RF CONTROLS
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User Guide

BESPA™ (Bidirectional Electronically Steerable Phased Array)

RF Controls Intelligent Tracking and Control System (ITCS™)

CS-445B NA BESPA™ Antenna Model

Configured with an RFC-CS-445B RFID Reader CCA

Revision History

Rev	Date	Description
1.2-	June 2016	Reviewer Comment List Max Antenna Gain
3.0-	Oct2018	Update for CS-445B NA
B -	April 2019	Created Production Version B with new Part Number
C-	July 2019	Addressed TCB reviewer Questions

Introduction

This **BESPA™ User Guide** provides the basic information needed to install an individual **BESPA** antenna unit containing an RFC-CS-445B RFID Reader CCA. This guide is not intended to provide instructions for installing, configuring and calibrating the RF Controls Intelligent Tracking and Control System (**ITCS™**). Detailed instructions are provided in the **Technical Manual** (ITCS-A-100-002) and **Programmer's Reference Guide** (ITCS-A-100-003).

INTENDED AUDIENCE

This guide is intended for those who will install and set up the RF Controls **BESPA** (Bidirectional Electronically Steerable Phased Array) unit. Before attempting to install, configure and operate this product, you should be familiar with the following:

- Windows based software installation and operation
- Device communication parameters including Ethernet and serial communications
- RFID reader configuration including antenna placement and RF Parameters
- Electrical and RF safety procedures.

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FCC NOTICE

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 received, including interference that may cause undesired operation.

The BESPA products and individual BESPA components are protected by one or more US and International Patents pending.

-BESPA Overview

BESPA is a multi-protocol, multi-regional Radio Frequency Bidirectional Electronically Steerable Phased Array unit, which is used to Identify and locate RFID tags operating in the UHF 840 – 960 MHz frequency band. A number of **BESPA** units may be used together with an **ITCS** Location Processor to form an Intelligent Tracking and Control System (**ITCS**). **BESPA** comprises an embedded multi-protocol, multi-regional RFID reader/writer transceiver connected to the patented steerable phased array antenna system. **BESPA** is designed to be powered from Power-Over-Ethernet and communicates with a host computer using standard Ethernet TCP/IP and UDP protocol. Figure 1 illustrates the version of BESPA currently available. The CS-445B contains the RF Controls RFC-CS-445B RFID reader CCA.

- CS-445B is constructed using a Bi-directional Electronically Steerable Phased Array (**BESPA™**) arranged to provide a single array with a circularly polarized gain of more than 6dBi and Linear Gains of more than 9dBi at all steer angles.

The particular units used in an installation will depend on the system design and determined by a qualified applications engineer.

Figure 1 BESPA (Bidirectional Electronically Steerable Phased Array) Unit

-Indicator LEDs

CS-445B Reader Indicator Lights

The RF Controls CS-445B RFID antenna is equipped with four status indicators located on the top of the Radome. If the LED indicators are enabled, from left to right, these LEDs provide indication according to the following table:

Indication	Color/State	Indication
Transmit	Off	RF Off
	Yellow	Transmit Active
Fault	Off	OK
	Red-Flashing	Error/Fault Blink Code
Power/ Tag Sense	Off	Power Off
	Green	Power On
	Green – Blinking	Tag Sensed

Note that when the CS-445B antenna is performing power on auto-test, the indicator lights will flash momentarily.

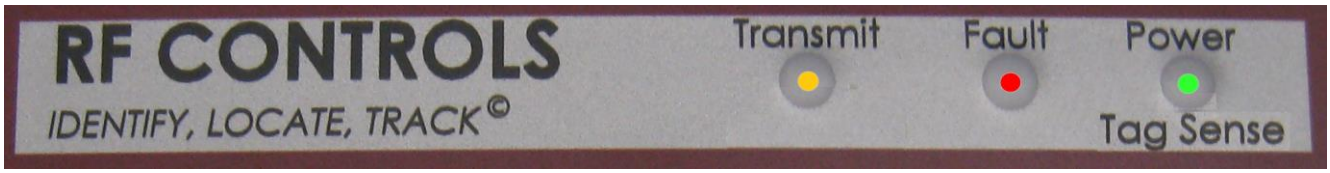


Figure 2 RF Controls CS-445B RFID Antenna Indicator Lights.

Red LED Fault Light Error Codes

Red LED Appearance	Error Code
OFF	No Arcon or Reader Issues
Solid Red	No Communication with the Reader for over an Hour
Two Blinks	Unable to Sweep
Nine Blinks	Error with BSU/BSA
Thirteen Blinks	Antenna Error-Reflected Power too High
Fourteen Blinks	Over Temperature Error

-INSTALLATION

-Mechanical Installation

Each model of the CS-445B family of BESPA units is mounted slightly differently. **BESPA** units weigh up to 15 lbs (7 kg), it is important to ensure that the structure, to which the **BESPA** is to be attached, is of sufficient strength. The **BESPA** may be ceiling mounted, wall mounted or attached to a suitable stand. A safety cable rated at three (3) times the hanging weight of the BESPA and associated hardware must be secured to a separate fixture and attached to the **BESPA** mounting bracket.

When mounting the **BESPA** as a stand-alone unit, make sure that it is mounted with the POE RJ45 facing down as indicated by information in the **Technical Manual**. If the **BESPA** is one of several and is part of an **ITCS** network, then orient each **BESPA** according to the **ITCS** system installation drawings. If in doubt contact a member of our technical support team.

CS-445B
The CS-445B **BESPA** is only mounted in a landscape orientation because the array is symmetrical, there is no benefit to mounting the array in a portrait fashion. When mounting the BESPA refer to Figure 1. Consult the **Technical Manual**, for further information. Contact a member of our technical support team for more information.

SAFETY WARNING
The CS-445B weighs approximately 15 lbs (7kg). These units should only be installed using suitable safety and lifting equipment. Ensure that the wall fixings or mounting hardware is suitably rated.

AVERTISSEMENT DE SÉCURITÉ
CS-445B pèse environ 7kg. Ces unités ne doivent être installés à l'aide des équipements de sécurité et de levage approprié. Veiller à ce que les fixations murales ou le matériel de montage est convenablement évalués.

-Electrical Installation

POE Power Input
Power over Ethernet, PoE, power input is available for the CS-445B using the RJ-45 connector as shown in Figure 1. Connect POE power supply and plug it in to a suitable mains outlet and the POE Bias T. POE power, DC Input equivalent to IEEE 802.3at type 2 Class 3. When using a multiport Ethernet switch the power budget for each antenna Powered Device should be +13W with 15.4W max supplied by the PSE switch. Do not plug in more than the calculated number of POE antennas to a multiport switch if the total Switch Ethernet power will be exceeded. Note that the power for the POE should be located within 300feet of the **BESPA** and should be accessible to enable easy disconnection of the power to the **BESPA** in case of emergency or when servicing.

Ethernet

The Ethernet LAN connection uses the industry standard RJ-45 connector. A suitable Ethernet cable fitted with an RJ-45 plug is connected to the **BESPA** Array Antenna as shown in Figure 1. The **BESPA** is factory programmed with a fixed IP address which is shown on the label adjacent to the Ethernet connector.

Non-Ionizing Radiation

This unit incorporates a Radio Frequency Transmitter and should therefore be installed and operated so as to avoid exposure of any persons to unsafe emissions. A minimum separation distance of 23cm must be maintained at all times between antenna and all persons. See ***FCC Radiation Exposure Statement*** in the Safety Instructions section of this guide.

Usable Frequency Range in US and Canada

For use in USA, Canada, and other North American countries, this device is factory programmed to operate in ISM 902MHz – 928MHz band and cannot be operated on other frequency bands. Model#: CS-445B NA

MULTIPLE BESPA UNITS CONFIGURED AS AN ITCS

Figure 3 shows how two or more CS-445B **BESPA** units may be connected via an Ethernet network to an **ITCS** Location Processor. One Location Processor and multiple distributed BESPAs operate collaboratively to form RF Controls' Intelligent Tracking and Control System (ITCS™). In this example two **BESPA** units have been attached to the network. Combinations of the various model **BESPA** units may be mixed and matched as required to suit a particular installation. The RF Controls **Technical Manual** provides details on how to install, configure and calibrate an **ITCS**.

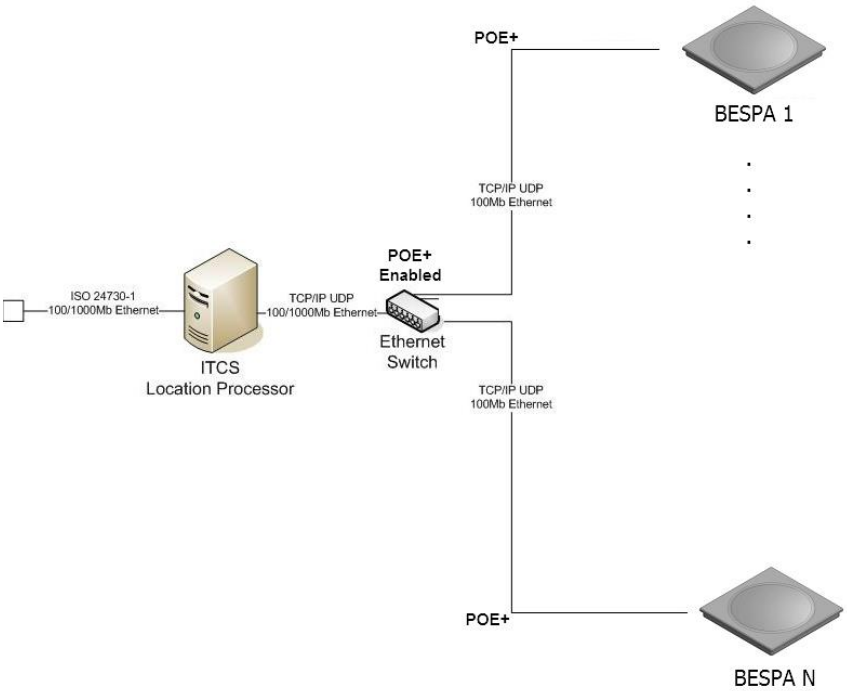


Figure 3 Intelligent Tracking and Control System comprising a number of BESPA units connected via POE Ethernet Network to a Location Processor

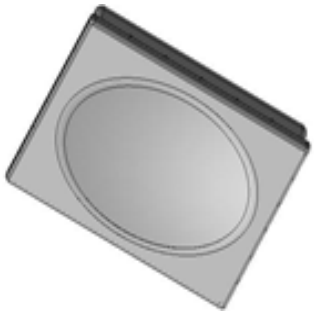
-SOFTWARE

The **BESPA** is provided with a basic test program on a CD, to run on a Microsoft™ Windows® equipped Personal Computer. The program enables you to carry out a number of basic tests. See the **Technical Manual** for further instruction on Software usage.

APPLICATION INTERFACE

The **BESPA** uses an International Standard, Application Program Interface (API) as defined in ISO/IEC 24730-1. Further details of the API and commands are contained in the **Programmer's Reference Guide.**

-SPECIFICATIONS

CS-445B	
Frequency RF Radiated Power Regulatory Compliance Safety Regulations Reading/Writing Protocols FCC ID IC ID Application Interface	UHF band: 902-928 MHz[1] Adjustable 0.2W to 4Watts EiRP FCC, CFR47 Part 15.247, RSS-247 Issue 2, RSS-Gen Issue 5, RSS-102 Issue 5 IEC62368-1 ISO18000-6C / EPC UHF Gen 2 EM 4122 (TTO) FCC: WFQCS-445B IC: 10717A-CS445B ISO/IEC 24730-1
Environmental Operating Temperature Storage Temperature Relative Humidity Dimensions Weight	 -22 to +113°F (-30 to +45°C) -40 to +185°F (-40 to +85ºC) 5 to 85% non-condensing 24in x 24in x 4in (60 x 60 x 10 cm) 15 lbs (7 kg)
Ethernet LAN	RJ-45 Connector
Power Current and Voltage	POE+ DC Input IEEE 802.3at Type 1 Class 3 0.35 Amp at +48Vdc
Antenna Gain[2]	>6 dBi Circular Polarization >9 dBi Linear Polarization Vertical and Horizontal
Antenna FWHM Beamwidth[3]	33 degrees

[1] The BESPA uses the RFC CS-445B RFID reader will be factory set at time of shipping, to suit the country of installation and use. Transmit Frequency range for the CS-445B NA model is 902-928MHz

[2] Value over Operating Frequency Range at all steer angles as referenced to an isotropic antenna.

[3] Maximum -3dB FWHM value over Operating Frequency Range at all steer angles.

-SAFETY INSTRUCTIONS Consignes de Sécurité

This unit emits Radio Frequency non-ionizing radiation. The installer must ensure that the antenna is located or pointed such that it does not create an RF field in excess of that permitted by the Health and Safety Regulations applicable to the country of installation.

Cet appareil émet Radio Fréquence rayonnements non ionisants. L'installateur doit s'assurer que l'antenne est située ou orientée de façon à ne pas créer un champ RF supérieure à celle permise par le Règlement sur la santé et applicable dans le pays d' installation.

Setting RF Output Power

Enter the desired RF output power as a percentage of the maximum power into the Set Power box. Click the **set Power** button. Note: the actual maximum Radiated RF Power is factory set to comply with the radio regulations in the country of use. In the USA and Canada this is 4 Watts EiRP. Model#: CS-445B NA

Entrer la puissance de sortie RF souhaité sous forme d' un pourcentage de la puissance maximale dans la zone d'alimentation Set. Cliquez sur le bouton **ensemble d'alimentation** . Remarque: le maximum réel rayonnée de puissance RF est réglé en usine pour se conformer à la réglementation de radio dans le pays d'utilisation. Aux Etats-Unis et au Canada c'est 4 Watts EiRP et selon la norme EN 302 208 c'est 2 watts (3,2 W PIRE).

FCC and IC Radiation Exposure Statement

The antenna used on this equipment must be installed to provide a separation distance of at least **30cm** from all persons and must not be co-located or operated in conjunction with another antenna or transmitter. The criteria used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation is specified in FCC Part 1 SUBPART I & PART 2 SUBPART J §1.107(b), Limits for General Population/Uncontrolled Exposure. This antenna meets INDUSTRY CANADA RSS 102 ISSUE 5, the SAR and RF field strength limits in Health Canada's RF exposure guideline, Safety Code 6 for Devices used by the General Public (Uncontrolled Environment).

L'antenne utilisée sur cet équipement doit être installée de manière à assurer une distance de séparation d'au moins **30 cm** de toute personne et ne doit pas être co-localisée ou utilisée avec une autre antenne ou un autre émetteur. Les critères utilisés pour évaluer l'impact environnemental de l'exposition des personnes aux rayonnements RF sont spécifiés dans la partie 1 des FCC, sous-parties I et 2, sous-parties J §1.107 (b), Limites pour une population générale / exposition non contrôlée. Cette antenne est conforme à la norme RSS 102 NUMÉRO 5 d'INDUSTRIE CANADA, concernant les limites de champ DAS et RF dans les lignes directrices de Santé Canada sur l'exposition aux RF, Code de sécurité 6 pour les appareils utilisés par le grand public (environnement non contrôlé).

FCC Part 15 Notice

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 received, including interference that may cause undesired operation.

FCC and Industry Canada Modification Warning Statement

Modification of this device is strictly prohibited. Any modifications to the factory hardware or software settings of this device will void all warranties and be deemed non-compliant with FCC and Industry Canada Regulations.

La modification de ce dispositif est strictement interdite. Toutes les modifications apportées au matériel d'usine ou les paramètres du logiciel de cet appareil annulera toutes les garanties et sera considérée comme non conforme aux normes FCC et d'Industrie Canada.

Industry Canada Statement

This device complies with Industry Canada license-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. Model#: CS-445B NA

Cet appareil est conforme aux normes d'Industrie Canada exempts de licence(s) RSS. Son fonctionnement est soumis aux deux conditions suivantes: (1) cet appareil ne doit pas provoquer d'interférences, et (2) cet appareil doit accepter toute interférence, y compris les interférences qui peuvent provoquer un fonctionnement non désiré de l'appareil.

Power Disconnect Device

This device is Power Over Ethernet. The plug on the ethernet cord is intended to be the power disconnect device. The power source socket is located at the equipment and is easily accessible.

La fiche du cordon d'alimentation est destiné à être le dispositif de coupure de courant. La source d'alimentation (prise ou sortie) doit être située près de l'équipement et doit être facilement accessible.

Warning

The BESPA is not user serviceable. Disassembly or opening the BESPA will cause damage to its operation, will void any warranty and may invalidate the FCC type approval and/or IC RSS standards.

ATTENTION

Le BESPA n'est pas réparable par l'utilisateur. Le démontage ou l'ouverture du BESPA endommagera son fonctionnement, annulera toute garantie et pourrait invalider l'approbation de type FCC et/ou les normes IC RSS.

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