



Bird[®]

Bird's Channel Power Monitor System



Introductions

Application Overview

Target Markets

Product Overview

Sales Tips

Product Solution Guide

Sales Tools

About: In this training we will cover Bird's Channel Power Monitoring Solutions and the best practices for approaching the Customer needs.

We will cover a brief overview of the CPM products, features and benefits, focusing on the requirements on how to identify the right product for optimal performance.

We will also discuss the new addition of Bird's new ethernet Directional Power Sensors and applications.



Michelle Specht-Product Manager for Test & Measurement, Performance products

- Over 20 years experience as Product manager and Engineer in Aerospace, Automotive Tools, Outdoor Power Equipment and RF Test & Measurement
- Bachelor's degree in Aerospace Engineering
- Responsible for product planning and strategy for Bird's Performance Products Portfolio: RF Analyzers, Power Meters and Monitors, Attenuators/Loads, Power sensors

Gregg Moffett-Applications Engineer for Bird's Test & Measurement Products

- Bachelor's degree in Engineering Technology
- Over 15 yrs. with Bird and prior 24 yrs. at FMC Smith Meter

Joel Meltzer-Agile Engineering Manager, Bird's Test & Measurement Products

- Bachelor's degree in Applied Physics/Masters of Science in EE
- Engineering field for 28 years with prior involvement in Acoustical & Systems Engineering.
- Joel has been with Bird for over 22 years supporting the research and development of diverse products including RF loads and attenuators, RF analyzers, power meters & sensors, RF capture & playback and Booster/DAS systems.

Bird manufactures many products which address several key issues in the Land Mobile Radio and other Critical Communications markets:

- Live remote monitoring of transmitter RF power output and antenna performance in multi-channel and trunked radio networks
- Test equipment for commissioning, maintenance and fault-finding of base station radios, mobile radios, repeaters, antennas, antenna combiners and transmission cables



Products for LMR and Critical Communication



Problem:

How to efficiently monitor the performance of a number of transmitters, transmission lines and antennas at many remote sites?

Solution:

Bird's CPM Radio System monitoring with up to 16 non-directional and 16 directional sensors simultaneously

Measures forward, reflected, composite and individual channel power as well as antenna system VSWR.

Monitoring of the system via interface with the front panel or accessed through the built-in web server and web page.

The advertisement for the Bird CPM Series features a blue and white color scheme with a grid background. It includes images of various Bird sensors (4043 Directional Power Sensor, 4042 Channel Power Sensor, and Bird Series 5005 Directional Power Sensor) and the central CPM monitor unit. The text highlights the product's capabilities for monitoring radio system health and provides contact information for Bird Corporation.

CHANNEL POWER MONITOR
Radio System Monitoring

CPM SERIES

Radio System Health Monitoring Solutions

Be confident of the status of each individual component in a radio system with effortless monitoring from a computer, tablet or mobile device.

Comprised of a central processor and a variety of sensors, the Bird CPM can be setup to monitor radio performance, combiner loss, and antenna/feedline characteristics providing continuous information on the health of each component it monitors.

Easy system access is available from any computer, tablet or phone on your network with the CPM-hosted web page. This allows for set up of alarms for failure conditions such as high or low power, or poor antenna VSWR. The monitor includes both software and hard contact alarms and can be configured to send SNMP Trap messages for emergency condition alerts. Data logging is standard and takes reliability one step further by enabling you to see degraded performance before it becomes an emergency.

Solutions are available for the entire range of Land Mobile Radio frequencies.



Who needs Bird's Channel Power Monitor



Public Safety



Marine / Coastguard



Critical Medical

Civil Aviation



Private Networks



Land Mobile Radio frequencies from 144 MHz to 940 MHz



Who needs Bird's Channel Power Monitor



Who is it for? Any multi-channel and/or multi-site radio network.

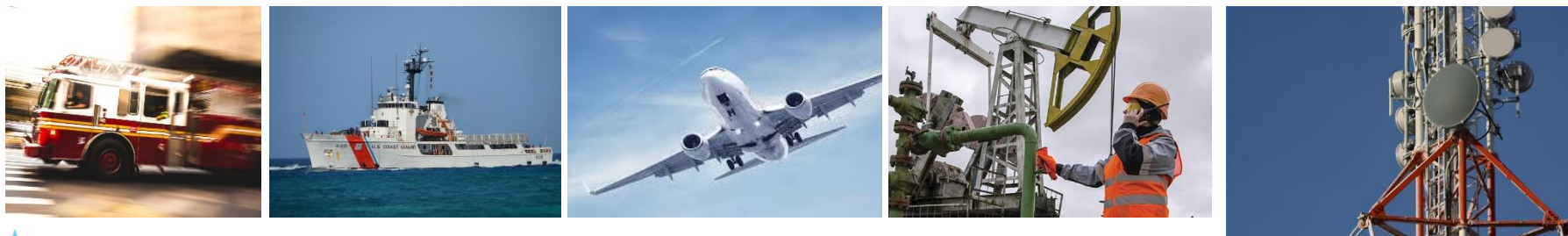
Public Safety These generally have many sites each with 2 or more transmission channels (referred to as “talkpaths”).

Marine/Coastguard VHF/FM (156-162MHz) radio networks. These often have numerous remote transmission sites, each with 2, 3 or 4 separate transmission channels.

Civil Aviation VHF/AM (118-136MHz) radio networks. These often have numerous remote transmission sites, each with 2, 3 or 4 separate transmission channels.

Private Networks which are “mission critical” to the success (or health and safety) of the organization. These might include transport, distribution, manufacturing, healthcare, oil & gas, etc...

Broadcasters. The TPM sensors allow CPM to monitor VHF and UHF television, both analog and digital, plus FM and Digital Audi Broadcasting.



Personas-Monitoring

Name: Mike, Public Safety Communication Site Manager

Segment: Land Mobile Radio (US Forest Service)

Age: 60 years old

Education: BS Degree Civil Engineering

Objective:

- Responsible for multi-site, multi-channel land mobile radio systems
- Maximizes communication performance
- Manages repair teams for maintenance and repairs

Pain Points:

- Transmitter sites that are difficult to access
- Failures that are not identified prior to communication disruptions
- Lack of failure data prior to a site visit

Personas are people based upon your research that represent a specific user type for a product



Critical info in critical times



Continuously monitors your land mobile radio systems performance

Consists of a monitoring unit with various RF power sensors.

User can configure systems to measure RF power at various points in a system and collect valuable data about system performance.



Provides for remote monitoring and notification.

Acts as a site monitor to provide an up- to-date status of RF systems with regard to power measurement.

to identify critical
communication
changes.



Why monitor with CPM?



Ability to diagnose various components within a communications system

Transmitter output monitoring

- Identify radios with reduced output. Monitoring this will allow repair or replacement prior to failure

Isolator performance

- Identify isolator degradation leading to an increase in reflected power that may harm the transmitter

Combiner loss by channel

- Identify increases in insertion loss due to combiner detuning or drifting

Antenna VSWR by channel

- Detailed monitoring of the antenna to identify frequency related VSWR shifts due to weather, aging, etc.

Composite antenna VSWR

- Identify failures in the post combiner feedline or antenna



Channel Power Monitor 3141



CPM Series-Bird's Radio System Health Monitoring Solutions

Features Include:

- Data Logging
- Slim 1RU package - Designed specifically for rack-mount applications
- Built-in web server with SNMP messaging
- Push-to-talk (PTT) compatibility
- Full control of alarm and data logging settings
- 16 channels with expansion modules
- Software and hard contact alarms



Directional RF Power Sensor
2MHz to 1000 MHz



Non-Directional RF Power Sensor
144 MHz to 940 MHz



Channel Directional RF
Power Sensor
100 MHz to 1000 MHz



Directional RF
Power Sensor
144 MHz to 940 MHz



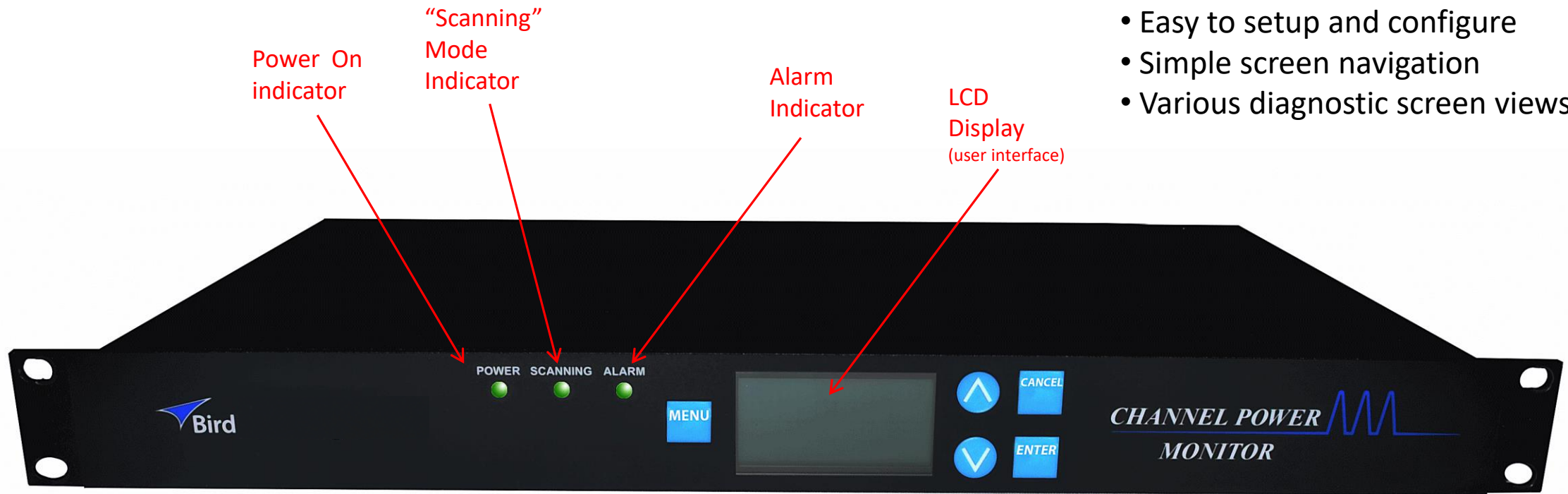
Monitoring unit



CPM Front Panel Detail

Local User Interface:

- Easy to setup and configure
- Simple screen navigation
- Various diagnostic screen views

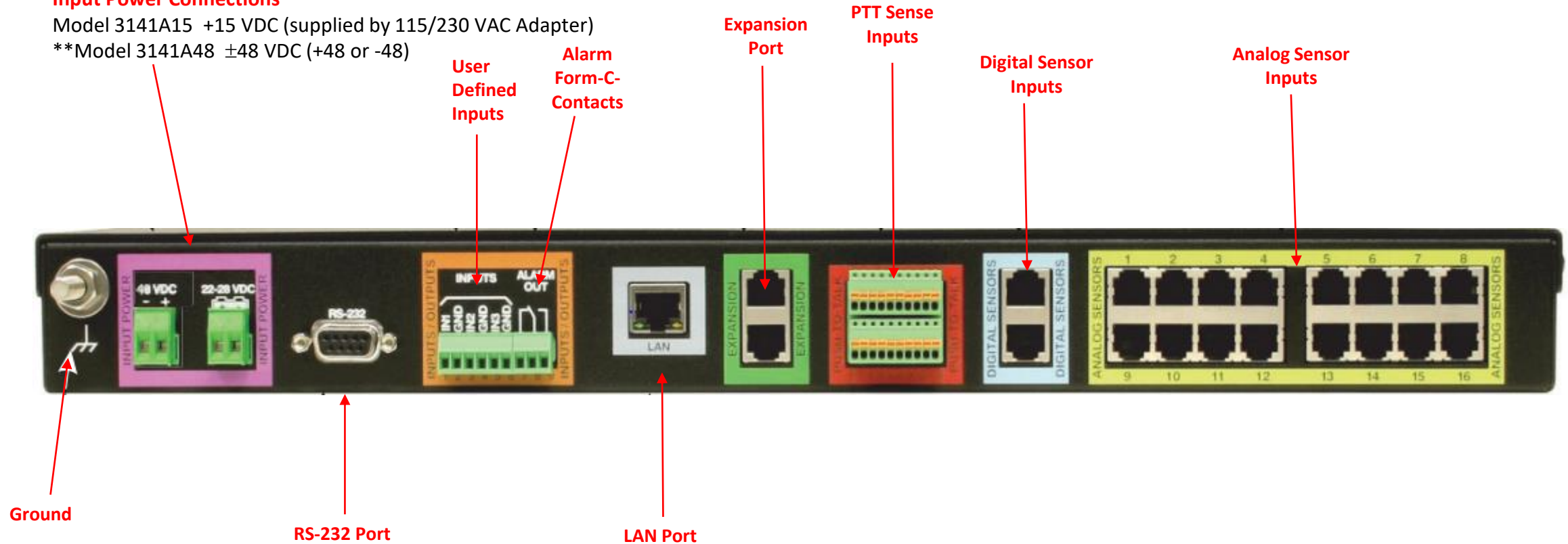


CPM Rear Panel

Input Power Connections

Model 3141A15 +15 VDC (supplied by 115/230 VAC Adapter)

**Model 3141A48 ± 48 VDC (+48 or -48)

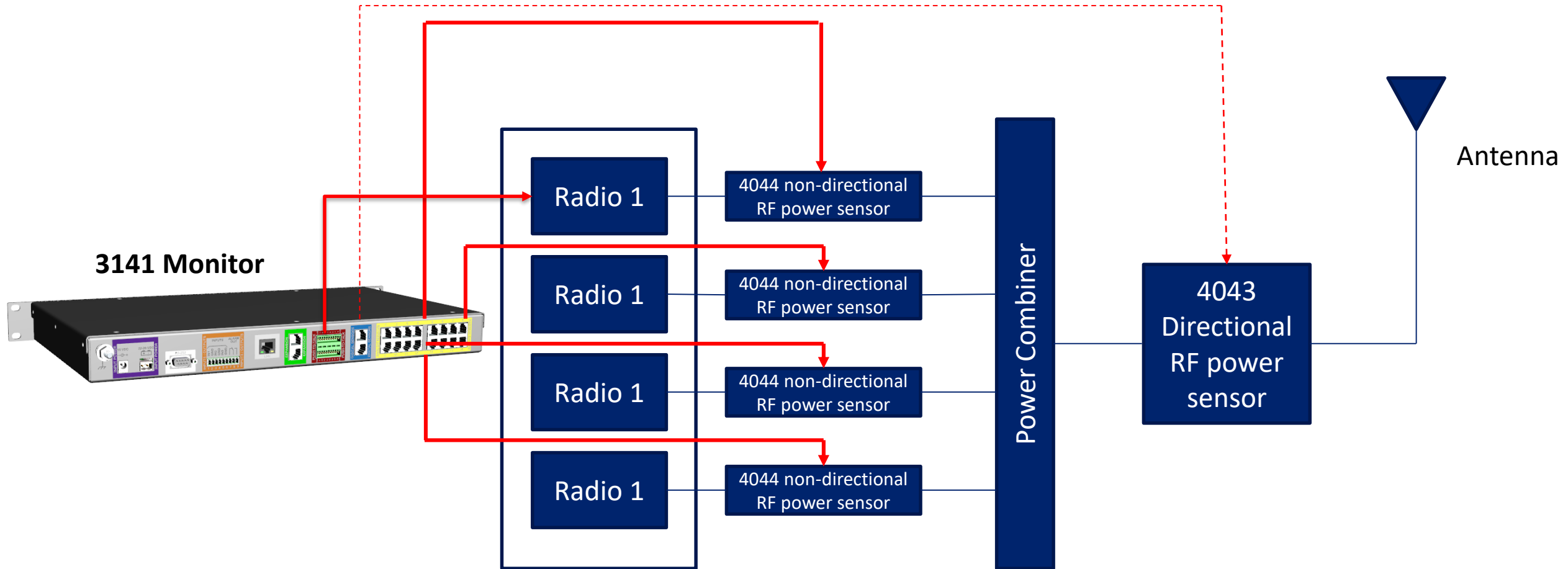


**3141A48 is shown for illustration only

A CPM is capable of monitoring both analog and digital power sensors, a single CPM may monitor a maximum of 16 analog sensors and a maximum of 16 digital sensors simultaneously.



Typical System



Critical Remote Monitoring

CPM System hosts its own webpage for setup and display of all measurement parameters and alarm functions



Bird Technologies[®]
You're heard, loud and clear.

Solon

Table		Graph		Settings
Channel	Channel Forward Power	Channel Reflected Power	Channel VSWR	
Solon Fire	37.7 Watts	0.0 Watts	1.01	
Solon Police	50.7 Watts	0.0 Watts	1.01	
Ambulance	48.6 Watts	0.0 Watts	1.01	
Fire1	34.0 Watts	0.0 Watts	1.01	
Police1	34.4 Watts	0.0 Watts	1.01	
465.75 MHz	45.6 Watts	0.0 Watts	1.01	
466.25 MHz	0.0 Watts	0.0 Watts	1.00	
466.75 MHz	7.2 Watts	0.0 Watts	1.02	
User 1	Disabled	Normally Open	OK	☒
User 2	Disabled	Normally Open	OK	☒
User 3	Disabled	Normally Open	OK	☒



Additional Value for the Customer



Bird's CPM features include:

- **Data files** that can be logged and exported to view historical information and perform trend analysis.
- **On-site visits can be minimized** – RF power measurements can be taken remotely.
- **Consistent measurements** – no subjectivity in measurements from technician to technician or measurement equipment variation during routine performance tests.
- **Can be interfaced** to customer equipment to signal transmitter shutdown during transmission line or antenna failure.
- **User can interface** other site-relevant alarm events from other equipment and send SNMP trap messages.

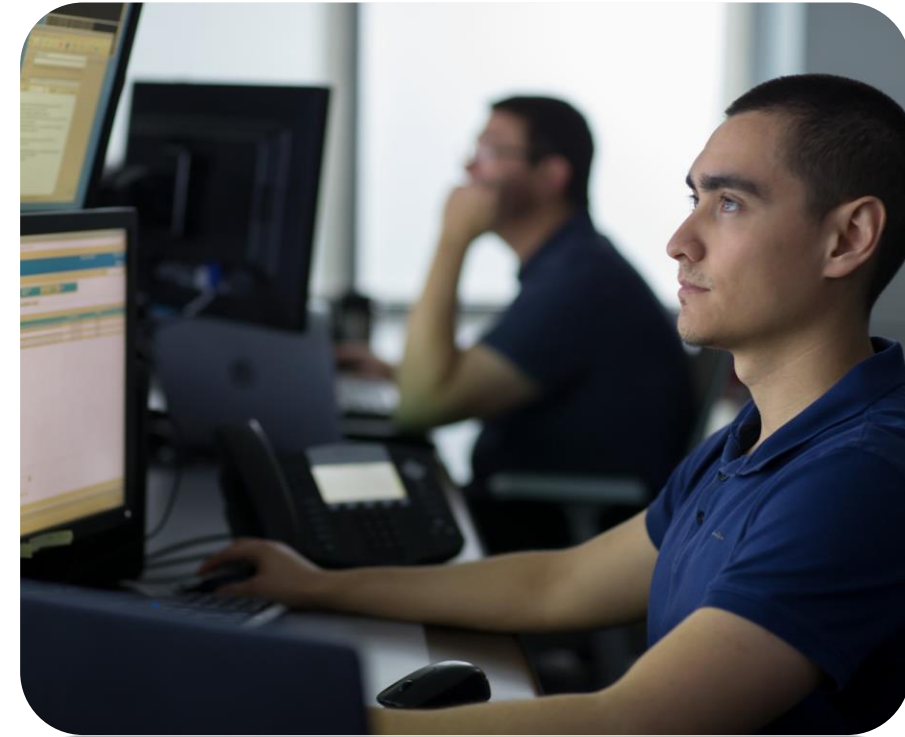


Sales Approach



Review your system today-Are you ready?
Can your system accomplish these things:

- Disaster recovery
- Always be connected
- Remote Monitoring-Access anywhere
- Preventative/Predictive Maintenance
- No truck roll
- Respond quickly to failures and maximize resources
- Improve time-to-repair, optimize spare parts inventory
- Allows external sensors (such as door alarms, smoke detectors, etc.) to be connected to the system



**When you need to be certain that your radio communication system is working
When you need it!**



CPM Solutions Guide

Channel Power Monitoring Solutions



Channel Power Measurement Solution



Features

- Provides real-time monitoring of RF power and antenna performance for up to 16 transmitters and/or antennas
- Wide range of sensors, covering Broadcast and Land Mobile Radio frequencies and power levels
- User-friendly display on “local” unit
- Built-in web server allows monitoring with web browser or Android app
- Supplied with MIB, allowing remote management with any SNMP version 2 management system
- Alarm on reduced power output, increased VSWR and reduced VSWR, alerting users as follows
 - Red alarm light on panel
 - Red alarm bars on web browser and Android app
 - SNMP traps to external devices
 - Alarm relay to external devices (lamps, etc...)
- External alarm inputs allow external devices to generate alarms, for example transmitter room door switches, PIR sensors, smoke sensors
- Data recording allows early diagnosis and repair of failing components
- AC supply with 24V station battery backup
- Accessible with the BirdRF Meter Android App



The Channel Power Monitor is a **Solution built for a System.**

Here are key questions and some things to know and need to be addressed prior to quoting a system.

Things to ask:

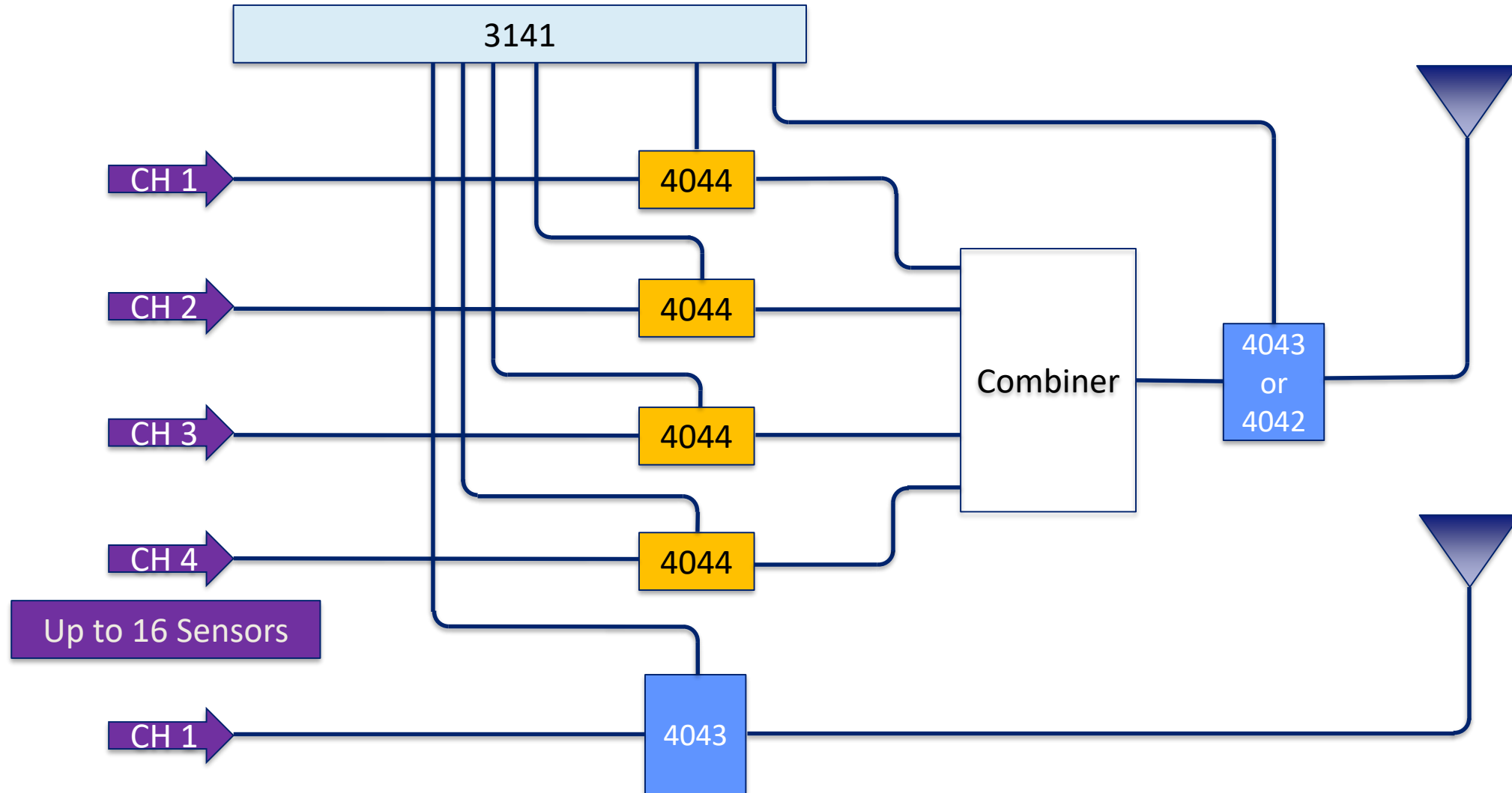
- What is the frequency and power to be measured?
- Can you provide a block diagram of your system?
- How many antennas do you have? How many sites?
- What is the provided input voltage at your site? 115VAC, ± 48 VDC?
- What type of network connection do you have? Cellular, ethernet?
- Do you have SNMP Manager?
- Do you have a Lab or test site available

Things to Know:

- When using a 4044 it needs to have a good match to the input of the combiner.
- When using a 4042 sensor (channelized power), note that due to processing time it is a good idea to limit one 4042 sensor per 3141.



Typical System Layout with CPM Monitor



4044 Sensor Options

Note: The 4044 is a non-directional sensor and will operate in either direction



Sensor Type
4044

Forward Power
125 W

Input Connector Options (yy)

01 = N(f)
02 = N(m)
03 = 4.3/10(f)
04 = 4.3/10(m)

4044-1-460404-0102

Select Options

4044-1-ff0404-yyzz

Frequency Bands (ff)

42 = 118-136MHz
44 = 144-174 MHz
45 = 380-450 MHz
46 = 450-512 MHz
47 = 762-806 MHz
48 = 806-869 MHz
49 = 896-940 MHz

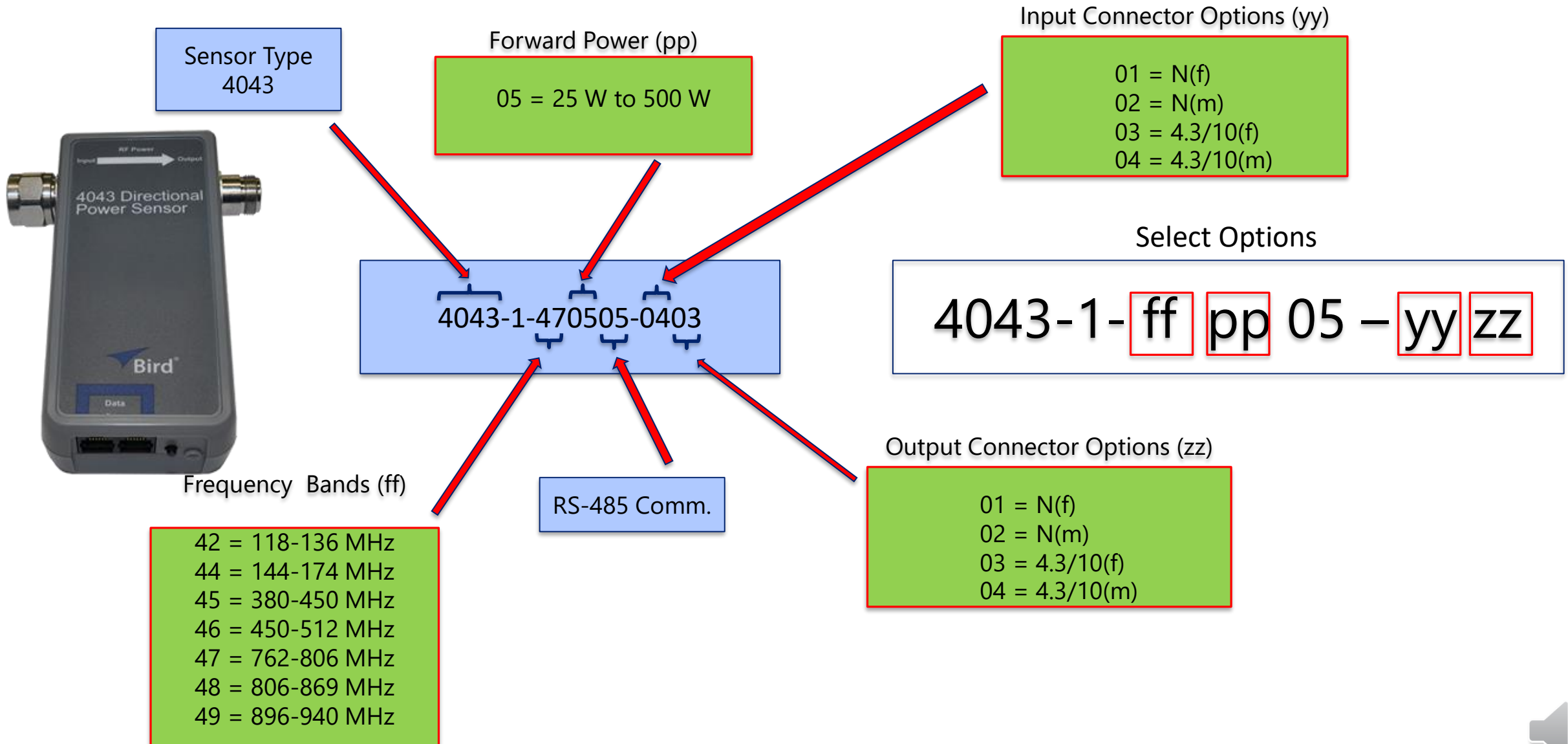
0-4V Analog

Output Connector Options (zz)

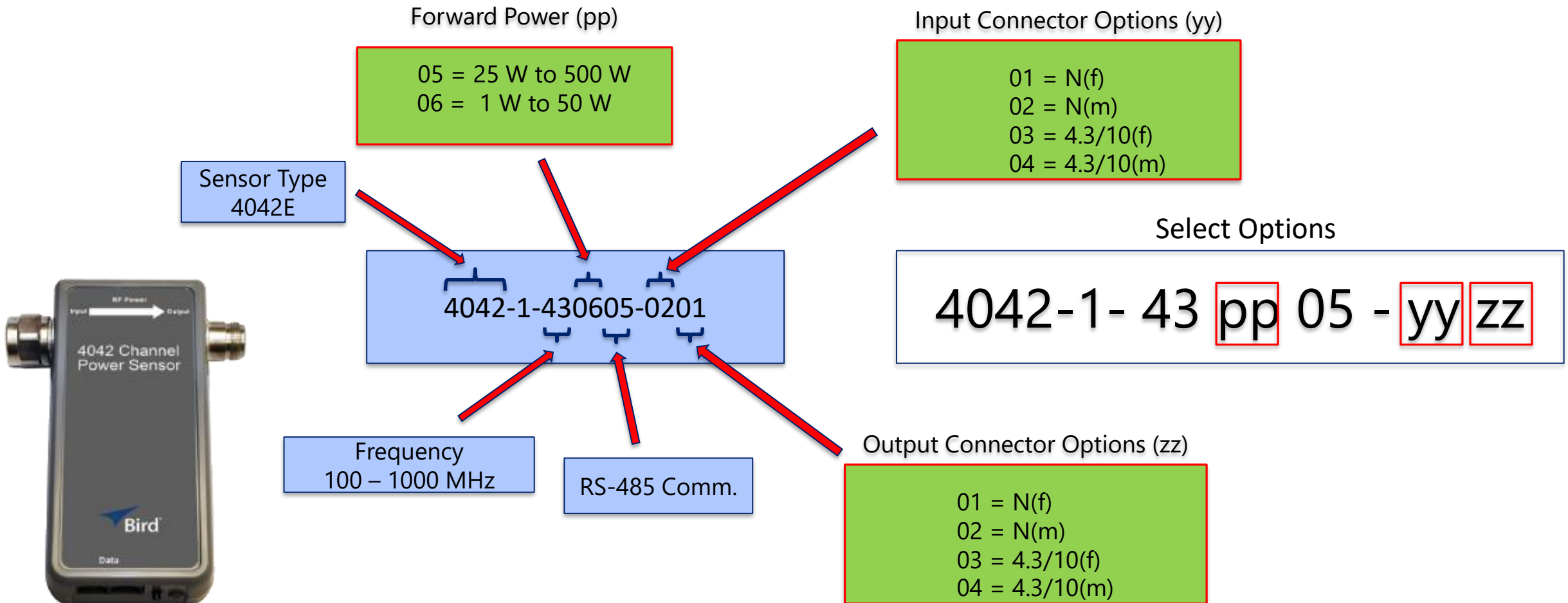
01 = N(f)
02 = N(m)
03 = 4.3/10(f)
04 = 4.3/10(m)



4043 Sensor Options



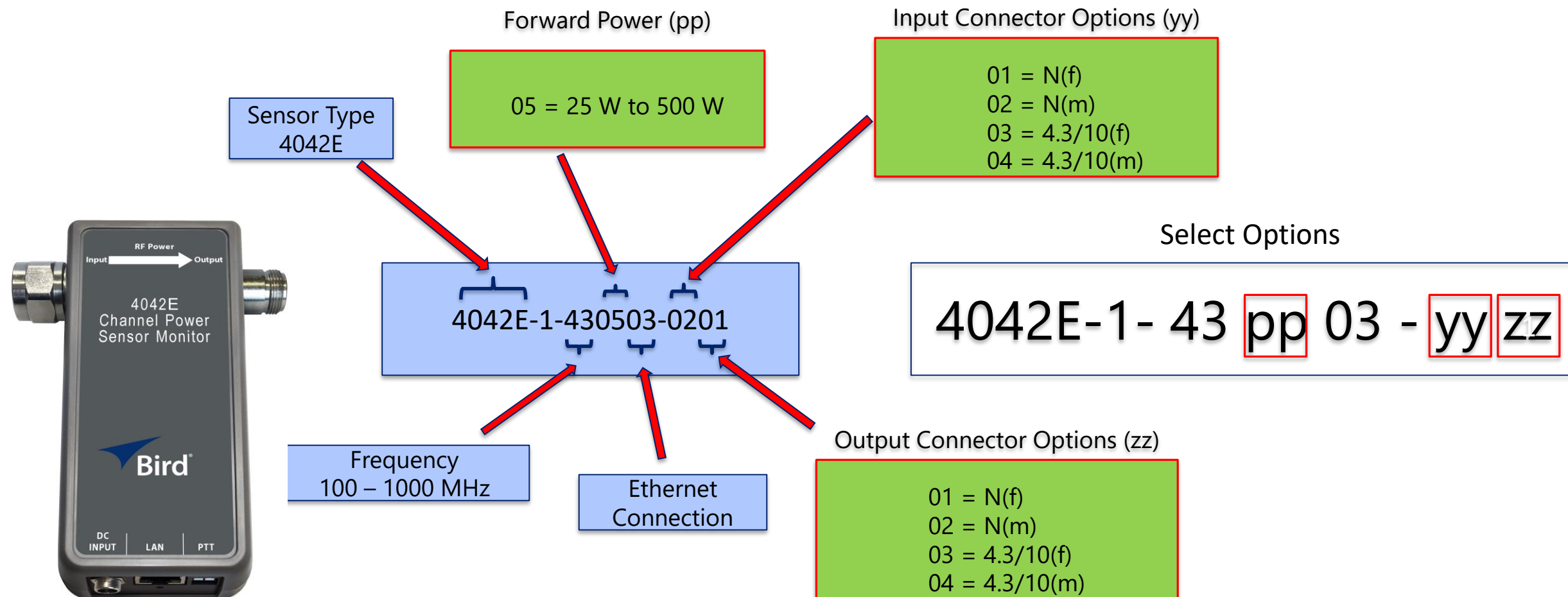
4042 Sensor Options – Per Channel – 50 W or 500 W



Note: The 4042 sensor is a 100 MHz – 1000 MHz sensor. Output power is per channel.



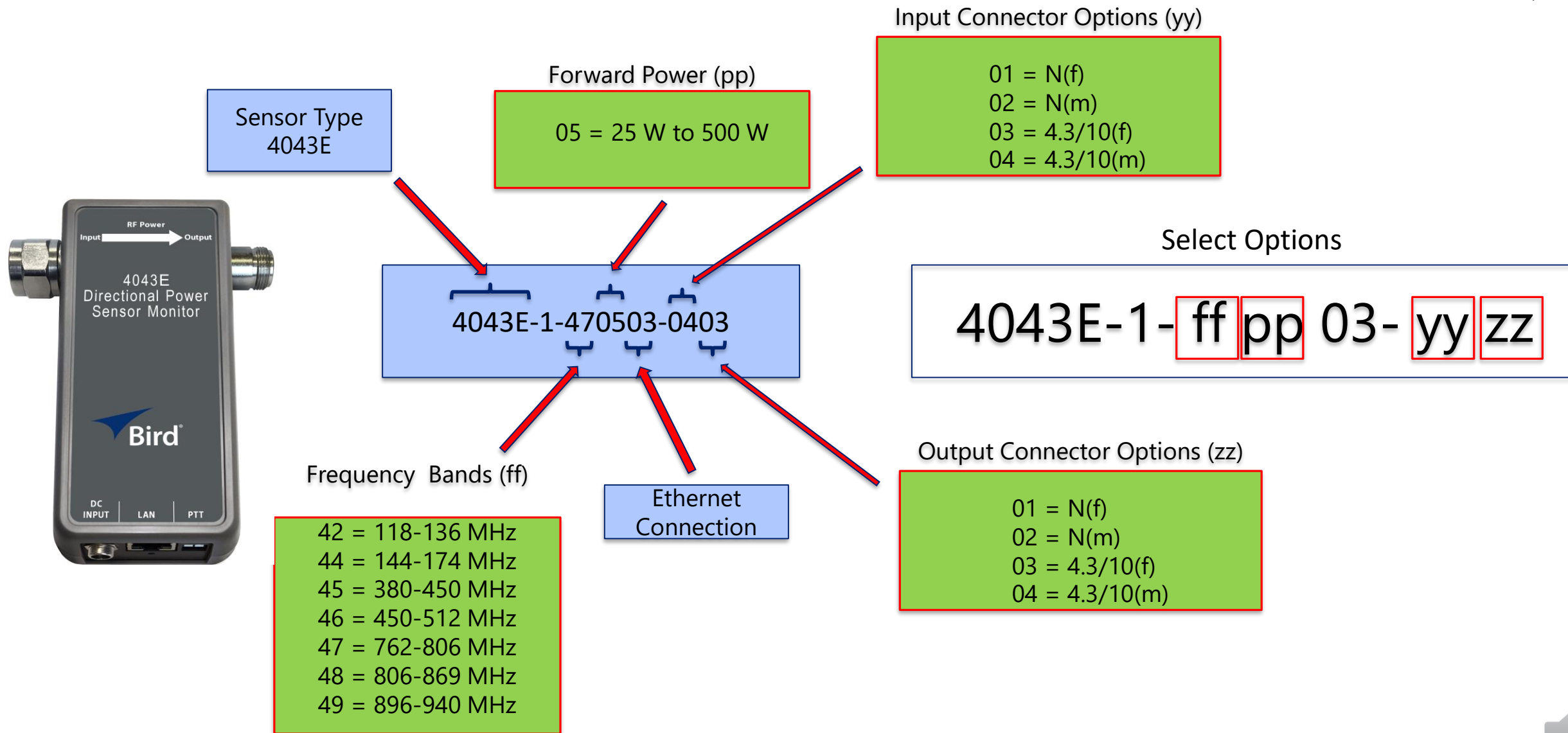
4042E Sensor Options



Note: The 4042E sensor is a 100 MHz – 1000 MHz sensor. Output power is per channel.



4043E Sensor Options – Composite Power



Channel Power Measurement Display

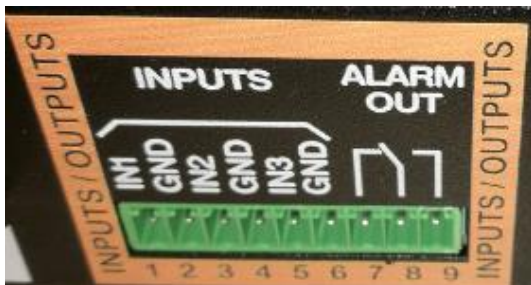
The Rear Panel – 1



Power Supply Inputs.

The left-hand socket connects to the AC power supply which is provided with the CPM.

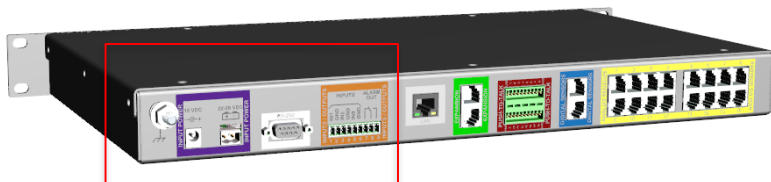
The right-hand socket can be connected to the site's battery backup.



User Alarm Inputs 1-3

There are 3 user defined inputs which can be connected to sensors/contacts of the customer's choice.

Alarm Out These are normally-open and normally-closed relay contacts which reflect the state of the Alarm LED on the front panel.



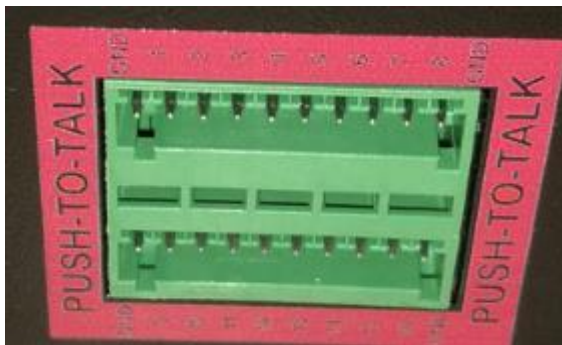
Channel Power Measurement Display

The Rear Panel – 2



LAN

Connects to the IP Network



Push-to-Talk

16 inputs which can be assigned to any of the RF sensors, and which allow forward power alarms to be sent only in the event that PTT is active and the minimum RF power threshold is not met.



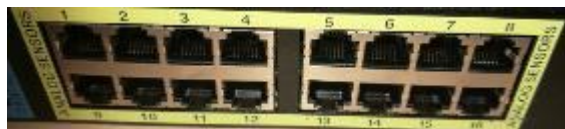
Channel Power Measurement Display

The Rear Panel – 3



Digital Sensors

Two RS-485 ports which connect to the 4042 and 4043 RF sensors. The sensors are connected in a chain, with a terminating resistor (120Ω) on the last sensor. Up to 32 sensors are supported. The sensors must be added via the front panel digital sensor menu.



Analog Sensors

16 inputs which connect to the 4044, 4043 and 5009 sensors. One port per sensor.

These ports may also be used for the TPM series of Broadcast Power Sensors.



4044 Non-Directional Power Sensors

Non-Directional Power Sensors

- Measure forward average power on a 50 ohm RF transmission line
- 125W Forward power level in frequency bands of 118-940 MHz
- Provides confirmation of transmitter output power
- Connects to 0-4V DC analog sensors input of CPM. Up to 16 are supported per CPM
- Ideal for use at the input to each channel of the transmit combiner where VSWR is well controlled

Measures output power of either analog or digitally modulated radios up 125W



4043 Directional RF Power Sensors



- 4043 Series are designed for use with the 3141 (CPM) to provide **composite** power readings
- Reads forward and reflected power on 50-ohm RF transmission line
- Max 500W forward and 50W reflected
- Available for frequency band with an overall range 144 to 940 MHz
- Provides VSWR Readings
- Connects to RS-485 digital serial bus sensor input of CPM. Up to 32 supported per CPM
- Any of the 16 PTT inputs can be re-mapped to 4043's
- Each sensor has:
 - (2) RJ-25 jacks for serial communication
 - RF input and output connectors
 - Status indicator

What is Composite Power?: When multiple transmitters of different frequencies are combined to a single antenna, the power produced is called Composite Power.



4042 Channelized RF Power Sensors



- Can measure the forward power, reflected power and the VSWR of a **SINGLE Channel**
- Can measure the forward power, reflected power and the VSWR of the **Composite** signal up to 16 individual channels and summing the power
- 500W forward and 50W reflected
- Connects to RS-485 digital serial bus sensor input of CPM
- Also shows aggregate forward and reflected power, and VSWR Readings
- Available for frequency band with an overall range 100 to 1000 MHz
- Any of the 16 PTT inputs can be re-mapped to individual 4042 frequencies



4042 Sensor Channels		State Of Alaska Site #1	
4042			
Name	FWD Power	REFL Power	VSWR
UKGen 1 164.0500	0	0	1
UKGen 2 164.0625	0	0	1
UKGen 3 169.0875	24.89	0.03	1.07
UKGen 4 169.3125	0	0	1
Total	24.89	0.03	1.07



Sensor Configuration

User can name each channel, alphanumerically

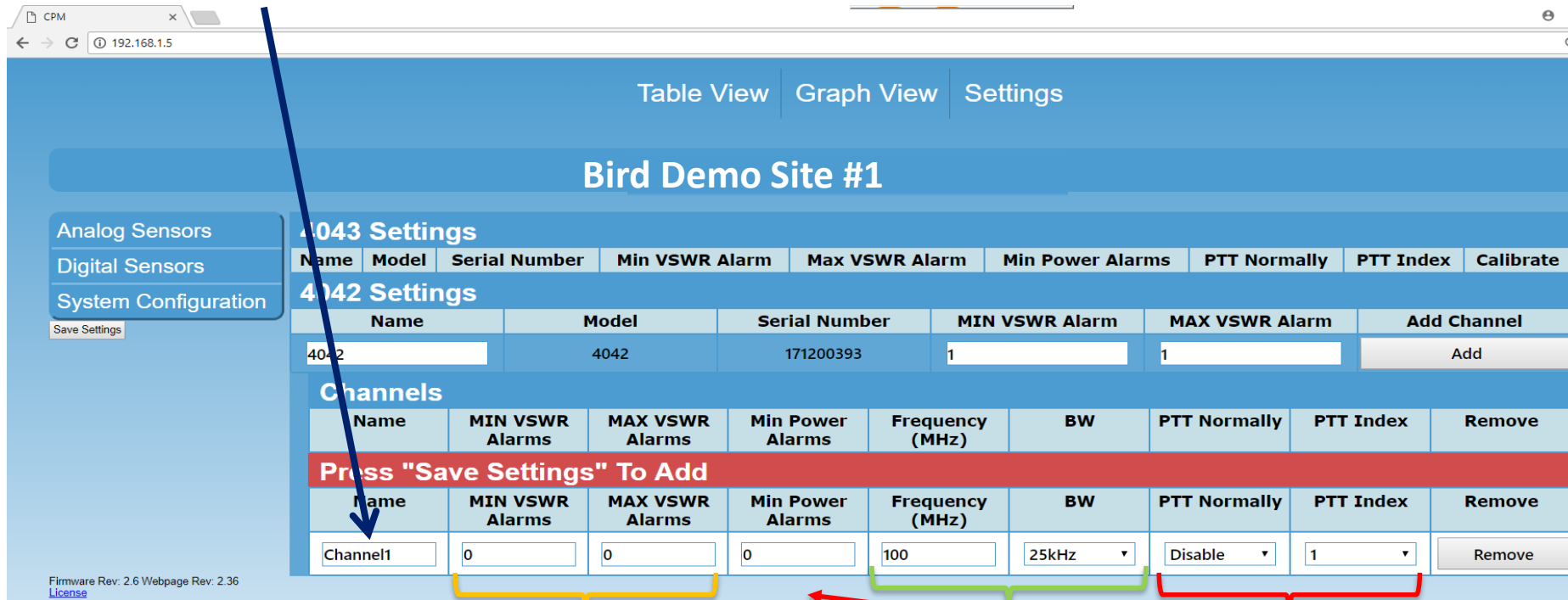


Table View | Graph View | Settings

Bird Demo Site #1

4043 Settings

Name	Model	Serial Number	Min VSWR Alarm	Max VSWR Alarm	Min Power Alarms	PTT Normally	PTT Index	Calibrate
------	-------	---------------	----------------	----------------	------------------	--------------	-----------	-----------

4042 Settings

Name	Model	Serial Number	MIN VSWR Alarm	MAX VSWR Alarm	Add Channel
4042	4042	171200393	1	1	Add

Channels

Name	MIN VSWR Alarms	MAX VSWR Alarms	Min Power Alarms	Frequency (MHz)	BW	PTT Normally	PTT Index	Remove
Press "Save Settings" To Add								
Name	MIN VSWR Alarms	MAX VSWR Alarms	Min Power Alarms	Frequency (MHz)	BW	PTT Normally	PTT Index	Remove
Channel1	0	0	0	100	25kHz	Disable	1	Remove

Firmware Rev: 2.6 Webpage Rev: 2.36
[License](#)

Thresholds below and above which minimum and maximum VSWR alarms are activated

Center frequency and bandwidth (6.25, 12.5 or 25kHz) for this channel

Threshold below which forward power alarm is activated, if PTT conditions here are realized



System Configuration

Analogue Sensors

Digital Sensors

System Configuration

Save Settings

Bird Demo Site #1

User Input Settings

Name	Enable/Disable	Default State	Alarm
Radio Cabin Door	☒	Normally Closed	☒
Radio Cabin PIR	☒	Normally Open	☒
Radio Cabin Smoke	☒	Normally Open	☒

SNMP Target IP

Channel Power Monitor

192.168.1.5

Site Name

Bracknell Marina

Logging

Download Log File

Delete Log File

Not Logging

5 seconds

Alarm Output Relay

Reset Alarm

Auto Reset

Configuration File

Import

Export

User can name the three auxiliary inputs , alphanumerically

User can specify IP address of SNMP management system

User can name the site

Configuration can be exported to, or imported from host PC

User can define whether the alarm relay is self-resetting or requires manual reset

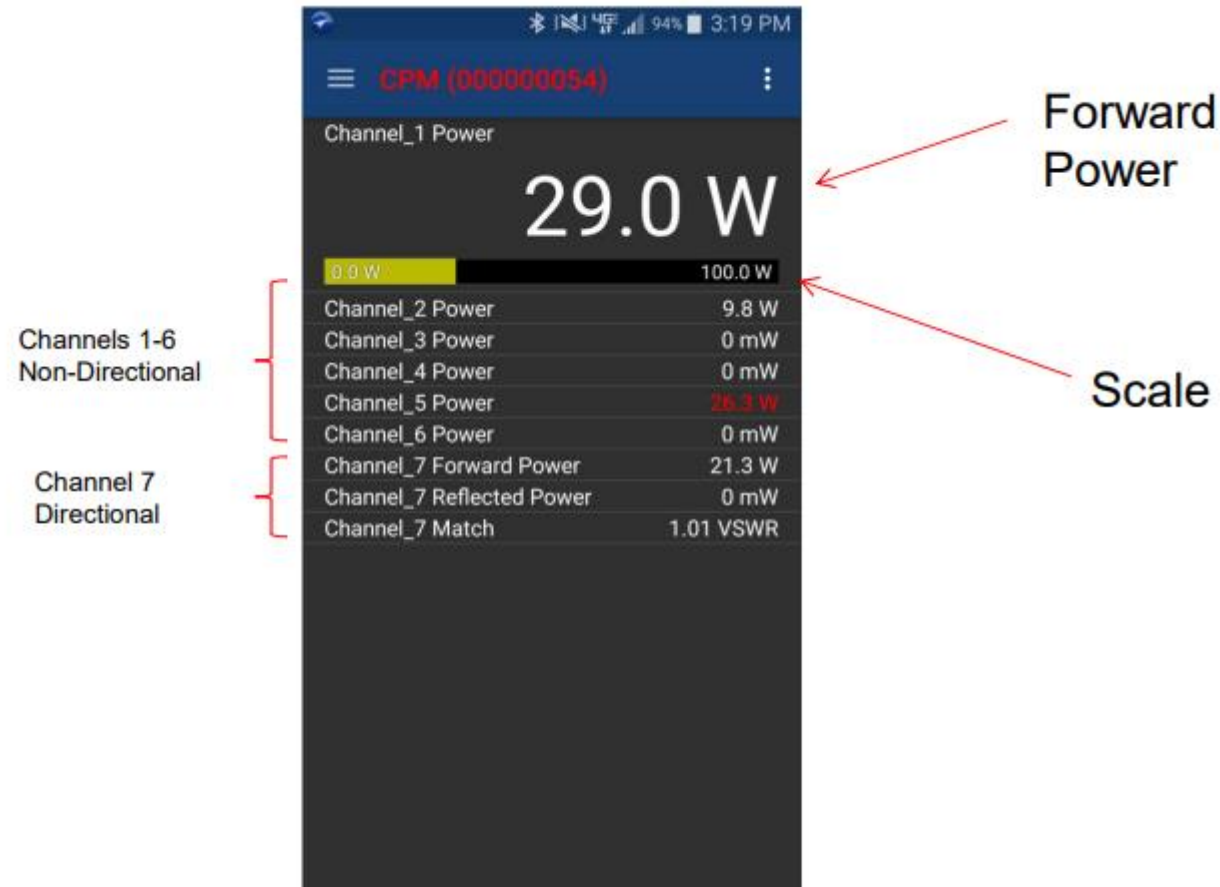
User can specify the type and frequency of event logging

User can define whether auxiliary inputs are enabled or disabled



Monitoring CPM with Android Phone

CPM can also be monitored with a (free) App call RF meter App, which can be downloaded from the Google Play Store



New Product Introduction



- Does not utilize the Model 3141 display unit
- More cost effective for applications requiring fewer sensors
- Consists of sensors that **connect directly to the ethernet**
- Allows remote access through the built-in Web Server for setup and monitoring
- Comprises a directional composite power sensor and a directional channelized power sensor



4043E and 4042E Ethernet Power Sensor Monitor



- Does not utilize the Model 3141 display unit
- More cost effective for applications requiring fewer sensors
- Consists of sensors that connect directly to the ethernet
- Allows remote access through the built-in Web Server for setup and monitoring
- Comprises a directional composite power sensor and a directional channelized power sensor



4043E Benefits

- Frequency range includes 7 bands between 118-940 MHz
- Provide composite power monitoring
 - The 4043E can be installed post-combiner to monitor the antenna VSWR
 - Alarm limits can be set by the user to provide alerts when that limit is crossed
 - Internal processing capability eliminates the need for additional monitoring and processing equipment

4042E Benefits

- Frequency Range 100 to 1000 MHz
- Monitoring antenna failure and radio power output simultaneously
 - The 4042E can be installed post-combiner to monitor the antenna VSWR
 - Monitor up to 16 radios with just one sensor
 - The 4042E (currently) has only one PTT input, so it **does not** provide frequency specific power alarms.

Note: Future Release 4042E that will address Frequency specific power alarms

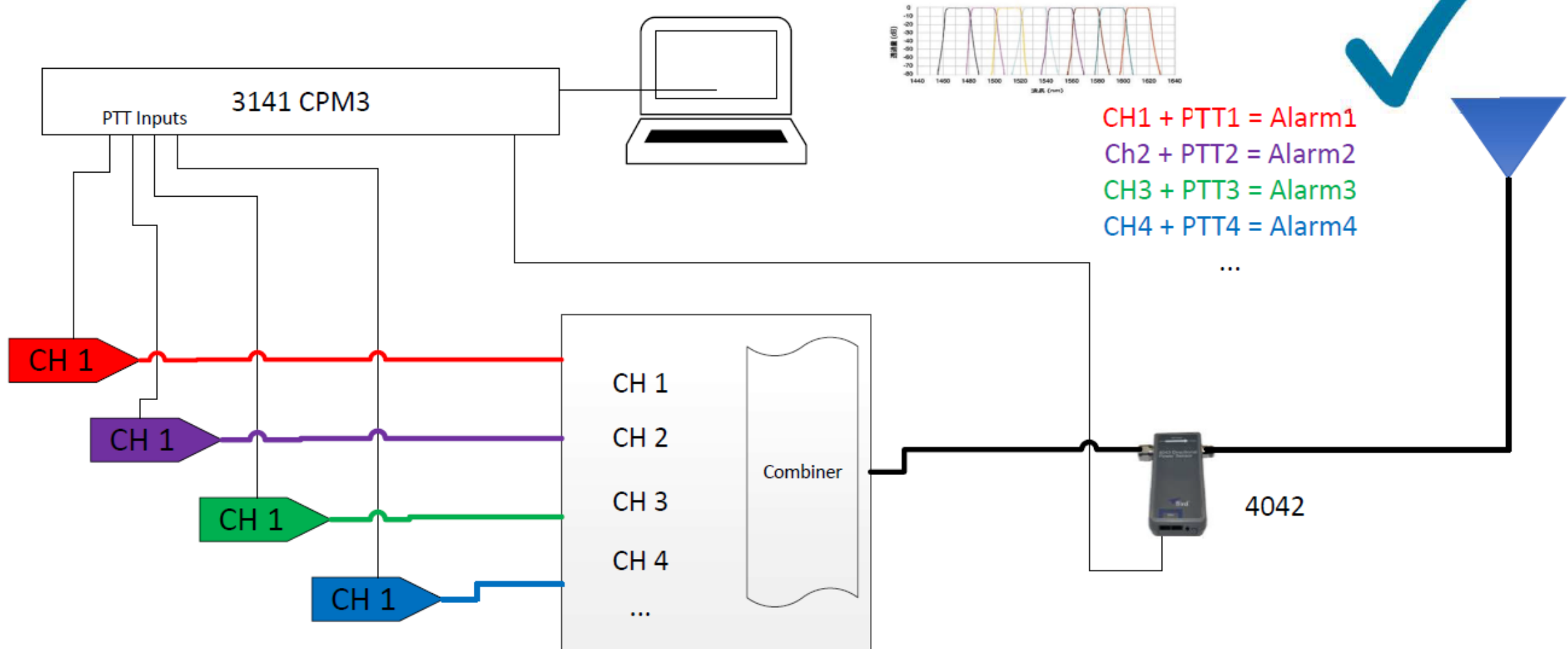


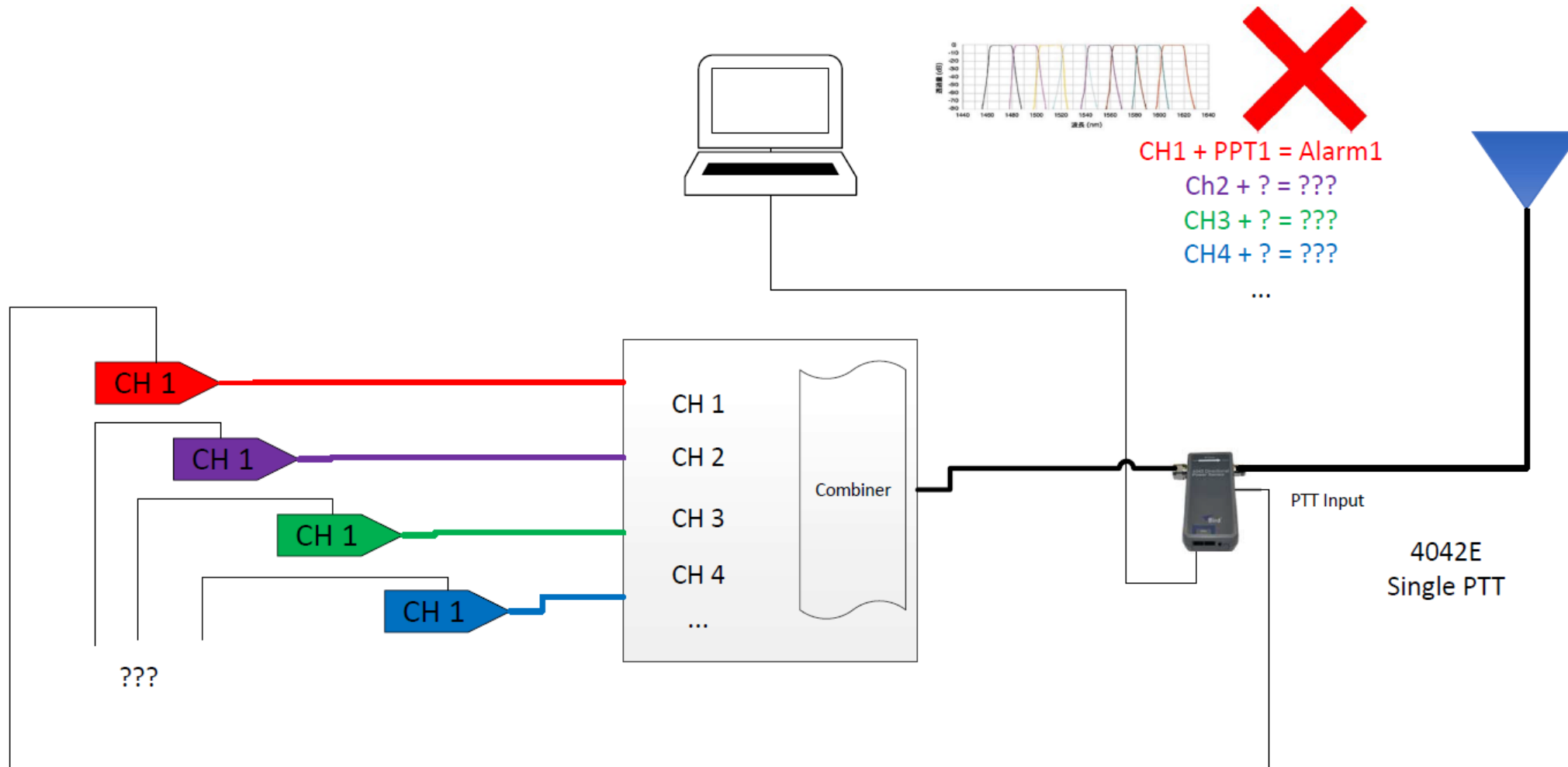
“Future” 4042E 16 Channel PTT

- The 4042E (currently) has only one PTT input, so it **does not** provide frequency specific power alarms.
- Create a new version of the sensor firmware to incorporate all networking features. This will enable the customer to access the sensor directly with his existing monitoring system.
- New 4042E has 16 PTT inputs. These individual inputs would map to the user-programmed channel configuration and gate the measurement in the same way as the 3141.
- By utilizing the 3141 PTT code into the 4042E, modified UI and redesign of the SNMP, this sensor would be able to **accommodate frequency specific power alarms**

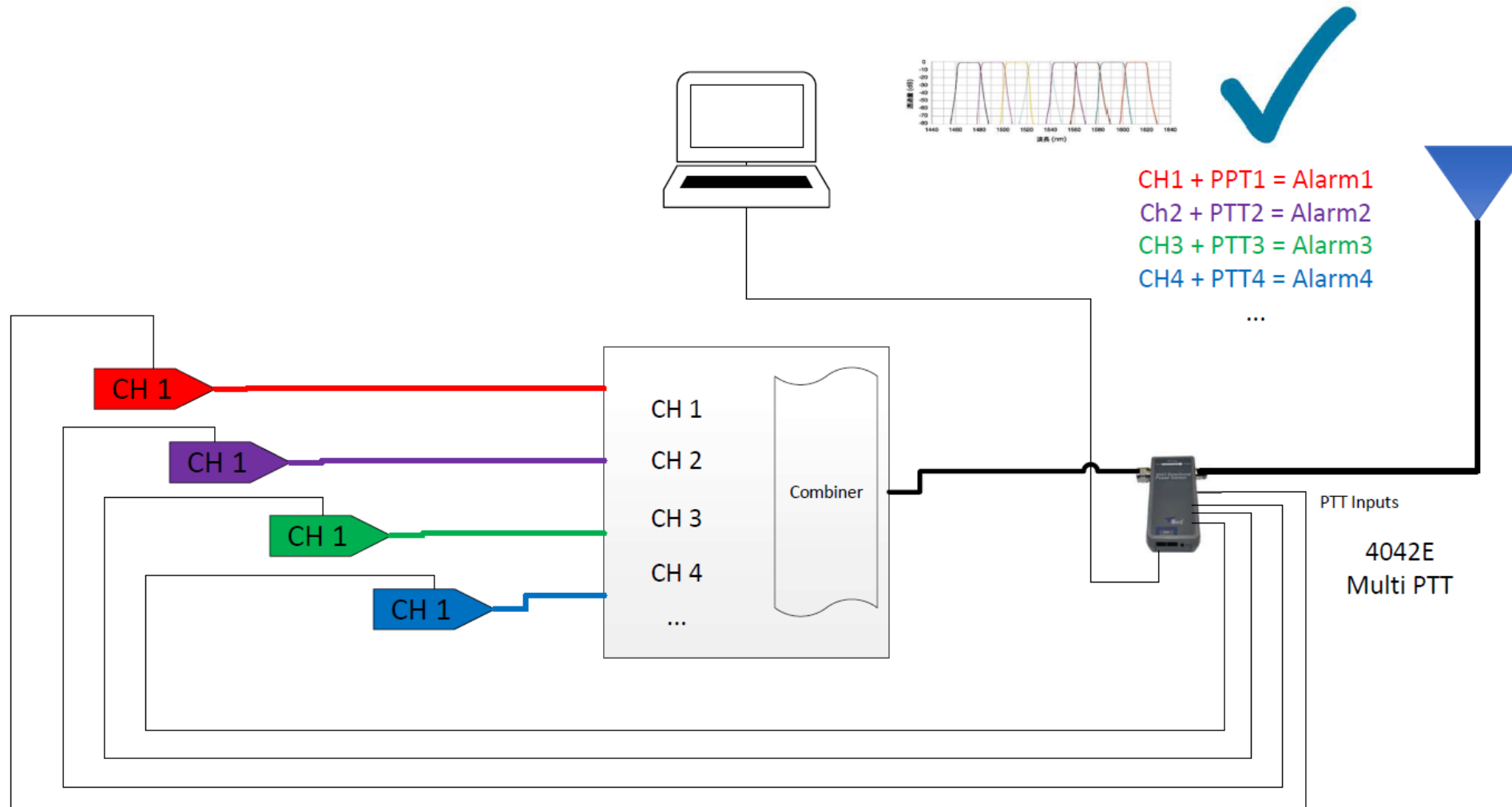


3141 Channel Power Monitoring System





4043E Future Release





Prospecting Toolkit

- Datasheet
- Training Webinar
- Outbound Marketing
- Target Advertising

Customer Meeting Tools

- Product Overview
- Data Sheet
- Application Notes
- Product Demos
- WebEx Training

Points of Differentiation

- Questions to Ask
- Solutions Guide



POWER SENSOR Monitors

4042E & 4043E SERIES

Maximize Up-Time

A new and cost-effective approach to antenna and power monitoring for smaller radio communications systems, and paging networks. Designed for smaller sites where the Bird 3141 Channel Power Monitor would be under-utilized, and connecting directly to the Internet or private IP network, they can be accessed remotely for both set-up and monitoring.

Bird's new Power Sensor Monitors provide reliable remote site monitoring to maximize uptime of mission critical communications. Unlike competitive solutions, the 4042E and 4043E can monitor for, and alarm in the event of, a reduced VSWR. This provides an early warning of increased losses in the transmission line resulting from water ingress, damage or deterioration.

Installed post-combiner, the 4042E and 4043E can generate alarms according to pre-configured parameters for forward power and minimum/maximum VSWR, then communicated to users with SNMP traps. The 4043E provides composite power monitoring while the 4042E is a channelized power sensor allowing for the individual monitoring up to 16 radios.

A powerful, yet cost-effective monitoring solution for smaller radio networks.

4042E CHANNEL POWER SENSOR MONITOR

- Offers channelized power measurement to monitor individual radios
- Frequency specific power alarms
- Monitor up to 16 radios with just one sensor

4043E DIRECTIONAL POWER SENSOR MONITOR

- Frequency range includes 7 bands between 118 and 960 MHz
- Provides composite power monitoring
- Internal processing capability eliminates the need for additional monitoring and processing equipment

APPLICATIONS

Commercial, industrial, and government land-mobile-radio (LMR) wireless-communications systems including:

- Public Safety
- Marine/Coast Guard
- Private Networks
- Railroad
- Civil Aviation

Thank you!



Time for some Questions and Answer Session

