



7020 SERIES
POWER SENSOR

OPERATION MANUAL

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INSTRUCTION BOOK PART NUMBER 920-7020S REV. F

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SEALEVEL SYSTEMS, INC.

Safety Precautions

The following are general safety precautions that are not necessarily related to any specific part or procedure, and do not necessarily appear elsewhere in this publication. These precautions must be thoroughly understood and apply to all phases of operation and maintenance.

WARNING

Keep Away From Live Circuits

Operating Personnel must at all times observe general safety precautions. Do not replace components or make adjustments to the inside of the test equipment with the high voltage supply turned on. To avoid casualties, always remove power.

WARNING

Shock Hazard

Do not attempt to remove the RF transmission line while RF power is present.

WARNING

Do Not Service Or Adjust Alone

Under no circumstances should any person reach into an enclosure for the purpose of service or adjustment of equipment except in the presence of someone who is capable of rendering aid.

WARNING

Resuscitation

Personnel working with or near high voltages should be familiar with modern methods of resuscitation.

Safety Symbols

WARNING

Warning notes call attention to a procedure, which if not correctly performed, could result in personal injury.

CAUTION

Caution notes call attention to a procedure, which if not correctly performed, could result in damage to the instrument.

Note: *Calls attention to supplemental information.*

Warning Statements

The following safety warnings appear in the text where there is danger to operating and maintenance personnel, and are repeated here for emphasis.

WARNING

Never attempt to connect or disconnect RF equipment from the transmission line while RF power is being applied.
Leaking RF energy is a potential health hazard.

On page 2.

Caution Statements

The following equipment cautions appear in the text and are repeated here for emphasis.

CAUTION

Do not exceed the Average Power listed in "[Specifications](#)" [on page 5](#). Otherwise, the sensor may be damaged.

On page 3.

CAUTION

Do not exceed the Peak-Average-Ratio listed in "[Specifications](#)" [on page 5](#). Otherwise, the sensor will be damaged.

On page 3.

Safety Statements

USAGE

ANY USE OF THIS INSTRUMENT IN A MANNER NOT SPECIFIED BY THE MANUFACTURER MAY IMPAIR THE INSTRUMENT'S SAFETY PROTECTION.

USO

EL USO DE ESTE INSTRUMENTO DE MANERA NO ESPECIFICADA POR EL FABRICANTE, PUEDE ANULAR LA PROTECCIÓN DE SEGURIDAD DEL INSTRUMENTO.

BENUTZUNG

WIRD DAS GERÄT AUF ANDERE WEISE VERWENDET ALS VOM HERSTELLER BESCHRIEBEN, KANN DIE GERÄTESICHERHEIT BEEINTRÄCHTIGT WERDEN.

UTILISATION

TOUTE UTILISATION DE CET INSTRUMENT QUI N'EST PAS EXPLICITEMENT PRÉVUE PAR LE FABRICANT PEUT ENDOMMAGER LE DISPOSITIF DE PROTECTION DE L'INSTRUMENT.

IMPIEGO

QUALORA QUESTO STRUMENTO VENISSE UTILIZZATO IN MODO DIVERSO DA COME SPECIFICATO DAL PRODUTTORE LA PROZIONE DI SICUREZZA POTREBBE VENIRNE COMPROMESSA.

SERVICE

SERVICING INSTRUCTIONS ARE FOR USE BY SERVICE - TRAINED PERSONNEL ONLY. TO AVOID DANGEROUS ELECTRIC SHOCK, DO NOT PERFORM ANY SERVICING UNLESS QUALIFIED TO DO SO.

SERVICIO

LAS INSTRUCCIONES DE SERVICIO SON PARA USO EXCLUSIVO DEL PERSONAL DE SERVICIO CAPACITADO. PARA EVITAR EL PELIGRO DE DESCARGAS ELÉCTRICAS, NO REALICE NINGÚN SERVICIO A MENOS QUE ESTÉ CAPACITADO PARA HACERLO.

WARTUNG

ANWEISUNGEN FÜR DIE WARTUNG DES GERÄTES GELTEN NUR FÜR GESCHULTES FACHPERSONAL. ZUR VERMEIDUNG GEFÄHRLICHE, ELEKTRISCHE SCHOCKS, SIND WARTUNGSARBEITEN AUSSCHLIEßLICH VON QUALIFIZIERTEM SERVICEPERSONAL DURCHZUFÜHREN.

ENTRETIEN

L'EMPLOI DES INSTRUCTIONS D'ENTRETIEN DOIT ÊTRE RÉSERVÉ AU PERSONNEL FORMÉ AUX OPÉRATIONS D'ENTRETIEN. POUR PRÉVENIR UN CHOC ÉLECTRIQUE DANGEREUX, NE PAS EFFECTUER D'ENTRETIEN SI L'ON N'A PAS ÉTÉ QUALIFIÉ POUR CE FAIRE.

ASSISTENZA TECNICA

LE ISTRUZIONI RELATIVE ALL'ASSISTENZA SONO PREVISTE ESCLUSIVAMENTE PER IL PERSONALE OPPORTUNAMENTE ADDESTRATO. PER EVITARE PERICOLOSE SCOSSE ELETTRICHE NON EFFETTUARE ALCUNA RIPARAZIONE A MENO CHE QUALIFICATI A FARLA.

About This Manual

This manual covers the operating and maintenance instructions for the following models:

7020-1-010101

7020-1-030301

Changes to this Manual

We have made every effort to ensure this manual is accurate. If you discover any errors, or if you have suggestions for improving this manual, please send your comments to our Solon, Ohio factory. This manual may be periodically updated. When inquiring about updates to this manual refer to the part number and revision on the title page.

Literature Contents

Chapter Layout

Introduction — Describes the features of the 7020 Sensor.

Installation — Describes how to connect and install the 7020 Sensor into the system that is being monitored.

Operation — Describes how to run and maintain the 7020 Sensor.

Specifications — Describes the basic information, settings, and ranges of the 7020 Sensor

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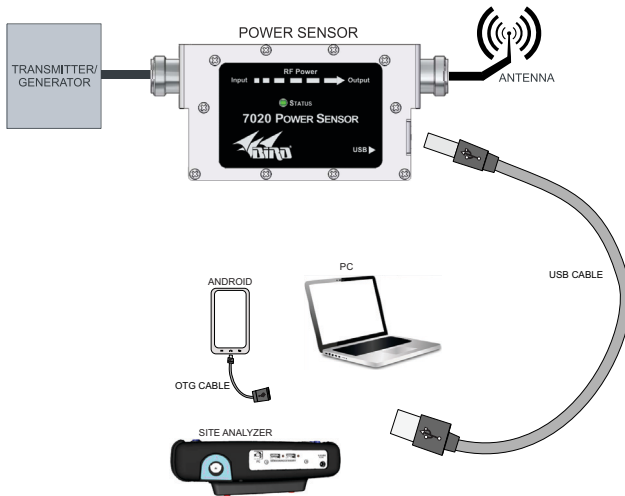
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Description

The Bird 7020 series sensors are ThruLine sensors that can measure forward and reflected average power and VSWR. They can be used with the Bird Site Analyzer (SA-XT), 5000-XT, Bird Virtual Power Meter Software (VPM3), and the Bird RF Meter Android App.

Note: *Firmware upgrades extending the sensor's capabilities may be periodically released. For the latest firmware upgrade visit our website at <http://www.birdrf.com>*

Connections



WARNING

Never attempt to connect or disconnect RF equipment from the transmission line while RF power is being applied. Leaking RF energy is a potential health hazard.

Note: Before connecting a 7020 sensor to a Site Analyzer, update the firmware on the Site Analyzer. For the latest firmware upgrade visit our website at <http://www.birdrf.com>.

Connecting the 7020 Sensor

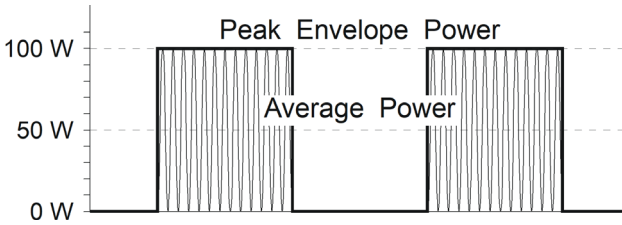
Note: Though any USB cable may be used, Bird recommends the use of the SeaLATCH™ locking USB cable provided with the unit.

1. Turn on the power meter.
2. Connect Type A (flat) connector end to the meter.
3. Connect Type B (square) end to the power sensor.
4. Connect the 7020 to the RF line.

Note: Connect the 7020 to the RF line so that the arrow on the sensor points towards the load.

Function Descriptions

Figure 1 Average Power Square Wave Signal



Average Power

CAUTION

Do not exceed the Average Power listed in "[Specifications](#)" on [page 5](#). Otherwise, the sensor may be damaged.

CAUTION

Do not exceed the Peak-Average-Ratio listed in "[Specifications](#)" on [page 5](#). Otherwise, the sensor will be damaged.

Average power is a measure of the equivalent “heating” power of a signal, as measured with a calorimeter. It measures the total RF power in the system, and does not depend on number of carriers or modulation scheme. The 7020 series sensors are broadband sensors that measure power across their entire frequency range. Their diodes operate in their ‘square law’ region so that the detector output is directly proportional to the average power, without any additional error correction.

Average power is the most important measurement of any transmission system since the average power is normally specified on the operating license. It is also valuable as a maintenance tool, showing overall system health, and for calibration.

VSWR

VSWR measures the relation between forward and reflected average power. The 7020 sensors calculate the VSWR from the Forward and Reflected Average Power measurements. Rho and Return Loss are also the same measurement, but in different units:

Rho

$$Rho(\rho) = \sqrt{P_R/P_F}$$

VSWR

$$VSWR = \frac{1 + \rho}{1 - \rho}$$

Return Loss (dB)

$$ReturnLoss(dB) = 10\log(P_R/P_F)$$

The health of the feedline and antenna systems can be monitored using VSWR measurement under full power operating conditions. High VSWR is an indicator of problematic issues. Some issues are feed line damage, overtightened equipment, antenna changes/damage due to weather conditions, or structural damage to the tower.

7020 Series Sensors Specifications

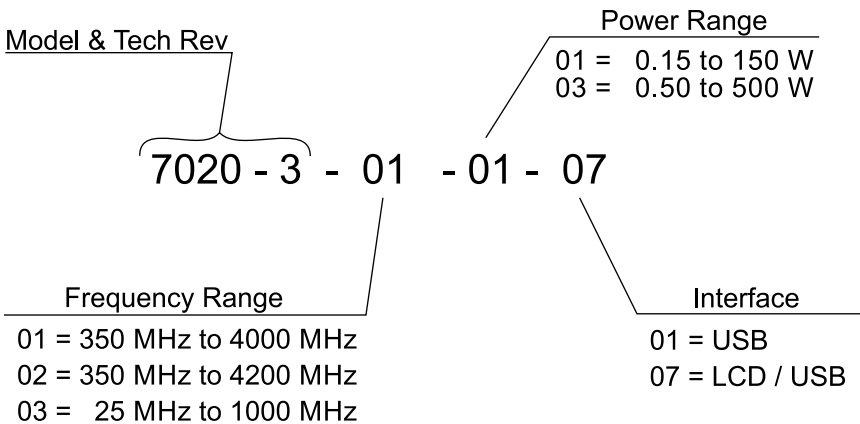
Measurement Type	ThruLine Power
Frequency Range	Model Dependant (see " Model Identification " on page 6.
Power Measurement Range¹	Model Dependant (see " Model Identification " on page 6.
Measurement Accy	+/- (4% of reading +0.05 W) Above 35° C or below 15° C, add 3%. Below -10° C add +/-0.01W
Peak/Avg Ratio	12 dB
Insertion Loss, Max²	0.1 dB
VSWR³	1.10 Max.
Impedance, Nominal	50 ohms
Response Time	0.1 Sec typical, 3 Sec max
VSWR Range	1.15 to 99.9
Min. Forward Power for Reflected Measurement	5.0 W
RF Connectors	N Female
Directivity, Min	28 dB
Power Supply Source	5 VDC from USB host
Current Draw	35 mA Max.
Recommended Calibration Interval	Annually
Interface Protocol	USB 2.0
Connector	USB Type 'B' with SeaLATCH USB connector
Mechanical and Environmental Shock	Mil-PRF-28800F Class 3
Vibration	Mil-PRF-28800F Class 3
Temperature Operating	-30 to +60°C (-22 to +140°F)
Storage	-40 to +80°C (-40 to +176°F)
Humidity, Max	95% (non-condensing)
Altitude, Max	4,572 m (15,000ft)
Data Logging	In VPM3, 5000XT, and Bird RF Meter App Software
Dimensions, Nominal	4.75" x 2.156" x 1.25" (LCD 1.5) (120mm x 55mm x 32mm)

Weight, nominal	0.8 lbs (0.36 kg)
Standards Compliance CE	European Standard EN 61326-1:2006 – Electronic Equipment for Measurement, Control and Laboratory Use – EMC Requirements in accordance with EMC Directive (2004/108/EC)
RoHS	Compliant
Compatible Displays	SA-XT Series, VPM3, 5000XT, Bird RF Meter App

- 1 500W Models: Derate maximum average power rating from 500W at 300MHz to 100W at 1 GHz linearly on a log-log scale.
- 2 350-4200MHz models: 0.1 dB max. 350-3800MHz, 0.115 max 3800-4200MHz.
- 3 350-4200MHz models: 1.10 max. 350-3800MHz, 1.13 max. 3800-4200MHz.

Model Identification

Note: The Model Identification guide is provided to allow existing model numbers to be understood. However, not all combinations are available. Please contact Bird for more information on new model number requests.



Limited Warranty

All products manufactured by Seller are warranted to be free from defects in material and workmanship for a period of one (1) year, unless otherwise specified, from date of shipment and to conform to applicable specifications, drawings, blueprints and/or samples. Seller's sole obligation under these warranties shall be to issue credit, repair or replace any item or part thereof which is proved to be other than as warranted; no allowance shall be made for any labor charges of Buyer for replacement of parts, adjustment or repairs, or any other work, unless such charges are authorized in advance by Seller.

If Seller's products are claimed to be defective in material or workmanship or not to conform to specifications, drawings, blueprints and/or samples, Seller shall, upon prompt notice thereof, either examine the products where they are located or issue shipping instructions for return to Seller (transportation-charges prepaid by Buyer). In the event any of our products are proved to be other than as warranted, transportation costs (cheapest way) to and from Seller's plant, will be borne by Seller and reimbursement or credit will be made for amounts so expended by Buyer. Every such claim for breach of these warranties shall be deemed to be waived by Buyer unless made in writing within ten (10) days from the date of discovery of the defect.

The above warranties shall not extend to any products or parts thereof which have been subjected to any misuse or neglect, damaged by accident, rendered defective by reason of improper installation or by the performance of repairs or alterations outside of our plant, and shall not apply to any goods or parts thereof furnished by Buyer or acquired from others at Buyer's request and/or to Buyer's specifications. Routine (regularly required) calibration is not covered under this limited warranty. In addition, Seller's warranties do not extend to the failure of tubes, transistors, fuses and batteries, or to other equipment and parts manufactured by others except to the extent of the original manufacturer's warranty to Seller.

The obligations under the foregoing warranties are limited to the precise terms thereof. These warranties provide exclusive remedies, expressly in lieu of all other remedies including claims for special or consequential damages. SELLER NEITHER MAKES NOR ASSUMES ANY OTHER WARRANTY WHATSOEVER, WHETHER EXPRESS, STATUTORY, OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS, AND NO PERSON IS AUTHORIZED TO ASSUME FOR SELLER ANY OBLIGATION OR LIABILITY NOT STRICTLY IN ACCORDANCE WITH THE FOREGOING.

