1000 Watt RF Sensor

User Manual

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PREFACE

This document describes the installation, configuration and operation of 1000 Watt RF Sensor.

Hardware described in this document is subject to ongoing development and improvement. Consequently, there may be minor discrepancies between the information in this document and the performance and design of the hardware and software.

The user should ascertain that this product is suitable for the intended application. TASC Systems Inc. accepts no responsibility, liability for misuses or damage resulting from the inappropriate use of the product described herein.

Before connecting any equipment to the 1000 Watt RF Sensor, the user is advised to read this document in its entirety. Application of voltages in excess of the built-in protection could seriously damage the sensor and/or equipment it is connected to.

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LIST OF FIGURES

RELATED DOCUMENTS

Summit User Manual (050-015-0112)

Apex User Manual (050-015-0110)

siteCOMMANDER User Manual (015-050-0002)

SCCU siteCOMMANDER/RSM Configuration Utility User Manual (050-015-0055)

siteVIEW APEX User Manual (050-015-0110)

REVISION HISTORY

Revision	Date	Changes
R00	June 2016	Original document
R01	May 2017	Updated calibration info
R02	May 2017	Updated chassis ground gauge

1.0 PRODUCT OVERVIEW

The 100 Watt RF Sensors are single or dual direction devices which produce a DC voltage proportional to an RF signal, between 30 and 960 MHz. Each RF Power Sensor model has a specified bandwidth. The sensors exhibit extremely low insertion loss, and are placed in the transmission line, to allow continuous monitoring of forward and reflected power. The RF connectors are N female. One or two RCA connectors provide access to the proportional DC output.

Voltage trimmers allow for quick adjustment. The sensors have been adjusted to the mid-point frequency.

The 1000 Watt RF Sensor can be connected to a Summit or siteCOMMANDER.

Input power range	5 – 1000 Watts
Impedance (typical)	50 Ohms
Output	0 – 5 VDC
VSWR (maximum)	1.1 : 1
Insertion loss (typical)	0.1 dB
Dimensions	1.375 x 2.25 x 1.25 inches (3.5 x 5.7 x 3.2 cm)
Weight	0.5 lb (0.2 kg)
RF connectors	N female
DC connectors	RCA female

Table 1 – Specifications

Figure 1 – Single direction (PM-1A)

Figure 2 – Dual direction (PM-2A)

Figure 3 – Dual direction top view (showing RCA connectors)

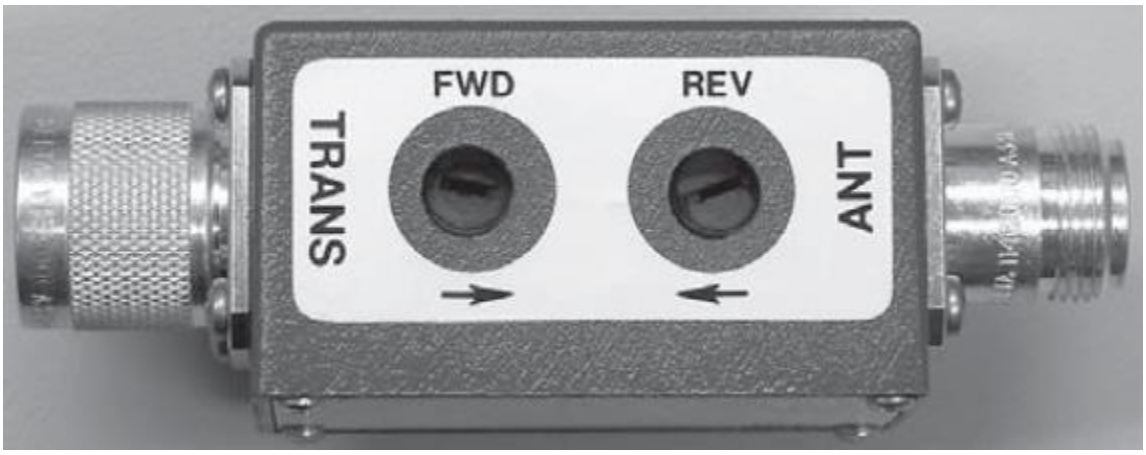

Figure 4 – Dual direction bottom view (showing potentiometers)

2.0 INSTALLATION AND SETUP

2.1 Caution

- Can cause electrical shock or equipment damage, disconnect the Summit power supply before connecting the wiring.
- Power down the radio before installing the RF Sensor.

2.2 Wiring

The RF sensor is connected to an analog input, and provides 0 – 5 VDC output.

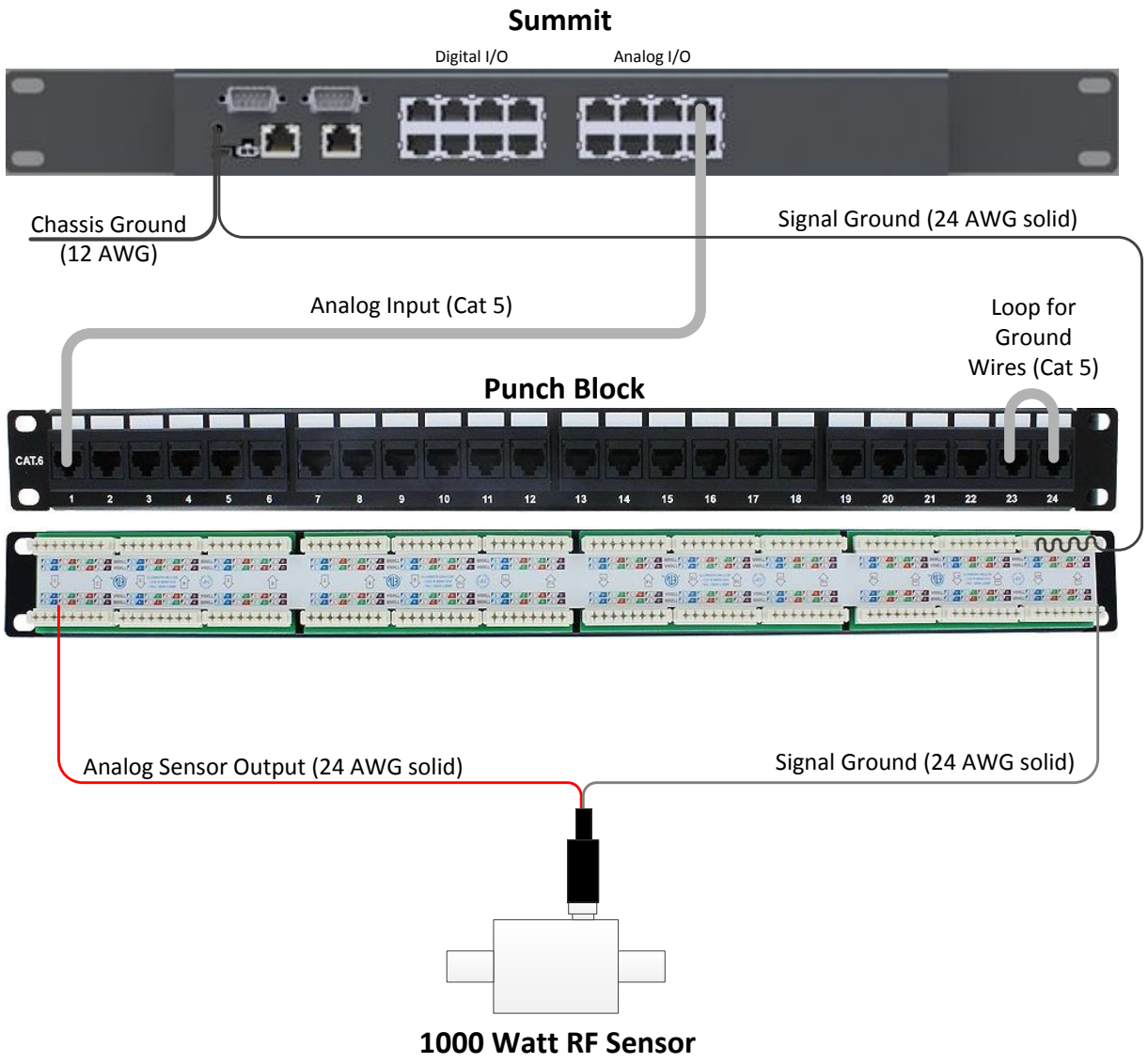

Figure 5 – Summit Wiring Drawing

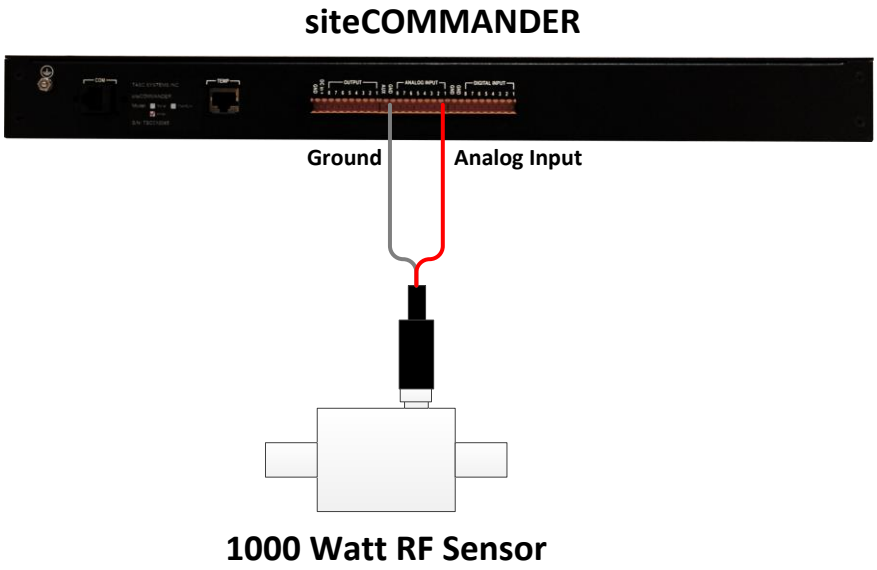

Figure 6 – siteCOMMANDER Wiring Drawing

Refer to the siteCOMMANDER User Manual for information regarding physical configuration of the analog input jumpers to work with the AC Voltage Sensor (0 – 5 V).

3.0 POWER FORMULAS AND TABLES

A custom formula can be created by varying the input power and plotting input power versus output DC voltage in MS Excel (scatter plot). Adding a trend line to the graph will provide the formula.

A mid frequency formula and table have been included in this section.

3.1 150 MHz

RF Power (dBm)	Voltage (DC)
35	0.12
36	0.21
37	0.30
38	0.40
39	0.50
40	0.61
41	0.71
42	0.83
43	0.95
44	1.07
45	1.21
46	1.35
47	1.51
48	1.68
49	1.88
50	2.11
51	2.41
52	2.95

Table 2 – 150 MHz – RF Power dBm vs Output Voltage (potentiometer 50%)

These numbers can be calculated using the formula: $y = -1.8258x2 + 11.613x + 33.631$

- y is RF power in dBm
- x is output voltage in VDC

3.2 450 MHz

RF Power (dBm)	Voltage (DC)
33	0.06
34	0.13
35	0.20
36	0.27
37	0.35
38	0.43
39	0.52
40	0.61
41	0.71
42	0.82
43	0.93
44	1.07
45	1.22
46	1.42
47	1.72

Table 3 – 450 MHz – Power dBm versus DC Voltage (potentiometer 50%)

These numbers can be calculated using the formula: $y = -3.7937x2 + 15.156x + 32.145$

- y is RF power in dBm
- x is output voltage in VDC

3.3 Software Settings

For siteCOMMANDER, refer to the SCCU or siteVIEW APEX Software Manuals for information regarding software configuration of the analog inputs.

For Summit, refer to the Summit User Manual for information about configuring the analog inputs using the Crest interface.

Platform	Frequency	Software	Formula (dBm)
siteCOMMANDER	150 MHz	siteVIEW APEX	-1.8258*X^2 + 11.613*X + 33.631
siteCOMMANDER	450 MHz	siteVIEW APEX	-3.7937*X^2 + 15.156*X + 32.145
Summit	150 MHz	Crest	-1.8258*pow(x,2) + 11.613*x + 33.631
Summit	450 MHz	Crest	-3.7937*pow(x,2) + 15.156*x + 32.145

4.0 POWER ADJUSTMENTS

4.1 Onsite Adjustment Steps – If Required

There are a two ways to make adjustments, when using the table/formula provided by TASC. A positive or negative adjustment (offset) can be made to the VDC output from the RF sensor. Alternatively, the potentiometer on the RF sensor can be adjusted.

I. For forward power, connect an inline RF wattmeter between the RF signal source and the TRANS connector on the power monitor. For reverse power (dual direction PM-2A models only), connect an inline RF wattmeter between the RF signal source and the ANT connector on the power monitor.

II. Connect a suitable RF load or the system antenna to the opposite end of the power sensor (ANT when testing forward, or TRANS when testing reverse).

III. Enable the RF source to produce power at the desired level and frequency.

IV. Compare the power formula value, based on the VDC output, from FWD for forward, from REV for reverse, to the RF wattmeter reading.

V. Option 1 – Offset adjustment
- Using the Crest user interface, add a positive or negative offset adjustment for the particular analog input, in order to make the RF wattmeter and formula values as close as possible.

Option 2 – Potentiometer adjustment
- Remove the chrome pop-off covers on the bottom of the power monitors, in order to access the calibration potentiometers.
- Using a small flat blade screw driver, adjust the appropriate potentiometer (FWD or REV) to change the VDC output so that the RF wattmeter and formula values are as close as possible.

4.2 Procedure to Create DC Output Table/Formula for RF Sensor

It is possible to create a custom formula based on the frequency and power range for the system. The following steps are used to create the tables and formulas.

I. Connect the RF signal source to the TRANS connector on the RF sensor.

II. Connect a 50 Ohm RF load to the ANT connector on the RF sensor.

III. Connect the RCA cable to the FWD connector on the RF sensor, and the multimeter to the signal and ground wires from the RCA cable.

IV. Set a signal generator to a mid-range frequency for the sensor and a low power level (minimum 5 Watts).

V. Record the multimeter reading and power level.

VI. Increase the power level in increments and record the multimeter and power level readings.

VII. Graph the data in a MS Excel Scatter Chart, and add an appropriate trend line to obtain a formula.