



SENSOR INTERFACE MODULE

MODEL
442 | B540-2

OPERATION MANUAL

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

Safety Earth Ground

An uninterruptible earth safety ground must be supplied from the main power source to test instruments. Grounding one conductor of a two conductor power cable is not sufficient protection. Serious injury or death can occur if this grounding is not properly supplied.

WARNING

Resuscitation

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

WARNING

Remove Power

Observe general safety precautions. Do not open the instrument with the power on.

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.



The caution symbol appears on the equipment indicating there is important information in the instruction manual regarding that particular area.

Note: *Calls attention to supplemental information.*

Caution Statements

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

CAUTION

4421B540-2 Sensor Interface Module must be unplugged from the power supply when making connections or disconnections to the power sensor.

On page 6.

CAUTION

Before connecting the power sensor to a transmission line, refer to the power sensor instruction book. Note the potential hazard when working with RF power.

On page 7.

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:

4421B540-2

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.

Chapter Layout

Introduction — Describes the features of the 4421B540-2, lists equipment supplied and optional equipment, and provides power-up instructions.

Theory of Operation — Describes how the 4421B540-2 works and its functions.

Installation — Describes the how to install the 4421B540-2.

Operation — Describes procedures require for operating the 4421B540-2.

Maintenance — Lists routine maintenance tasks as well as troubleshooting for common problems. Specifications and parts information are also included.

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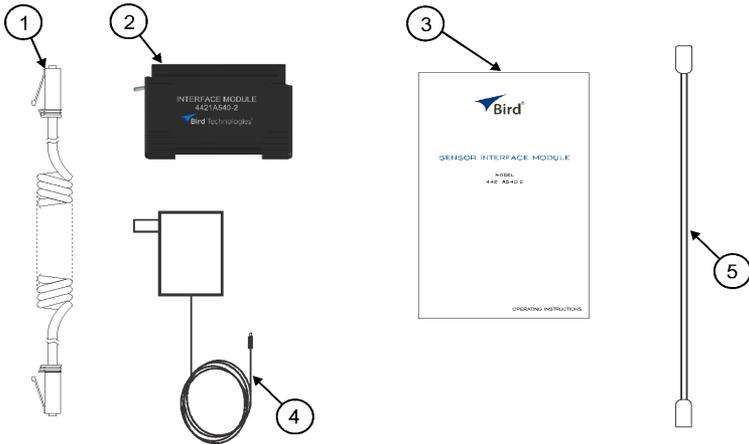
This instruction book is for operators of the Bird 4421B540-2 Sensor Interface Module. This section contains introductory information including items supplied.

Purpose and Function

The purpose of the 4421B540-2 Sensor Interface Module is to provide a means of communicating with Bird 402X Series power sensors instead of using the Bird 4421 RF Power Meter.

Items Supplied

Figure 1 Items Supplied



Item	Qty	Name	Description
1	1	Sensor Cable	Used to connect the 4421B540-2 to the power meter
2	1	4421B540-2	Interconnected between computer and Series 4020 power sensor.
3	1	Instruction Book	Instructions on using the 4421B540-2
4	1	Power Supply	+12V Power Supply
5	1	USB Cable	USB A-B Cable

Bird's Virtual Power Meter Software

Bird's VPM3 software provides a graphical user interface for communicating with Bird 402X Series Sensors.

VPM3 software is available for download from Bird's website:

<http://www.Birdrf.com>

Search = VPM3

Interface Module Driver

The interface module requires a USB driver, included with the VPM3 software, to operate properly. VPM3 software must be installed on any PC communicating with the interface module.

Items required but not supplied

The following items are required for use with the interface module but are not supplied:

- PC meeting the following requirements
 - ✓ Vista Sp1, Windows 7, Windows 8, Windows 10
 - ✓ Web Browser
 - ✓ Adobe Reader
 - ✓ 800 x 600, 256 color display (1280 x 720, 16 bit or higher resolution recommended)
 - ✓ 200 MB free disk space
 - ✓ 1 available USB port
- Bird 402X Power Sensor

Theory of operation is included to provide a level of understanding needed to avoid potential errors. The following paragraphs describe the operation of the 402X power sensors, the equipment needed to calibrate them, and the 4421B540-2.

Sensor Operation

Inherent to the operation of the power sensor is the linearization circuitry of the diode. With this proprietary method the power sensor is able to linearize the otherwise nonlinear response of the diode. This enables the sensor to be calibrated at relatively low power with less cost and effort and still maintain accurate measurements at higher power levels.

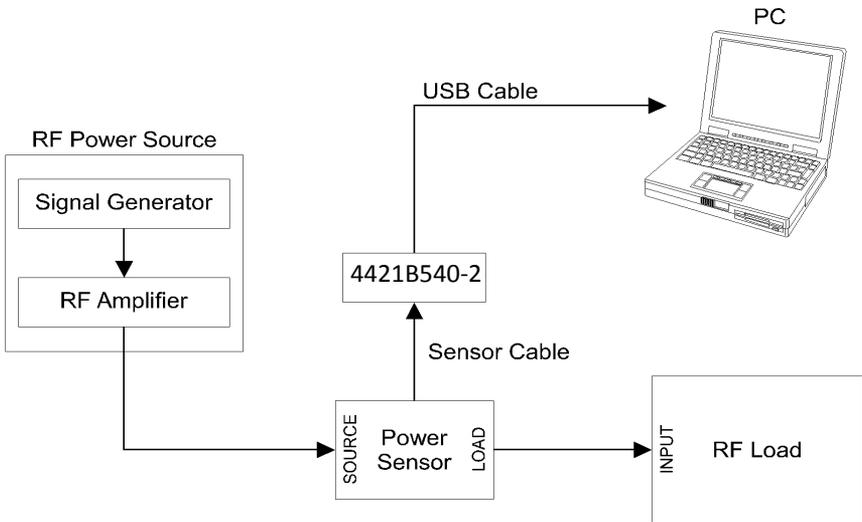
In addition to the linearization of the diode output, a temperature compensating network is added to counteract drift commonly encountered in other power meters that use diode sensors.

Since all coupling devices exhibit variations in coupling over a wide bandwidth, calibration must take place to normalize the frequency response of the 402X power sensor. Each power sensor has a unique, but repeatable, frequency versus amplitude response. This information is stored in memory in the sensor and used by the microprocessor to assign a correction factor to the measured frequency.

The RF signal is sampled by a detector circuit. Each sensor has at least two detectors, one for each direction i.e. forward and reflected. Some sensors have two detectors for each power direction to cover the frequency bandwidth. The sensors automatically select which detector to use, with the aid of the frequency counter.

Since the calibration is stored in memory within the sensors, a calibration key is necessary to unlock the memory and allow a change in calibration to take place. This calibration key is required only when the sensor's calibration needs to be corrected.

Figure 2 Setup Block Diagram



Unpacking and Inspection

1. Inspect the 4421B540-2 shipping package for signs of damage.

Note: *Use care when inspecting the package.*

2. Do one of the following:

- **If shipping package is damaged** - Do not unpack the unit.

Note: *Immediately notify the shipping carrier and Bird Technologies of the damage.*

- **If shipping package is not damaged** - Unpack the unit.

Note: *Save all shipping materials.*

3. Check package contents against the items supplied list on [page 1](#).
4. Visually inspect all components for signs of damage.

Note: *Immediately notify the shipping carrier and Bird Technologies of equipment damage or missing parts.*

Download and Install VPM3 software

1. Go to www.birdrf.com
2. Search VPM3, and click the link in results for VPM3 Virtual Power Meter.
3. Click the "Download Software" link.
4. Install VPM3 onto the computer.

Driver installation

Installing VPM3 should install the USB driver required for the Interface Module. If the driver is not installed correctly when the Interface Module is connected to the computer perform the following procedure.

You can install the driver (.inf) file by opening:

1. Click the Start button
2. Type *Device Manager* into the search box.
3. Click Device Manager in the results for Control Panel.
4. Right-click on the "unknown USB" device (yellow caution triangle), see [Figure 3 on page 6](#).

Figure 3 Device Manager



5. Then click on Update Driver Software....
6. Select "Browse my computer for driver software."
7. Click Browse, and navigate to:
C:\Program Files (x86)\Bird Technologies Group\VPM3\Driver.
8. Select the **Bird_4421_adapter_cdc.inf** file in the Driver folder.
9. Click OK and Windows will install the driver.

Connecting the 4421B540-2 Module

CAUTION

4421B540-2 Sensor Interface Module must be unplugged from the power supply when making connections or disconnections to the power sensor.

1. Move the Serial/USB selector switch on the 4421B540-2 to USB position. See [Figure 4](#).

Figure 4 Serial/USB Selector Switch

Serial/USB Selector Switch



2. Connect a USB cable between the 4421B540-2 and the computer.
 - a. If the Driver for the Interface Module does not install correctly, perform "[Driver installation](#)" on page 5.
3. Connect a sensor cable (supplied with sensor) between the 4421B540-2 and the 402X RF power sensor.

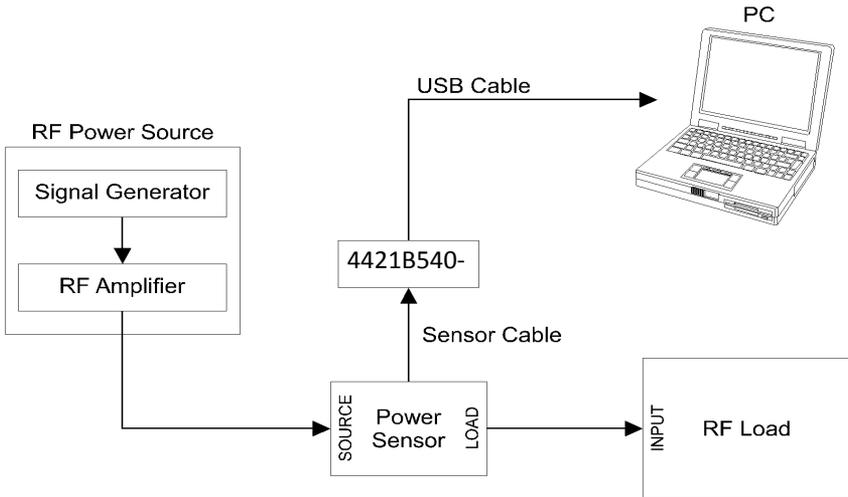
CAUTION

Before connecting the power sensor to a transmission line, refer to the power sensor instruction book. Note the potential hazard when working with RF power.

4. Connect the power sensor in an RF transmission line:
 - The Source side connects to the signal source.
 - The Load side connects to a power standard.

Note: Make this connection as short as possible.

Figure 5 Operational Setup



Equipment Startup

Equipment connection varies depending on operating mode desired, follow equipment startup procedures for individual equipment connected.

VPM3 Setup

Follow the instructions in the VPM3 manual for setup and operation of the VPM3 and the 402X power Sensor.

Troubleshooting

Table 1 contains troubleshooting information for problems which can occur during normal operation. Locate the problem, review the possible causes and perform corrective action listed.

Note: *When a corrective action lists replace sensor, return the sensor to a qualified service center for repair.*

Only those functions within the scope of normal maintenance are listed. This manual cannot list all malfunctions or corrective actions. If a malfunction is not listed or is not corrected by listed corrective actions, notify a qualified service center.

Table 1 Troubleshooting, Symptom, Cause, Action

Problem	Possible Cause	Corrective Action
No display on computer	Poor connections	Check connections, replace cables as necessary.
	Faulty cables	
	Driver not Installed correctly	Check Device Manager for improperly installed USB device, perform " Driver installation " on page 5 if required.
	Defective 4421B540-2	Replace 4421B540-2.
	Defective sensor	Replace sensor.
Unit will not display power	Open or defective RF cable	Check connections, replace RF cable.
	Defective Power Supply	Replace Power Supply , see " Parts List " on page 10 .
	Defective sensor	Replace sensor.
	Defective 4421B540-2	Replace 4421B540-2.

Preparation for Shipment or Storage

Storage

The Model 4421B540-2 should be stored in a cool, dry area. Ensure storage area temperature remains within the limits contained in the [Specifications](#). If storage period is expected to exceed 30 days, package the unit as described below to keep it free of dust and dirt, and protect it against rough handling.

Packaging

Package instrument using the original shipping container. If the original shipping container is not available, use a corrugated box. Place shock absorbing material around all sides of the instrument to prevent movement during handling or shipment. Equipment packaging shall be in accordance with best commercial practices.

Parts List

The parts list in this section identifies the major components of the Model 4421B540-2. See [Figure 1 on page 1](#) for item number cross reference.

Item No.	Part No.	Description	Qty. .
1	4421-038	Interface Cable, Latch-N-Lock	1
2	4421B540-2	Sensor Interface Module	1
3	920-4421B540-2	Instruction Book	1
4	5B2229-1224-G-1	12V Power Supply	1
5	5A2653-GL	USB Cable	1

Specifications

Compatible Power Sensors	4020 Series 4027 Series 4028 Series
Interfaces	USB 2.0, Type B Serial RS-232
Operating Power AC Supply Input Power AC Supply Output Power	115/230 VAC, 50/60 Hz 12 VDC
Dimensions	4.1" x 2.8" x 1.4" (105 x 72 x 36 mm)
Weight	0.75 lbs (1.7 kg)
Operating Temperature	+14 to 122 °F (-10 to 50 °C)
Storage Temperature	-40 to 176 °F (-40 to 80 °C)
Humidity	95% Non-condensing

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.