces

	Wayside	Locomotive	Base
Ethernet Ports	2	2	2
GPS Antenna Inputs	1	0	1
Separate RX Connectors	0	1	2
Combination TX/RX Connectors	1	1	1

General Specifications

	Wayside Radio	Locomotive Radio	Base Station Radio
Function	Half-duplex radio	Half-duplex radio	Half-duplex radio
Frequency Range	217.6-222.0 MHz	217.6-222.0 MHz	217.6-222.0 MHz
Application	Fixed (non-mobile)	Mobile	Base Station
Use Environment	Wayside bungalow (per AAR S-5702)	Vehicle interior cab (per AAR S-5702)	Wayside control room (per AAR S-5702)
Operating Temperature	-40° C to +70° C	-40° C to +70° C	-30° C to +70° C

DC Power Specifications

	Wayside Radio	Locomotive Radio	Base Station (24 VDC)	Base Station (48 VDC)
Supply Voltage	13.6 VDC (10.9-15.5 VDC)	74 VDC (45-100 VDC)	24 VDC (21-27 VDC)	48 VDC (42-54 VDC)
TX Current Drain	7.5 A	1.8 A	7.5 A	4 A
RX Current Drain	0.65 A	0.36 A	0.85 A	0.41 A

Transmitter Specifications

	Wayside Radio	Locomotive Radio	Base Station (24 VDC)	Base Station (48 VDC)
Rated Power Output	25 W PEP	50 W PEP	75 W PEP	75 W PEP
Adjustment Range	7.5 - 25 W PEP	15 - 50 W PEP	10 - 75 W PEP	10 - 75 W PEP
Transmitter Class	Quasi-Linear	Linear	Linear	Linear
Transmitter Waveforms	16 kbps pi/4 DQPSK	16 kbps, 32 kbps pi/4 DQPSK	16 kbps, 32 kbps pi/4 DQPSK	16 kbps, 32 kbps pi/4 DQPSK
Transmitter Duty Cycle	10%	30%	50%	50%

Receiver Specifications

	Wayside Radio	Locomotive Radio	Base Station (24 VDC)	Base Station (48 VDC)
Receiver Waveforms	pi/4DQPSK	pi/4DQPSK	pi/4DQPSK	pi/4DQPSK
Raw Data Rates	16 kbps, 32 kbps	16 kbps, 32 kbps	16 kbps, 32 kbps	16 kbps, 32 kbps
16 kbps Static Sensitivity	-111 dBm	-111 dBm	-111 dBm	-111 dBm
32 kbps Static Sensitivity	-108 dBm	-108 dBm	-108 dBm	-108 dBm
Simultaneous Channels	2	8 primary 8 diversity	8 primary 8 diversity	8 primary 8 diversity
Diversity	Not supported	Two-antenna spatial diversity	Two-antenna spatial diversity	Two-antenna spatial diversity