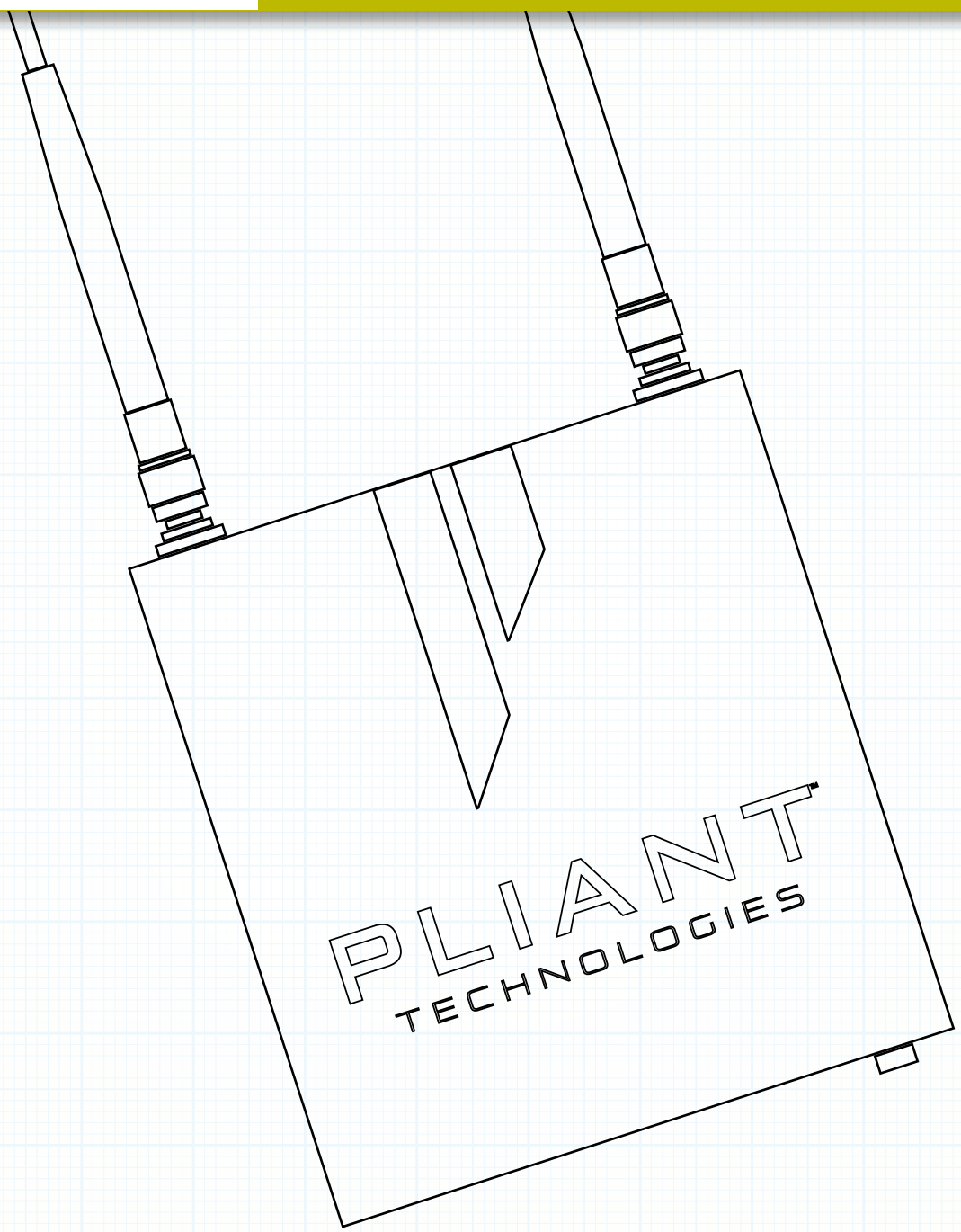
Radio Transceiver

CREWCOM BY PLIANT

OPERATING MANUAL



Thank You

We at Pliant® Technologies want to thank you for purchasing CrewCom®. Pliant brings our experience, expertise, and commitment to quality technology with the new CrewCom System. In order to get the most out of your new CrewCom product, please take a few moments to read this manual completely so that you better understand the operation of this product. For questions not addressed in this manual, feel free to review the additional support documentation provided on our website or to contact Pliant's Customer Support Department:

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Model Information

This document applies to CrewCom models CRT-900*, CRT-900AN**, CRT-2400, and CRT-2400CE***.

*CRT-900 model is only available in North America and operates within the 902–928 MHz frequency range.
**CRT-900AN (Oceania) model is approved for use in Australia and New Zealand and operates within the 915–928 MHz frequency range.
***CRT-2400CE model meets the same specifications as the CRT-2400 model, and it complies with ETSI standards (300.328 v1.8.1). Non-CE models are non-compliant with some ETSI standards.

Document Reference: 2019.01 D0000216_C

Table of Contents

Safety Information

The following section details important safety information related to the ownership and operation of the CrewCom Radio Transceiver.

WARNING: *Indicates a situation, which, when not avoided, has the potential to result in death or severe injury.*

CAUTION: *Indicates a situation, which, when not avoided, results or has the potential to result in minor injury or product failure or damage.*

1. Read these instructions.
2. Follow all instructions.
3. Heed all warnings.

Safe Operation Recommendations

- Install and operate in accordance with manufacturer's instructions.
- Do not submerge the Radio Transceiver in water.
- Do not set food, water, or other beverage containers on or near the unit.
- Do not place unit in areas where it will be exposed to weather.
- Plug the Radio Transceiver directly into an AC power inlet. Avoid using extension cords to power unit.
- Ensure the power cord remains free from areas of foot traffic. Do not allow power cord to become crimped, twisted, or frayed.
- Clean by using a dry cloth only. Do not spray household cleaners or water onto the cloth. Never spray household cleaners or water onto any part of the unit.
- Use only attachments/accessories that are specifically made for or certified by Pliant Technologies with the Radio Transceiver. Any attempt to modify ports in order to use cables or wires that are not manufactured specifically for or certified for use on this system will void the product warranty.
- Unplug the Control Unit during periods of inclement weather and after use.
- **Refer all Radio Transceiver service to qualified Pliant Technologies service personnel.** There are no user-serviceable parts inside the CrewCom Radio Transceiver. Opening the product may expose dangerous electrical components, which will result in product failure. Any attempt to self-service or self-repair the unit will void the product warranty.
- Service is required if the Radio Transceiver receives any type of damage to any of its parts or if it does not operate normally. For example, if water or any other type of liquid has been spilled on the Radio Transceiver or if it has been exposed to rain or moisture, then service is necessary. Service is also required if debris or other objects have fallen into the unit or if it has been dropped.

Power Information

WARNING *– DANGER! Users should exercise extreme care when working with electricity. Additional care should be used when working with electricity outdoors during inclement weather. When working outdoors or near water, always connect the system into a ground-fault interrupting circuit.*

AC Power Connection Safety

- When using local power to power the Radio Transceiver, always connect the power cord to the CrewCom Radio Transceiver's external power supply before connecting to the outlet.
- CrewCom Radio Transceivers may be powered by an external power supply. The cord to connect the external power supply to the mains supply must conform to the following specifications:
  - » The mains power cord shall have an IEC C13 connector at one end and a mains power plug at the opposite end.
  - » An IEC C13 plug has three pins. The center pin carries the earth/ground. The remaining two pins carry neutral and live circuits.
  - » The conductors of the mains cords shall have adequate cross-sectional area for rated current consumption of the equipment.
  - » The mains plug that connects to the mains supply must be approved for use in the country in which the equipment will be used.
  - » The mains power cord must be an IEC mains 3-Wire grounding power cord complying with standard IEC60320; IEC320/C13.
  - » Mains power cords used in the U.S. must also comply with standard UL817.

Introduction

What's in the Box?

- Radio Transceiver
- USB A to Micro B cable
- Cat 5e cable, 15 ft. (4.6 m)
- Product Overview Guide
- RT Flat Mounting Bracket
- Single RT Adapter Mounting Bracket
- Bracket Mounting Hardware
- Omni-Directional Antenna (x2)
- Microphone Stand Adapter
- Warranty Extension Registration Card

Note: *A one-year product warranty is standard with CrewCom products. Follow the product registration instructions on the Warranty Extension Registration Card and visit www.plianttechnologies.com/customer/account/login to extend your product warranty to two years at no charge. See page 18 for more information about Pliant warranties.*

Additional Items Required

In addition to your Radio Transceiver, at least one of each of the devices listed below is required to complete your CrewCom System (sold separately with included components):

- Control Unit
- Radio Pack
- Headset

Firmware Release Notes

Find the latest CrewCom firmware release notes on the Pliant Technologies website at www.plianttechnologies.com/media/resources/releasenotes/crewcom_release_notes.pdf

Download the latest firmware release from www.plianttechnologies.com/downloads.

CrewCom Overview

CrewCom is a versatile yet straightforward communications solution built on an intelligent wireless and wired network-based distributed system architecture. Innovative technologies have been specifically developed to facilitate intercom system growth and effortless adaptation, along with unparalleled digital wireless reliability for consistent operation, even in the most demanding production environments.

Decentralized Network Architecture

The CrewCom system utilizes a proprietary network backbone, known as CrewNet™, to coordinate and transport all system timing, audio, signaling, and controls. This efficient, decentralized resource network delivers increased flexibility over that of traditional technologies, using a distributed network-to-device intelligence within a modular building block structure. System components can easily be placed where they are needed or scaled to facilitate system growth, reconfiguration, and effortless adaptation to changing environments. For increased infrastructure flexibility, the CrewNet network is capable of operating over standard Cat 5e (or greater) and/or Single Mode Fiber (SMF) lines.

Flexible RF Platform

CrewCom's RF platform is vast and flexible to meet the needs of virtually any wireless communication challenge facing production and entertainment professionals worldwide. Each CrewCom wireless product is available in the 2.4GHz and 900MHz (North America, Australia, and New Zealand only) ISM bands and any combination of these frequency ranges may be simultaneously used on the same CrewCom system. CrewCom makes it easy to operate in challenging RF environments by combining support for multiple simultaneous frequency bands, while also allowing for simple system setup without the need for an RF engineer.

In addition, a more robust RF link enhances RF range and reliability through a newly developed dual carrier double-send transmission scheme that minimizes the adverse effects of inter-symbol interference. This innovation allows increased useful RF range and improved performance, especially in large, reflective environments.

Intuitive User Experience

CrewCom's family of products is designed around a system architecture that offers a high density of users with a more manageable infrastructure and lower cost per user than typically found in large-scale wireless installations. The CrewCom system not only consists of a range of wired and wireless hardware products but also incorporates an intuitive software application, known as CrewWare, working together with the system hardware to enhance the experience of system administrators, designers, integrators, and users. Each device's user interface allows a quick learning curve with high functionality, and its ease of use is consistent across all frequency bands, types of users, and applications.

CrewCom Devices

The following is a list of available CrewCom devices. For more information on each of these products and their configuration capabilities, visit our website at: www.plianttechnologies.com

- **Control Unit (CU)** – the 1RU foundational element of the CrewCom system that establishes the CrewNet-based infrastructure while also providing external connections to common established intercom systems. Unlike traditional BaseStations, the CU contains no radio and is frequency agnostic, which sets the groundwork for a multi-frequency capable system. For maximum flexibility, any CU can access, control, and monitor any active device across CrewNet. The CU is available in a "CCU-22" or "CCU-44" model, which simultaneously support up to (2) 2-Wire and (2) 4-Wire or (4) 2-Wire and (4) 4-Wire intercom connections, respectively.
- **Radio Transceiver (RT)** – a CrewCom radio device that houses a radio (2.4GHz or 900MHz) and its corresponding antennas, enabling RF communications to CrewCom Radio Packs. Using the CrewNet network as the system's backbone, RTs can be positioned throughout a wide coverage area by being linked back to a Control Unit either directly or through a Hub(s). Connectivity is accomplished using either Cat 5e (or greater) or Single Mode Fiber (SMF).
- **Radio Pack (RP)** – the direct portable wireless communication device connecting individual CrewCom users to the CrewCom system. Each RP provides full duplex audio communications and, through customized function buttons, General Purpose Output (GPO) control and event logging. The RP requires a connected headset and access to a Radio Transceiver on the CrewCom system. Devices are available in 2.4GHz and 900MHz bands as well as two and four volume/talk button configurations.
- **Copper Hub** – a CrewNet-based device with eight ports to allow extended interconnection for a variety of CrewCom hardware. Ports one through seven are copper (RJ-45, Cat 5e, or greater); port eight can be either an additional copper port or a duplex LC Single Mode Fiber port, but only one may be used at a time. The Hub provides for extensive system expansion and flexibility.
- **Fiber Hub** – a CrewNet-based device with eight ports to allow extended interconnection for a variety of CrewCom hardware. Ports two through eight are duplex LC Single Mode Fiber ports; port one can be either an additional fiber port or a copper port (RJ-45, Cat 5e, or greater), but only one may be used at a time. The Hub provides for extensive system expansion and flexibility.

CrewCom Configuration File Overview

The CrewCom system operates using a CrewCom Configuration File (CCF) to coordinate the processes and data that make up the system's operation. A default CCF is available for your CrewCom system out of the box to provide your initial settings. You can use CrewWare to customize your configuration to meet your specific needs beyond the default settings. The CCF stores the settings for your Conferences and Profiles, intercom settings, and connection information for your 2-Wire, 4-Wire, and CrewCom devices.

Conferences and Profiles work together to create channels of communication between CrewCom users. They are defined for each user, stored in the CCF, and available each time you set up. For more information about Conferences and Profiles, continue reading the following sections for their definition.

About Conferences

A CrewCom Conference is an administrator-defined grouping of audio entities (inputs such as Radio Packs, wired intercom ports, etc.). Audio outputs are then created dynamically by mixing one or more audio entities and routing them to Conference subscribers accordingly. This method of subscription-based audio using Conferences is very powerful. Point-to-point associations may also be easily constructed using this method. Each association requires a separate, unique Conference. Conferences in CrewCom are full duplex (i.e. bidirectional) and there can be a maximum of 1,024.

Default Conferences are included as part of a system's default configuration. New Conferences can be created using CrewWare.

About Profiles

Each CrewCom Radio Pack has a Profile that contains a variety of system settings that are defined as either global profile settings or user settings. A Radio Pack Profile assigns functionality to an RP's local controls, knobs, and buttons (including Conference assignments), and allows customization for user preferences and roaming

- **Global Profile Settings** – These settings are part of the CrewCom Configuration File and are usually assigned by a system administrator through customization in CrewWare during setup. Find a full list of the global profile settings available for each Radio Pack in the *CrewWare Operating Manual* or the *Radio Pack Operating Manual*.
- **User Settings** – A user setting is one that is classified as being adjustable by the Radio Pack user and is limited to local device settings that do not alter the CrewCom Configuration File. The Profile can be used to determine these settings, but they can also be customized directly from a Radio Pack after a Profile is loaded.

About Network Power

Power-over-CrewNet (PoC) is a proprietary network protocol that provides operating voltage and current to CrewNet-compatible devices connected to the Control Unit via RJ-45 connections (Cat-5e or greater.) Control Units must receive AC power via the supplied power cord in order to operate and provide necessary PoC to connected CrewNet-compatible devices.

In most cases, powering an RT and any daisy-chained RTs downstream via PoC is acceptable. However, depending on cable lengths and number of RTs in your CrewCom configuration, you may need to utilize the 48VDC power supply (PPS-48V, sold separately) to provide local power where needed. Fiber connections will not transfer power to an RT. The 48VDC Power Supply must be used in conjunction with a fiber connection in order for the RT to operate.

PoC can be supplied to RTs downstream from a locally powered CrewCom RT. Under optimal conditions, seven connected RTs may be powered from a locally powered RT; however, this number can vary greatly depending on the line lengths and the number and configuration of those connected RTs. For CrewNet-compatible devices using fiber connectivity, local power must be supplied to that device using a Pliant 48VDC power supply (PPS-48V, sold separately).

Product Overview

The CrewCom Radio Transceiver (RT) serves as a point of contact for Radio Packs (RPs) on CrewNet. RTs are available in either 2.4GHz or 900MHz models, and they can be positioned throughout the coverage area to provide better, expanded coverage.

For a single Control Unit (CU) to allow the maximum 18 RPs to communicate wirelessly (6 per RT), a minimum of 3 RTs per single CU is required. A single CU can support a maximum of 46 2.4GHz and 900MHz RTs; however, it will still only allow 18 RPs to be active in this setup.

As stated above, a single CU can support up to 46 RTs. This count breaks down as follows:

- 32 2.4GHz RTs
- 14 900MHz RTs (in full band operation)
  - » In Oceania, a CU will support up to 32 2.4GHz RTs and up to 7 900Mhz RTs (in a reduced 900MHz band).

Note: *Connected RTs may require supplemental Pliant 48VDC power supplies (sold separately) if there are too many devices connected via CrewNet for the Power over CrewNet to adequately power all devices.*

RT Top

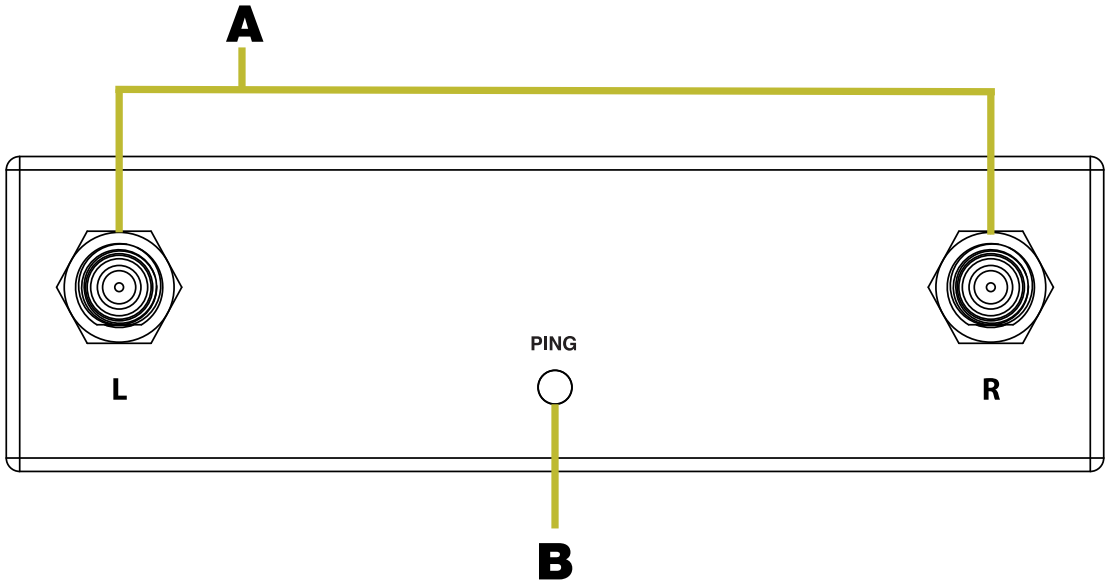

Figure 1: Radio Transceiver Top View

(A) Antenna Connections

RP-TNC (Connector). If alternative antenna setup is needed, see the CrewWare Manual for more information about how to adjust antenna diversity settings within your CrewCom Configuration File.

(B) PING LED

White LED – ON when user has initiated a PING to identify the device

RT Bottom

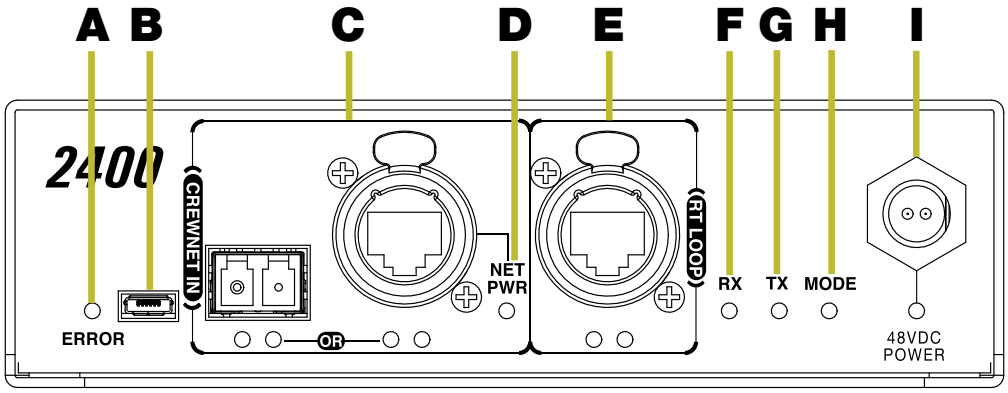

Figure 2: Radio Transceiver Bottom View

(A) ERROR LED

Indicates the device's error status. This LED function is currently not available. See the Operation section on page 11 of this manual for more LED information.

(B) USB Connection

For connectivity to a PC to update device firmware. See the *CrewWare Manual* for more information on updating firmware.

(C) CREWNET IN Port (RJ-45 or Fiber) and Status LEDs

The RT's CREWNET IN ports allow it to connect to any available CREWNET port on other devices or any RT LOOP port on other RTs, thus adding the RT to a proprietary network where all devices are part of a configuration that shares data, timing synchronization, and audio. Each RT has a CREWNET IN port (RJ-45 for copper or duplex LC for Single Mode Fiber) and an RT LOOP port (RJ-45, which allows RTs to be daisy-chained (looped through) together). Each port's status LEDs indicate the status of the CrewNet link. See the Operation section on page 11 of this manual for more LED information.

(D) Network Power (NET PWR) LED

Indicates the presence and condition of Power-over-CrewNet (PoC), which is being provided to the unit via the CREWNET IN port. This port must be connected via copper (Cat 5e or greater) cable for the RT to receive power over CrewNet. The NET PWR LED indicates the presence and strength of the PoC. If PoC is not used, the RT can be powered locally from an optional Pliant 48VDC power supply (sold separately).

(E) RT LOOP Port and Status LEDs

The RT LOOP port is used to connect multiple RTs together. This port's status LEDs indicate the status of the CrewNet link. See the Operation section on page 11 of this manual for more LED information.

(F) RX LED

Green LED – Blinks when RT is receiving transmissions from Radio Packs.

(G) TX LED

Green LED – On when RT is transmitting properly.

(H) MODE LED

Green LED – On to denote Normal operating mode.

(I) 48VDC POWER Connection and LED

The locking DC Power Connector enables the RT to be powered locally with a Pliant 48VDC power supply (sold separately). External (local) power is required if using the CrewNet fiber port or if there isn't sufficient PoC present on the CrewNet In copper port. See the Operation section on page 11 of this manual for more LED information.

RT Setup and Installation

Determining the Device Location

Follow these tips when determining a location for your RT and antennas:

- Every antenna has a certain pattern of coverage for which it is useful. The patterns of both CrewCom RT antennas need to be focused in the same general area of the desired coverage area to ensure best RF results.
  a. When possible, centrally position omni-directional antennas in the middle of the desired coverage area.
  b. Don't separate omni-directional antennas too far away from each other (not more than 3–4 m, 9–13 ft).
  c. Don't aim directional antennas in two different directions.
- Both antennas are necessary and equally important. Redundant transmissions from both antennas must regularly reach the Radio Packs to have a robust, successful RF link.
- Higher is almost always better when placing antennas.
  a. Maintaining a direct line of sight from the RT antennas to the Radio Pack is the best possible antenna scenario.
  b. The minimum acceptable application of this is to get the RT antennas above head level. In many cases, the best execution is to place the RT well above the desired coverage area and aim antennas directly down at the coverage area.

  Note: *Always follow safety instructions. When the RT will be exposed to moisture, ensure proper measures are taken to prevent water ingress.*

- Always keep antennas away from the following:
  a. Large metal objects. Stay at least two feet away from these.
  b. Large containers of liquid. Most liquids are intense RF absorbers.
  c. Confined spaces. Don't set up antennas in rooms or areas with RF obstacles. Wide open spaces are good. Stay two to four feet away from walls or ceilings.

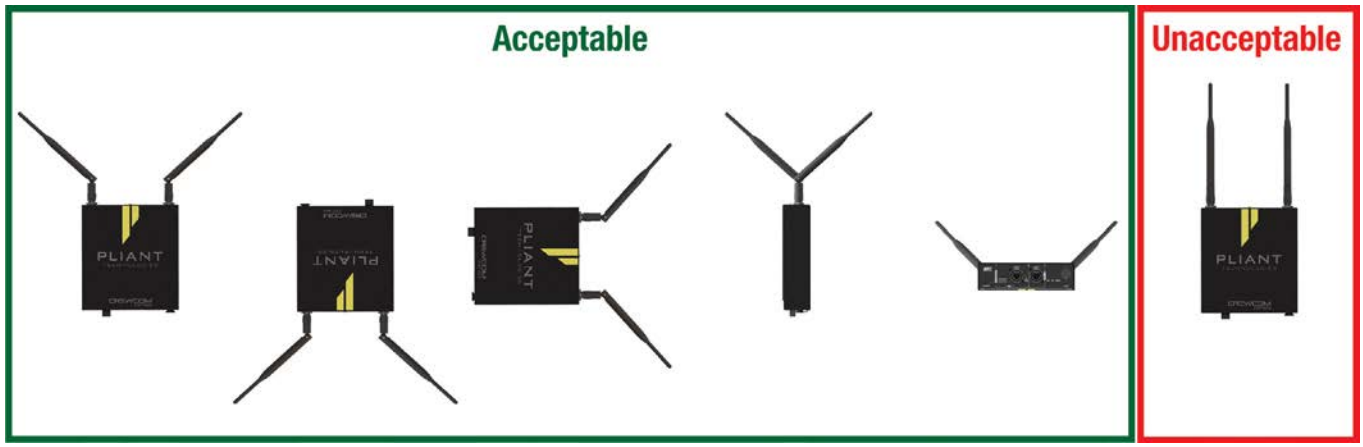

Figure 3: RT and Antenna Orientation

Attaching RT Bracket Mount

1. Place the transceiver down on a flat surface (logo side down) and place two rubber washers over each of the two holes on the rear of the device.
2. Choose one of the two available mounting brackets—the single RT adapter bracket (for use with mic stand adapter or other mounting hardware (e.g., ball mount) or the flat bracket.
3. Place the bracket flush over the washers and align the two holes.
4. Insert each knob/screw into the back side of the bracket and hand tighten until the transceiver is secure.

   Note: *If using the flat bracket to mount the RT(s) flush with a wall, use the provided screws rather than knobs to attach the RT to the bracket.*

5. If using the adapter bracket, and the mic stand adapter is needed, attach the mic stand adapter to the bracket by screwing it into the hole on the bottom.
6. Attach the provided 2dBi omni-directional antennas onto the RT's antenna connections.

Note: *Additional antenna options are available where legal. For more information, please contact an applications specialist.*

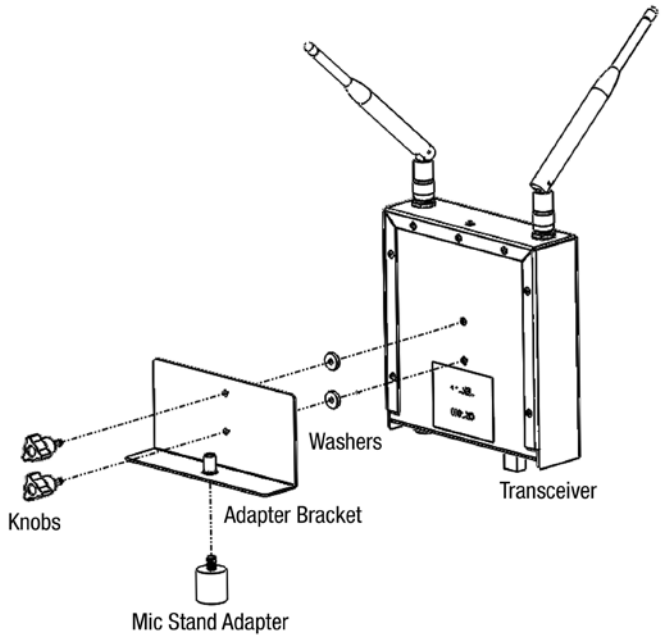

Figure 4: Diagram of Single RT Adapter Mounting Bracket

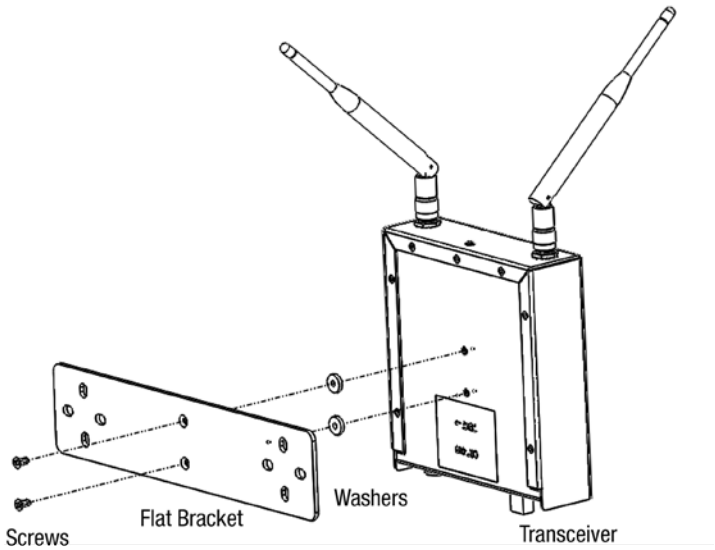

Figure 5: Diagram of RT Flat Mounting Bracket

Connecting to CrewNet

After securely placing the RT, connect it to other CrewCom devices via its available CrewNet ports. RTs can be connected to any CrewCom system via a Control Unit (CU), a Hub, or by daisy-chaining (looping through) from an existing RT. Device port connections must match the CCF in order to operate. Ensure all cable connections between devices are made prior to powering on the system. Adding and removing devices in live mode (often referred to as "hot-plugging" or "hot-swapping") may cause system errors to occur.

For a single CU to allow the maximum 18 Normal mode Radio Packs (RPs) to communicate wirelessly (6 per RT), a minimum of 3 RTs per single CU is required. A single CU can support a maximum of 46 2.4GHz and 900MHz RTs; however, it will still only allow 18 Normal mode RPs to be active in this setup.

NOTE: *In Oceania, a CU will support up to 32 2.4GHz RTs and up to 7 900Mhz RTs (due to the reduced 900MHz band).*

- **RJ-45 Ports** – For an RJ-45 copper CrewNet port, use the supplied 15 ft. (4.6 m) Cat 5e cable, or your own Cat 5e (or greater) cable (up to 330 ft. (100 m) in length). Any CrewCom device connected to CrewNet via a Cat 5e (or greater) cable can receive Power-over-CrewNet (PoC) from the Control Unit via the CrewNet port. In some situations, there may be too many connected devices or the cable lengths may be too long for the PoC to adequately power all devices, and this will be indicated with the NET PWR LED lighting red. In most cases, powering an RT and any daisy-chained RTs downstream via PoC is acceptable. However, depending on cable lengths and number of RTs in your CrewCom configuration, you may need to utilize the 48VDC power supply (PPS-48V, sold separately) to provide local power where needed.
- **Fiber (Optical) Ports** – For a fiber CREWNET port, a Single Mode Fiber cable (duplex LC connector) will be required (up to 32,800 ft. (10,000 m) in length). Any CrewCom device connected to CrewNet via fiber port must receive power via a Pliant 48VDC power supply (PPS-48V, sold separately).

Powering the Device

After connecting your CrewCom devices, power everything on and verify that your RT is receiving power by checking that the applicable Power LED is green. PoC can be supplied to RTs downstream from a locally powered CrewCom RT. Under optimal conditions, seven connected RTs may be powered from a locally powered RT; however, this number can vary greatly depending on the line lengths and the number and configuration of those connected RTs.

Once the CU is powered on, you can tell that a configuration error has occurred with an RT if its TX LED is not lit and its RPs do not log in. The configuration error may be present in the RT or other device upstream. If you are connected to CrewWare, it will alert you of any firmware or configuration errors needing resolution. If a device does not have compatible firmware, follow the instructions provided in the *CrewWare Manual* to update to the correct version.

Operation

Configuring One or More RTs

If you need to add additional CrewCom devices (e.g., a Hub, RT, or additional Control Units) after you've applied your CrewCom Configuration File (CCF), you must open and edit the CCF offline with CrewWare.

Before uploading the new CCF, power down your system and connect new devices according to their location in the new CCF. Once connected, upload the new CCF via CrewWare or via USB drive in the master CU.

Advanced system configuration and customization of radio bands and hopping patterns can be done via CrewWare. Refer to the separate *CrewWare Operating Manual* for more information on this option.

- **Radio Band** – All radios on a CrewCom system of the same frequency must be set to the same Radio Band. The default Radio Band is selected automatically by choosing the widest Radio Band setting for that frequency range. The Radio Band you use should follow the rules governing radio use in your country. You can change the system Radio Band selection from the Control Unit or CrewWare, choosing either ***Full, High***, or ***Low.***

Table 1: Radio Band Options

	900MHz Radio Bands	2.4GHz Radio Bands
Full	902–928 Mhz	2400–2483.5 Mhz
High	915–928 Mhz*	2445–2483.5 Mhz
Low	902–915 Mhz	2400–2444 Mhz

*The -900AN device models use only the High 900MHz radio band.

- **Hopping Pattern** – The RT's Hopping Pattern is selected automatically by CrewCom when comparing all the existing RTs and assigning the next compatible number (within the same frequency range) available on CrewNet. You can either leave the Hopping Pattern that the system selects or edit the Hopping Pattern to your preference. If you select a Hopping Pattern that is not compatible with the Control Unit's setting, a warning will display prompting you to confirm your preferred settings.

These settings are part of the CrewCom Configuration File, but they are not adjustable in "Live" mode.

Understanding the RT's LEDs

Each LED on the top and bottom of the RT indicates a particular condition or status for the device. See Table 2 for details about each meaning.

Table 2: RT LED Descriptions		
Connection/LED	**Description**	
ERROR LED	This LED function is currently not available.	
48VDC POWER LED	**Green** – External (local) power is present. **Off** – No external (local) power is present.	
NET PWR LED	**Green** – Power-over-CrewNet is adequate for operation with current connections. **Amber** – Power-over-CrewNet is approaching the minimum threshold with current connections. **Off** – No Power-over-CrewNet is present.	
CREWNET IN and RT LOOP Status LEDs	**Left**	**Green** – CrewNet connection is good.
		Off – No CrewNet connection detected.
	Right	**On** (**Green**) – 1000 Mbps link is detected.
		Blinking (**Green**) – Activity is detected.
		Off – No CrewNet connection detected.
RX LED	**Green** LED – On, and blinks when RT is receiving transmissions from roaming Radio Packs (roaming to the RT and away from the RT).	
TX LED	**Green** LED – On when RT is transmitting properly.	
PING LED	**White** LED – On when user has initiated a PING to identify the device. (This feature is currently not available.)	
MODE LED	**Green** LED – Denotes operating mode. On when set to Normal mode; blinks when set to High Density mode. (High Density mode is currently not available.)	

Product Specifications

Table 3: RT Specifications*		
Specification	**CRT-900/CRT-900AN****	**CRT-2400 / CRT-2400CE*****
RF Frequency (MHz)	902–928 MHz (915–928 MHz)**	2400–2483 MHz
RF Scheme	FHSS with TDMA	
Effective Radiated Power	400 mW (+26dBm)	100 mW (+20dBm)
Receiver Sensitivity	-100 dBm at 10^{-5} BER	
Radio Certification	FCCID: HSW-CCT900 and IC: 4492A-CCT900	FCCID: HSW-CCT24 and IC: 4492A-CCT24
Transmission Range	650 ft. (200 m) under typical conditions; 1950 ft. (600 m) line of sight (Note: Functional range depends on many variables, including RF signal absorption, reflection, and external interference.)	500 ft. (150 m) under typical conditions; 1500 ft. (450 m) line of sight (Note: Functional range depends on many variables, including RF signal absorption, reflection, and external interference.)
No. of Radio Packs Supported (when RT in Normal mode)	6	
Number of Antenna Connections per Transceiver	2	
Antenna Connector Type	RP-TNC	
Supplied Antenna	+2dBi Omni-directional (whip)	
CREWNET IN Port (supports 1 connection)	(1) RJ-45 for copper; (1) duplex LC for Single Mode Fiber	
RT LOOP Port	(1) RJ-45	
Maximum CrewNet Line Length	Copper 330 ft. (100 m); Fiber 32,800 ft. (10,000 m)	
Network Power (Power-over-CrewNet)	CrewNet RJ-45 only	
External Power	48VDC Power Supply, PPS-48V (Sold Separately)	
Dimensions without Antennas (L x W x H)	6.30 in. × 7.74 in. × 1.81 in. (16 cm × 19.7 cm × 4.6 cm)	
Weight	1.25 lbs (567 g)	
Operating Environment	-20° to 50° C (-4° to 122° F); 10% to 90% Humidity	
Maximum Altitude	6,562 ft. (2,000 m)	
RoHS	Yes	

***Notice About Specifications:** While Pliant makes every attempt to maintain the accuracy of the information contained in this manual, this information is subject to change without notice, and published device/system functions and features are subject to firmware version. Please check our website for the latest system specifications and certifications. 900MHz products only available in North America, Australia, and New Zealand.

**CRT-900AN (Oceania) model is approved for use in Australia and New Zealand and operates within the 915–928 MHz frequency range.

CE ***The CRT-2400CE model meets the same specifications and complies with ETSI standards (300.328 v1.8.1). Non-CE models are non-compliant with some ETSI standards.

Product Support

Pliant offers technical support via phone and email from 07:00 to 19:00 Central Time (UTC–06:00), seven days per week.

1.844.475.4268 or +1.334.321.1160
technical.support@plianttechnologies.com

Visit www.plianttechnologies.com for product support, documentation, and live chat for help. (Live chat available 08:00 to 17:00 Central Time (UTC–06:00), Monday–Friday.)

Returning Equipment for Repair or Maintenance

All questions and/or requests for a Return Material Authorization Number should be directed to the Customer Service department (customer.service@plianttechnologies.com). Do not return any equipment directly to the factory without first obtaining a Return Material Authorization (RMA) Number. Obtaining a Return Material Authorization Number will ensure that your equipment is handled promptly.

All shipments of Pliant products should be made via UPS, or the best available shipper, prepaid and insured. The equipment should be shipped in the original packing carton; if that is not available, use any suitable container that is rigid and of adequate size to surround the equipment with at least four inches of shock-absorbing material. All shipments should be sent to the following address and must include a Return Material Authorization Number:

Pliant Technologies Customer Service Department
Attn: Return Material Authorization #
205 Technology Parkway
Auburn, AL 36830-0500

Maintenance and Storage

Cleaning

Generally, the CrewCom hardware should be cleaned only with a dry cloth. A soft cloth with rubbing alcohol may be used to wipe the devices if needed, but you should avoid using rubbing alcohol on plastic components. Never spray solvents or chemicals onto the devices.

All electronic devices can be susceptible to particulate contamination. If yours are exposed to an extremely dusty environment, contact Pliant's Customer Service for internal cleaning.

Temperature and Humidity

CrewCom components are designed to be very durable and can tolerate a wide range of environmental conditions; however, you should take all necessary precautions to keep your system devices safe, dry, and out of extreme conditions.

The Radio Transceiver is weather-resistant, including gaskets intended to prevent moisture entry from the top and sides. The Cat 5e cable connection on the bottom is not water tight. If it is to be used in an outdoor environment, protect the RT with a protective enclosure that will not interfere with the RF.

The Radio Packs are designed to work wherever people work. While the Radio Pack design is weather-resistant, Radio Packs should not be submerged in liquids unnecessarily. Protect the battery compartment from water when changing batteries. The battery compartment offers a route to the electronic circuitry.

License Information

Warning: Changes or modifications to this device not expressly approved by Pliant could void the user's authority to operate the equipment.

1. FCC Notices

   1.1. This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference that may cause undesired operation.

   1.2. This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

2. Canada, Industry Canada (IC) Notices

   2.1. This Class A digital apparatus complies with Canadian ICES-003.

   Cet appareil numerique de la classe A est conforme a la norme NMB-003 du Canada.

   2.2. Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

   Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

   2.3. This radio transmitter (FCCID: HSW-CCT24 & HSW-CCT900, IC: 4492A-CCT24 & 4492A-CCT900) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

   Le présent émetteur radio (FCCID: HSW-CCT24 & HSW-CCT900, IC: 4492A-CCT24 & 4492A-CCT900) a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

      2.3.1. The following antenna types are approved for use with the Radio Transceiver, and their required impedance is 50 ohms:

      - 2.4GHz Model :
        - » 9dBi dipole
        - » 14dBi corner reflector
        - » 12dBi patch
        - » 13.9dBi yagi
        - » 4dBi pifa

- » 14dBi CP beam
- 900MHz Model:
  - » 5 dBi dipole
  - » 4dBi pifa
  - » 9 dBi yagi
  - » 12 dBi panel

2.4. This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

RF-Exposure Statement

The CrewCom Radio Transceiver has been designed for use as what the FCC calls a "mobile" device.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

CrewCom Compliance Numbers

Table 4: RT Compliance Model Numbers

Model Numbers	Compliance Model No.
CRT-2400	RT2505
CRT-2400CE	RT2505
CRT-900	RT2505
CRT-900AN	RT2505

Warranty Information

Limited Warranty

CrewCom products are warranted to be free from defects in materials and workmanship for a period of two years from the date of sale to the end user, under the following conditions:

- First year of warranty included with purchase.
- Second year of warranty requires product registration on the Pliant website.

Tempest professional products will carry a two-year product warranty.

All accessories carry a one-year warranty.

The sole obligation of Pliant Technologies, LLC during the warranty period is to provide, without charge, parts and labor necessary to remedy covered defects appearing in products returned prepaid to Pliant Technologies, LLC. This warranty does not cover any defect, malfunction, or failure caused by circumstances beyond the control of Pliant Technologies, LLC, including but not limited to negligent operation, abuse, accident, failure to follow instructions in the Operating Manual, defective or improper associated equipment, attempts at modification and/or repair not authorized by Pliant Technologies, LLC, and shipping damage. Products with their serial numbers removed or effaced are not covered by this warranty.

Pliant device IP ratings are dependent upon device design and assembly; therefore, unauthorized disassembly or device modifications may impair or negate the IP rating for the device, and therefore any associated damage or malfunction is not covered under this warranty.

This limited warranty is the sole and exclusive express warranty given with respect to Pliant Technologies, LLC products. It is the responsibility of the user to determine before purchase that this product is suitable for the user's intended purpose. ANY AND ALL IMPLIED WARRANTIES, INCLUDING THE IMPLIED WARRANTY OF MERCHANTABILITY, ARE LIMITED TO THE DURATION OF THIS EXPRESS LIMITED WARRANTY. NEITHER PLIANT TECHNOLOGIES, LLC NOR ANY AUTHORIZED RESELLER WHO SELLS PLIANT PROFESSIONAL INTERCOM PRODUCTS IS LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY KIND.

Parts Limited Warranty

Replacement parts for Pliant Technologies, LLC products are warranted to be free from defects in materials and workmanship for 120 days from the date of sale to the end user.

This warranty does not cover any defect, malfunction, or failure caused by circumstances beyond the control of Pliant Technologies, LLC, including but not limited to negligent operation, abuse, accident, failure to follow instructions in the Operating Manual, defective or improper associated equipment, attempts at modification and/or repair not authorized by Pliant Technologies, LLC, and shipping damage. Any damage done to a replacement part during its installation voids the warranty of the replacement part.

This limited warranty is the sole and exclusive express warranty given with respect to Pliant Technologies, LLC products. It is the responsibility of the user to determine before purchase that this product is suitable for the user's intended purpose. ANY AND ALL IMPLIED WARRANTIES, INCLUDING THE IMPLIED WARRANTY OF MERCHANTABILITY, ARE LIMITED TO THE DURATION OF THIS EXPRESS LIMITED WARRANTY. NEITHER PLIANT TECHNOLOGIES, LLC NOR ANY AUTHORIZED RESELLER WHO SELLS PLIANT PROFESSIONAL INTERCOM PRODUCTS IS LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY KIND.

Glossary

Audio Output: Outputs are created by mixing one or more audio entities. This could be for use at any headset connection or for output to a wired connection.

Conference: A grouping of audio entities. Wireless Radio Packs (or other CrewCom I/O) may be subscribed to one or more of 1024 available Conferences.

Control Unit (CCU-22 and CCU-44): A CrewCom device that is used to establish a CrewNet system and provides initial system audio I/O. It is compatible with all levels of wireless Radio Packs.

CrewCom Configuration File (CCF): A file that stores all of the device setup and configuration parameters for a CrewCom system. These files can be created, edited, saved, and recalled both online and offline.

CrewNet: The digital proprietary network used to move audio and to control data, timing, and other functional signals used in CrewCom.

CrewWare: Software tool developed to incorporate all the necessary mechanisms for facilitating graphically based system construction and full system control, monitoring, and diagnosis.

Daisy Chain: A method of connecting a series of CrewCom Radio Transceivers (RTs) via their CREWNET IN and LOOP THRU ports. A total of up to seven additional RTs can be added to a single RT in a Daisy Chain Configuration.

Firmware: (As it relates to CrewCom.) The embedded code that exists in any CrewCom device. All of this embedded code, including radio code, is upgradeable easily by the end user. It is required that all CrewCom devices operate on the same version of firmware.

Frequency Band: The RF spectrum area that a device operates. For CrewCom, this is 900MHz (900–928 MHz) and 2.4GHz (2400–2483 MHz).

Hopping Pattern: A radio setting that determines the order in which the radio frequencies are used.

Hub: A device that provides routing and expansion capabilities to a CrewNet infrastructure allowing the connection of multiple CrewCom devices.

ISM Bands: Industrial, Scientific, and Medical Bands. A part of the radio spectrum that can be used for any purpose without a license in most countries.

Omni-directional Antenna: Antennas that radiate out in all directions and are good when the location of the Radio Transceiver is in the center of the coverage area.

Ping (Device): Used for physically locating new CrewCom devices. CrewCom Radio Transceivers have a Ping LED that will turn on when a system administrator initiates a "ping" of that device. In addition, all LED on the device will blink.

Power-Over-CrewNet: A proprietary network protocol that provides operating voltage and current to devices that are connected to the CrewCom Control Unit.

Profile: A Radio Pack (RP) Profile assigns functionality to a RP's local controls, knobs, and buttons as well as what Conferences it subscribes to.

Radio Band: The frequency band that the radio transmits and receives within.

Radio Pack: The direct portable wireless communication device connecting individual CrewCom users to the CrewCom system. Sometimes commonly referred to as a BeltPack.

Radio Transceiver: A device used to remotely locate a radio and its corresponding antenna to provide an expanded coverage area.

Subscriber: A member of a Conference who can hear all Conference audio and can serve as an audio input to a Conference.

Subscription: CrewCom utilizes Subscription-Based audio mixing and routing based on user-defined Conferences. A Conference is a grouping of associated audio entities. Wireless Radio Packs (or other CrewCom users) may subscribe to one or more Conferences.

Wired Intercom: Any hard wired duplex audio port for getting audio in or out of a system.

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CREWCOM BY PLIANT

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