IMPORTANT

BEFORE INSTALLING, MAINTAINING, OR USING YOUR RADIO TRANSCEIVER, READ THIS GUIDE WHICH CONTAINS IMPORTANT RF ENERGY AWARENESS AND CONTROL INFORMATION AND OPERATIONAL INSTRUCTIONS TO ENSURE COMPLIANCE WITH FCC OR INDUSTRY CANADA RF EXPOSURE GUIDELINES.

IMPORTANT

RETAIN THIS GUIDE AT THE LOCATION OF THE RADIO TRANSCEIVER INSTALLATION.

RF Energy Exposure Guide for

ITC 220 Base Station, Locomotive, and Wayside Transceivers Installed in Vehicles or at Fixed Sites

Radio Frequency Energy Exposure Guide
ITC 220 Base Station, Locomotive & Wayside Transceivers
PN 134069 Rev. A
Revised July 2012

REVISION HISTORY

REV	DATE	REVISION DETAILS
A	July 2012	Initial release. Part number 134069.

Important Notice

Because of the nature of wireless communication, transmission and reception of data can never be guaranteed. Data may be delayed, corrupted (i.e. have errors), or be totally lost. Significant delays or losses of data are rare when wireless devices such as CalAmp provides are used in a normal manner with a well-constructed network. These products should not be used in situations where failure to transmit or receive data could result in damage of any kind to the user or any other party, including but not limited to personal injury or death, or loss of property. CalAmp accepts no responsibility for damages of any kind resulting from delays or errors in data transmitted or received using the ITC 220 Base Station, Locomotive, or Wayside Transceiver, or for failure to transmit or receive such data.

Copyright Notice

RF Exposure Compliance Requirements

The ITC 220 Base Station, Locomotive, and Wayside Transceivers are intended for use in the railroad industry as Interoperable Train Control (ITC) Radio (ITCR), which is an important component of Positive Train Control (PTC). The ITC 220 Base station, Locomotive, and Wayside Transceiver units must be professionally installed and must ensure a minimum separation distance between the antenna or radiating structure and any person. Refer to Table 1 and 2 on pages 3 and 4 of this *RF Energy Exposure Guide* for recommended minimum lateral distance, as applicable for the antenna type and application and transmitting power.

Radio Transceiver Model	Antenna application	Section and applicable table
ITC 220 Base Station Transceiver	Fixed installation	Section 6 Fixed Installations; Table 2 on Page 5
ITC 220 Locomotive Transceiver	Mobile installation	Section 4 Mobile Installations; Table 1 on Page 3
ITC 220 Wayside Transceiver	Fixed installation	Section 6 Fixed Installations; Table 2 on Page 5
ITC 220 Wayside Transceiver	Mobile installation	Section 4 Mobile Installations; Table 1 on Page 3

It is the responsibility of the user to guarantee compliance with the FCC MPE regulations when operating this device in a way other than described above. The installer of this equipment must ensure the antenna is located or pointed such that it does not emit an RF field in excess of Health Canada limits for the general population.

ITC 220 Base Station, Locomotive, and Wayside Transceivers use a low power radio frequency transmitter. The concentrated energy from an antenna may pose a health hazard. People should not be in front of the antenna when the transmitter is operating.

Recommended safety guidelines for the human exposure to radio frequency electromagnetic energy are contained in the Canadian Safety Code 6 (available from Health Canada), the Federal Communications Commission (FCC) Bulletin 65 and the Council of the European Union's Recommendation of 12 July 1999 on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz) (1999/519/EC).

Any changes or modifications not expressly approved by the party responsible for compliance (in the country where used) could void the user's authority to operate the equipment.

TABLE OF CONTENTS

1 RF Energy Exposure Awareness and Control Information and Operational Instructions for FCC/IC Occupational Use Requirements 1

2 FCC / Industry Canada Regulations 1

3 Compliance with RF Exposure Standard 1

3.1 Your CalAmp radio transceiver complies with the following RF energy exposure standards and guidelines as of the date of manufacture: 2

4 Mobile Installations: RF Exposure Compliance, Control Guidelines, and Operating Instructions . 3

4.1 Guidelines 3

4.2 Operator Instructions 3

5 Mobile Antenna Installation Guidelines 4

6 Fixed Installations: RF Exposure Compliance Control Guidelines and Operating Instructions 5

7 Approved Accessories 6

8 CalAmp Contact Information 6

8.1 Factory and Technical Support 6

8.2 Customer Service 6

9 Documentation and Downloads 6

APPENDIX A: Abbreviations and Definitions 7

1 RF ENERGY EXPOSURE AWARENESS AND CONTROL INFORMATION AND OPERATIONAL INSTRUCTIONS FOR FCC/IC OCCUPATIONAL USE REQUIREMENTS

NOTICE: This radio transceiver is intended for use in occupational/controlled conditions, where users have full knowledge of their exposure and can exercise control over their exposure to meet FCC/IC limits. This radio device is NOT authorized for general population, consumer, or any other use.

This radio transceiver uses electromagnetic energy in the radio frequency (RF) spectrum to provide communications between two or more users over a distance. It uses RF energy or radio waves to send and receive messages. RF energy is one form of electromagnetic energy. Other forms include, but are not limited to, sunlight and x-rays. RF energy, however, should not be confused with these other forms of electromagnetic energy, which when used improperly, can cause biological damage. Very high levels of x-rays, for example, can damage tissues and genetic material.

Experts in science, engineering, medicine, health, and industry work with organizations to develop standards for safe exposure to RF energy. These standards provide recommended levels of RF exposure for both workers and the general public. These recommended RF exposure levels include substantial margins of protection.

All radio transceivers marketed in North America are designed, manufactured, and tested to ensure they meet government-established RF exposure levels. In addition, manufacturers also recommend specific operating instructions to users of radio transceivers. These instructions are important because they inform users about RF energy exposure and provide simple procedures on how to control it. Please refer to the following Web sites for more information about what RF energy exposure is and how to control your exposure to assure compliance with established RF exposure limits.

http://www.fcc.gov/oet/rfsafety/rf-faqs.html
http://www.osha.gov/SLTC/radiofrequencyradiation/index.html

2 FCC / INDUSTRY CANADA REGULATIONS

The FCC/IC rules require manufacturers to comply with the FCC/IC RF energy exposure limits for mobile radio transceivers before they can be marketed in the U.S. or Canada as applicable. When radio transceivers are used as a consequence of employment, the FCC/IC requires users to be fully aware of and able to control their exposure to meet occupational requirements. Your CalAmp user manuals and this RF Energy Exposure Guide include information and operating instructions required to control your RF exposure and to satisfy compliance requirements.

3 COMPLIANCE WITH RF EXPOSURE STANDARD

Your CalAmp radio transceiver is designed and tested to comply with a number of national and international standards and guidelines (listed below) regarding human exposure to radio frequency electromagnetic energy. This radio complies with IEEE and ICNIRP exposure limits for occupational/controlled RF exposure environment at duty factors as shown in Table 1 and Table 2 and is authorized by the FCC/IC for occupational use. In terms of measuring RF energy for compliance with the FCC/IC exposure guidelines, your radio antenna radiates measurable RF energy only while it is transmitting, not when it is receiving or in standby mode.

3.1 YOUR CALAMP RADIO TRANSCEIVER COMPLIES WITH THE FOLLOWING RF ENERGY EXPOSURE STANDARDS AND GUIDELINES AS OF THE DATE OF MANUFACTURE:

- U.S. Federal Communications Commission, Code of Federal Regulations; 47CFR Part 2 Subpart J
- Industry Canada RSS-102 Issue 4
- American National Standards Institute (ANSI) / Institute of Electrical and Electronic Engineers (IEEE) C95.1-1992
- Institute of Electrical and Electronic Engineers (IEEE) C95.1-1999 Edition

4 MOBILE INSTALLATIONS: RF EXPOSURE COMPLIANCE, CONTROL GUIDELINES, AND OPERATING INSTRUCTIONS

To control exposure to yourself and others and to ensure compliance with occupational/controlled environment limits, always adhere to the following procedures.

4.1 GUIDELINES

- These user awareness instructions should accompany the device or vehicle that it is installed when transferred to other users.
- Do not use this device if the operational requirements described herein are not met.

4.2 OPERATOR INSTRUCTIONS

- Be aware that a transmitter may operate automatically at any time when functioning as a data radio transceiver. People outside of the vehicle must maintain recommended minimum lateral distance from the antennas at all times. It is the responsibility of the vehicle's operator to keep bystanders beyond the minimum lateral distance from the antennas in order to comply with the FCC RF exposure limits for an uncontrolled/general population environment.
- **Verify that people outside the vehicle are at least the recommended minimum lateral distance away, as shown in Table 1, from a properly installed externally-mounted antenna.**
- The transmitter power is adjustable to accommodate the various installations of this product. Once the authorized ERP, antenna gain and the losses from the feed line, connectors and any inline RF filters are known, the transmitter power must be evaluated and if necessary, set to a value that will ensure that the authorized ERP and RF exposure requirements are met. Refer to the user manual for the particular radio model for additional information regarding power adjustment.

Table 1 below lists the recommended lateral distances to be maintained between bystanders and approved, properly installed mobile transmitting antennas in an uncontrolled environment.

Table 1 — Rated Power and Recommended Lateral Distance from Transmitting Antennas in Mobile Applications

Radio Type	Antenna Type	Antenna gain (dbi)	Nominal PEP (watts)	Maximum Duty Cycle	Recommended minimum lateral distance from transmitting antenna	
					cm	in.
Wayside*	¼-wave dipole mounted to roof or trunk of vehicle	2.15	30	10%	31.6	12.4
Wayside*	½-wave dipole mounted to roof or trunk of vehicle	4.55	28.77	10%	40.4	15.9
Locomotive	Locomotive antenna 0 dBd mounted to roof of locomotive	2.15	50	30%	70	27.6

*When Wayside Transceiver is used in a mobile application.

IMPORTANT

The licensee is required to comply with limits on frequency use, antenna location, power and effective antenna height per 47CFR Subpart T §90.701 et. seq., or Industry Canada SRSP-512 §6.3 as applicable.

Note: You, as the vehicle operator, **should be knowledgeable of the location of each of the antennas on the vehicle** and of the minimum lateral distances applicable to each. If this information is not available to you, contact your installer to obtain this information. Until this information is available to you, *keep bystanders at a distance beyond the largest lateral distance specified in Table 1 from every radio transceiver antenna on the vehicle.*

5 MOBILE ANTENNA INSTALLATION GUIDELINES

The following instructions apply only to vehicles with metal bodies or suitable ground plane:

- Mount each antenna connected to a transmitter in the center of the roof or trunk lid of the vehicle. When mounting an antenna to a trunk lid, be sure the minimum lateral separation distances (Table 1) are maintained with respect to back seat passengers and people that might be standing next to a stationary vehicle.
- Install all antennas in accordance with manufacturer's instructions.
- Always disable the transmitter when installing or servicing the antenna or transmission line or when working near an installed antenna.
- Use only CalAmp-supplied or CalAmp-approved antennas. Unauthorized antennas, modifications, or attachments could damage the radio and their use may violate FCC or IC regulations.

6 FIXED INSTALLATIONS: RF EXPOSURE COMPLIANCE CONTROL GUIDELINES AND OPERATING INSTRUCTIONS

To control exposure to yourself and others and to ensure compliance with RF exposure limits, always adhere to the following procedures:

- Base station or fixed antennas should be installed on permanent outdoor structures, such as the roof of a building or antenna tower.
- Install all antennas in accordance with the manufacturer's instructions.
- Always disable the transmitter when installing or servicing an antenna or transmission line or when working near an installed antenna.
- Use only CalAmp-supplied or CalAmp-approved antennas. Unauthorized antennas, modifications, or attachments could damage the radio and their use may violate FCC or IC regulations.
- RF Exposure compliance at such sites must be addressed on a site-by-site basis. It is the responsibility of the licensee to ensure compliance is met.
- The transmitter power is adjustable to accommodate the various installations of this product. Once the authorized ERP, antenna gain, and the losses from feed line, connectors, and any inline RF filters are known, the transmitter power must be evaluated and if necessary, set to a value that will ensure that the authorized ERP and RF exposure requirements are met. Refer to the user manual for the particular radio manual for additional information regarding power adjustment.

Table 2 below lists the recommended lateral distances to be maintained between bystanders and approved, properly installed fixed transmitting antennas in an uncontrolled environment.

Table 2 — Rated Power and Recommended Lateral Distance from Transmitting Antennas in Fixed Applications

Radio Type	Antenna Type	Antenna gain (dbi)	Nominal PEP (watts)	Maximum Duty Cycle	Recommended minimum lateral distance from transmitting antenna	
					cm	in.
Wayside	2.0 dBd exposed dipole tower leg-mounted fixed antenna	4.1	30	10%	39.6	15.6
Wayside	5.5 dBd exposed dipole tower leg-mounted fixed antenna	7.6	14.26	10%	40.4	15.9
Base	2.0 dBd exposed dipole tower leg-mounted fixed antenna	4.1	75	50%	140	55.0
Base	5.5 dBd exposed dipole tower leg-mounted fixed antenna	7.6	75	50%	209	82.3

IMPORTANT

The licensee is required to comply with limits on frequency use, antenna location, power and effective antenna height per 47CFR Subpart T §90.701 et. seq., or Industry Canada SRSP-512 §6.3 as applicable.

7 APPROVED ACCESSORIES

For a list of CalAmp approved accessories, refer to the user manual or contact CalAmp.

8 CALAMP CONTACT INFORMATION

For additional information about exposure requirements or other information, please visit the CalAmp Web site online at www.calamp.com.

8.1 FACTORY AND TECHNICAL SUPPORT

M-F 7:30-4:30 CST

CalAmp
1401 North Rice Avenue, Oxnard, CA 93030
Tel 805.987.9000; Fax 805.987.8359
Email wngsupport@calamp.com

8.2 CUSTOMER SERVICE

CalAmp
1401 North Rice Avenue
Oxnard, CA 93030
Tel 1.805.987.9000

BE SURE TO HAVE THE EQUIPMENT MODEL AND SERIAL NUMBER, AND BILLING AND SHIPPING ADDRESSES ON HAND WHEN CALLING.

For units in warranty, customers are responsible for shipping charges to CalAmp. For units returned out of warranty, customers are responsible for all shipping charges. Return shipping instructions are the responsibility of the customer. For warranty information, contact CalAmp.

9 DOCUMENTATION AND DOWNLOADS

CalAmp reserves the right to update its products, software, or documentation without obligation to notify any individual or entity. Product updates may result in differences between the information provided in this manual and the product shipped. For access to the most current product documentation and application notes, visit www.calamp.com.

APPENDIX A: ABBREVIATIONS AND DEFINITIONS

ANSI: American National Standards Institute (U.S.)

CFR: Code of Federal Regulations (U.S.)

dBd (Decibel, dipole): The forward gain of an antenna compared to a half-wave dipole antenna in decibels

dBi (Decibel, isotropic): the forward gain of an antenna compared with the hypothetical isotropic antenna, which uniformly distributes energy in all directions; linear polarization of the electromagnetic field is assumed unless noted otherwise

EM: Electromagnetic; Electromagnetism

EIRP: Equivalent Isotropically Radiated Power

ERP: Effective Radiated Power

FCC: Federal Communications Commission (U.S.)

HAAT: Height Above Average Terrain

IC: Industry Canada

ICNIRP: International Commission on Non-Ionizing Radiation Protection

IEEE: Institute of Electrical and Electronic Engineers

ITC: Interoperable Train Control

ITCR: Interoperable Train Control Radio

MPE: Maximum Permissible Exposure

OSHA: Occupational Safety and Health Administration (U.S.)

PEP: Peak Envelope Power

PTC: Positive Train Control

Radio Transceiver: Device that uses radio frequency (RF) energy to transmit and receive data, voice, or video

RF: Radio Frequency

SRSP: Standard Radio System Plan (Canada)

ABOUT CALAMP

CalAmp is a leading provider of wireless communications products that enable anytime/anywhere access to critical information, data and entertainment content. With comprehensive capabilities ranging from product design and development through volume production, CalAmp delivers cost-effective high quality solutions to a broad array of customers and end markets. CalAmp is the leading supplier of Direct Broadcast Satellite (DBS) outdoor customer premise equipment to the U.S. satellite television market. The Company also provides wireless data communication solutions for the telemetry and asset tracking markets, private wireless networks, Interoperable Train Control (ITC) radio transceivers for use in railroad Positive Train Control (PTC) applications, public safety communications and critical infrastructure and process control applications. For additional information, please visit the Company's website at www.calamp.com.