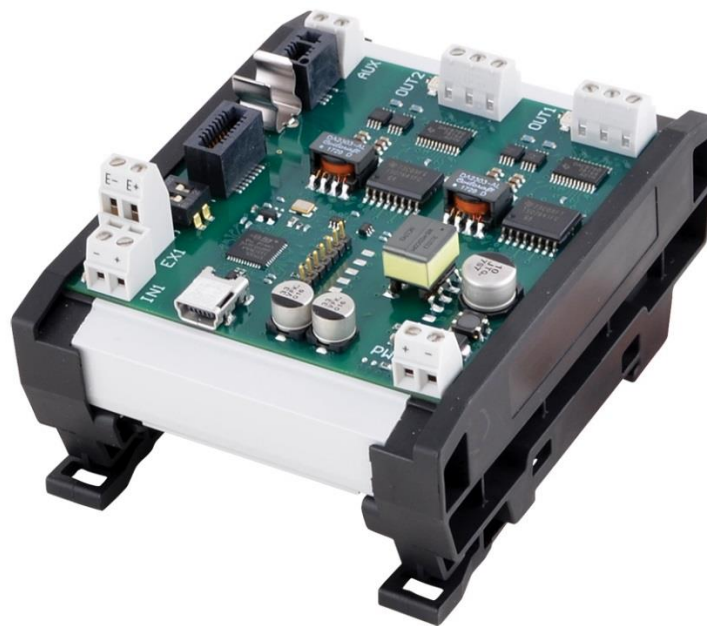# microBlox® Series, uBSP-P-1
Single Channel USB Programmable Signal Splitter for microBlox® (uB) Field Input Modules

USER'S MANUAL

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IMPORTANT SAFETY CONSIDERATIONS
You must consider the possible negative effects of power, wiring, component, sensor, or software failure in the design of any type of control or monitoring system. This is very important where property loss or human life is involved. It is important that you perform satisfactory overall system design and it is agreed between you and Acromag, that this is your responsibility.

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GETTING STARTED

DESCRIPTION

Symbols on equipment:

Means "Refer to User's Manual (this document) for additional information".

This carrier is used with Acromag microBlox® modules to build a flexible signal splitter with multi-range voltage and current outputs (input module not included, see below for compatible models). Modules are isolated input-to-output and these carriers add power isolation and split the input of the microBlox® module to separately isolated voltage and current outputs. Module inputs and splitter outputs are configured via a wired USB connection to your personal computer/laptop or Android smartphone/tablet.

uB Model Types Supported (10/11 Model types Plug-In including "-B" versions)

Input Model	Module Input Limits	Module Voltage Output (AUX)
uB31/uB41	±1V to ±60V	0-5V, ±5V, 1-5V (this module output drives a third or AUX output on this splitter)
uB30/uB40	±10mV to ±100mV	
uB32/uB42	4-20mA/0-11.17mA DC	
uB34/uB35	2/3/4-Wire Pt RTD	
uB37/uB47	J/K/T/R/S Thermocouple	

This microBlox® module carrier adds wide-input isolated power, cold junction compensation for thermocouple modules, dual isolated current and/or voltage outputs, an AUX voltage output, plus LED indication for module power and splitter output fault detection, and indication for optional Bluetooth wireless technology linking (splitter functionality cannot be configured wirelessly). The microBlox® (uB) modules offer a flexible space-saving solution for isolating, monitoring, and driving industrial process signals to interface with modern data acquisition equipment. A single uB input module plugs into this carrier to build a powerful signal splitter. Different input types can be plugged into this carrier to split different signals, and each splitter output may be scaled differently. Units provide an adjustable input range, input isolation, variable input filtering, and output scaling. This splitter is set up and calibrated using a wired USB connection to a Windows-based PC running configuration software (Windows 7 and later versions only), or an Android-based tablet or smartphone running our Agility mobile APP. Like all microBlox® components, this carrier has a high immunity to harsh industrial environments, is CE and ATEX / IECEx compliant, and UL approved for installation in Class I, Division II hazardous locations.

Key Features

- **Field-pluggable microBlox® input module allows you to change an input type on this carrier in the field. Modules are over-molded and RoHS compliant, and offer superior shock, moisture, and dust protection.**
- **Software Configuration via wired USB to a Windows based personal computer or tablet running Windows software, or wired USB OTG (On-The-Go) to an Android smartphone or tablet using our Agility Configuration App. Software for USB Configuration and the Agility app is free (no other software required).**
- **Separate isolated voltage and current outputs at each splitter output channel support ±10V, ±5V, 0-10V, 0-5V, or 0-20mA and 4-20mA ranges. A third isolated AUX/host voltage output is sourced from the microBlox® module.**
- **Input range and output ranges are adjustable, input and outputs can be scaled independently and the input may even be scaled differently for each output.**
- **Normal or Reverse Acting splitter outputs.**
- **Variable Digital Input Filter adjustment.**
- **Designed and manufactured for High Quality/High Reliability with AS9100 (Aerospace Quality)/ISO9001.**
- **Designed, hardened, and thoroughly tested for use in Harsh Environments.**
- **CE Approved & UL / cUL Class I, Division 2 Approvals.**
- **FCC Conformity Class B.**
- **ATEX / IECEx Certified for Explosive Atmospheres.**
  ⟨Ex⟩ II 3 G Ex nA IIC T3 Gc -40ºC ≤ Ta ≤ +75ºC
  DEMKO 18 ATEX 2086X   IECEx UL 18.0092X
- **Carrier includes a voltage or current output at each output channel.**
- **Better than ±0.1% output accuracy.**
- **Wide ambient temperature operation from -40°C to +75°C.**
- **All I/O and power ports are transient protected.**
- **Wide-range isolated DC power input from 6-32V.**
- **LED indicators for module Bluetooth wireless technology link, module power, and splitter output fault detection aides trouble-shooting.**
- **High 1500VAC safety Isolation between field input, each output, and power. Individually isolated for common-mode voltage up to 250VAC, or 354V DC off DC power ground, on a continuous basis (will withstand 1500VAC HIPOT/dielectric strength test for one minute without breakdown). Complies with test requirements of ANSI/ISA-82.01-1988 for voltage rating specified.**
- **Shock (25G) and Vibration Immunity (4G) - Conforms to: IEC 60068-2-6: 10-500 Hz, 5G, 2 Hours/axis, for sinusoidal vibration; IEC 60068-2-64: 10-500 Hz, 5G-rms, 2 Hours/axis, for random vibration, and IEC 60068-2-27: 30G, 11ms half-sine, 18 shocks at 6 orientations and 50G, 3ms half-sine, 18 shocks at 6 orientations, for mechanical shock.**
- **EMC (Electromagnetic Compatibility) – Min Immunity per BS EN 61000-6-1 (2007); CE marked, per EMC Directive 2014/30/EU. Electrostatic Discharge Immunity (ESD), per IEC 61000-4-2; Radiated Field Immunity (RFI), per IEC 61000-4-3 and ETSI EN 301 489; Electrical Fast Transient Immunity (EFT), per IEC 61000-4-4; Surge Immunity, per IEC 61000-4-5. Conducted RF Immunity (CRFI), per IEC 61000-4-6.**
- **Emissions - This is a Class B Product with Emissions per BS EN 61000-6-3 (2007+A1:2011) and Spurious Emissions per ETSI EN 300 328. Enclosure Port, per CISPR 16. Low Voltage AC Mains Port, per CISPR 16.**
- **Installation Category - Suitable for installation in a Pollution Degree 2 environment with an Installation Category (Over-voltage Category) II rating per IEC 1010-1 (1990).**

Application

This carrier allows a single microBlox® input module to be plugged into it as shown at left and mounted on T-type DIN rail. The unit splits the module input into two separately isolated sourcing voltage/current outputs, plus a third isolated voltage output (AUX). This carrier supports all uB input model types (except uB45 frequency type) and allows splitter I/O to be programmed via a wired USB connection to a Windows based personal computer/laptop, or a wired USB-OTG connection to an Android smartphone/tablet. This carrier provides isolated host power to the module, a host USB port, a host voltage output (third AUX output), and separate isolated sourcing current or voltage splitter outputs. Note that although Bluetooth wireless technology enabled modules are supported by this splitter, splitter functionality cannot be configured wirelessly.

Mechanical Dimensions

Carriers are mounted to 35mm "T" type DIN rail (35mm, type EN50022).

WARNING: IEC Safety Standards may require that this device be mounted within an approved metal enclosure or sub-system, particularly for applications with exposure to voltages greater than or equal to 75VDC or 50VAC.

uBSP-P-1 SPLITTER CARRIER PANEL DIMENSIONS w/o MODULE
BOARD COMPONENTS EXTEND UP TO 0.65" ABOVE PANEL. THE uB MODULE EXTENDS 1.4" ABOVE PANEL.
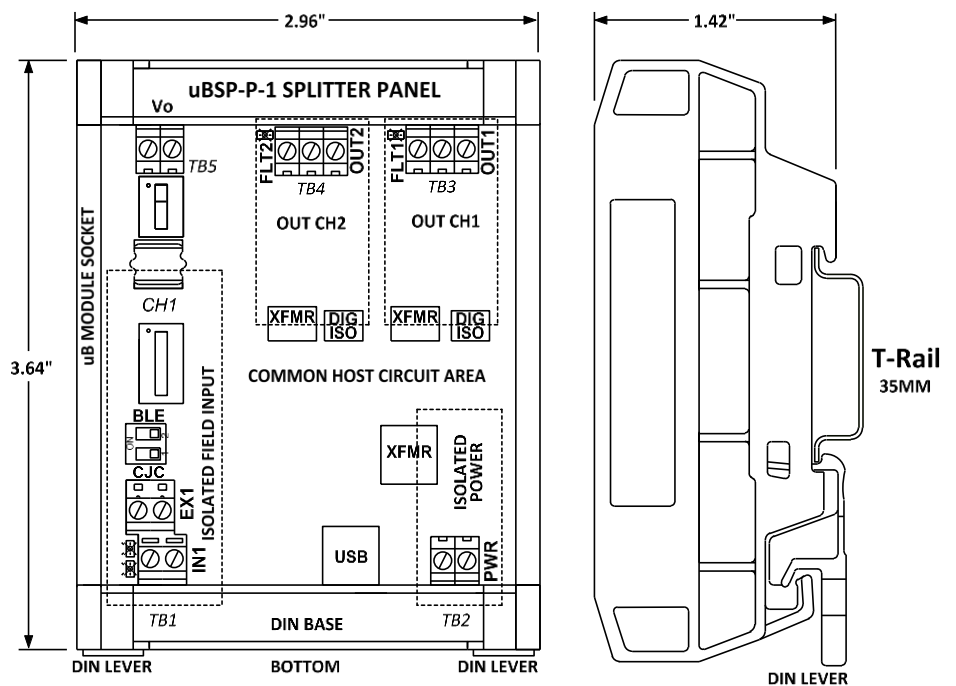
DIN Rail Mounting & Removal

Refer to the following figure for attaching and removing the carrier from the DIN rail. A plastic spring DIN clip is located on the bottom side at each end. You can pry the DIN clip back with a screwdriver along the bottom to release the unit and lift it from the rail.

To attach the carrier to T-type DIN rail, position the top groove of the DIN Clip along the rail and push the bottom inward to snap it into place on the DIN rail.

To remove it from the DIN rail, first disconnect any I/O wiring from its terminals. While holding the carrier secure, insert a screwdriver along the bottom edge of the carrier into the loop of the DIN rail clip and use it as a lever to force the DIN rail clip down, while pulling the bottom of the carrier outward until it disengages from the rail. Then tilt the carrier upward and lift it from the rail.
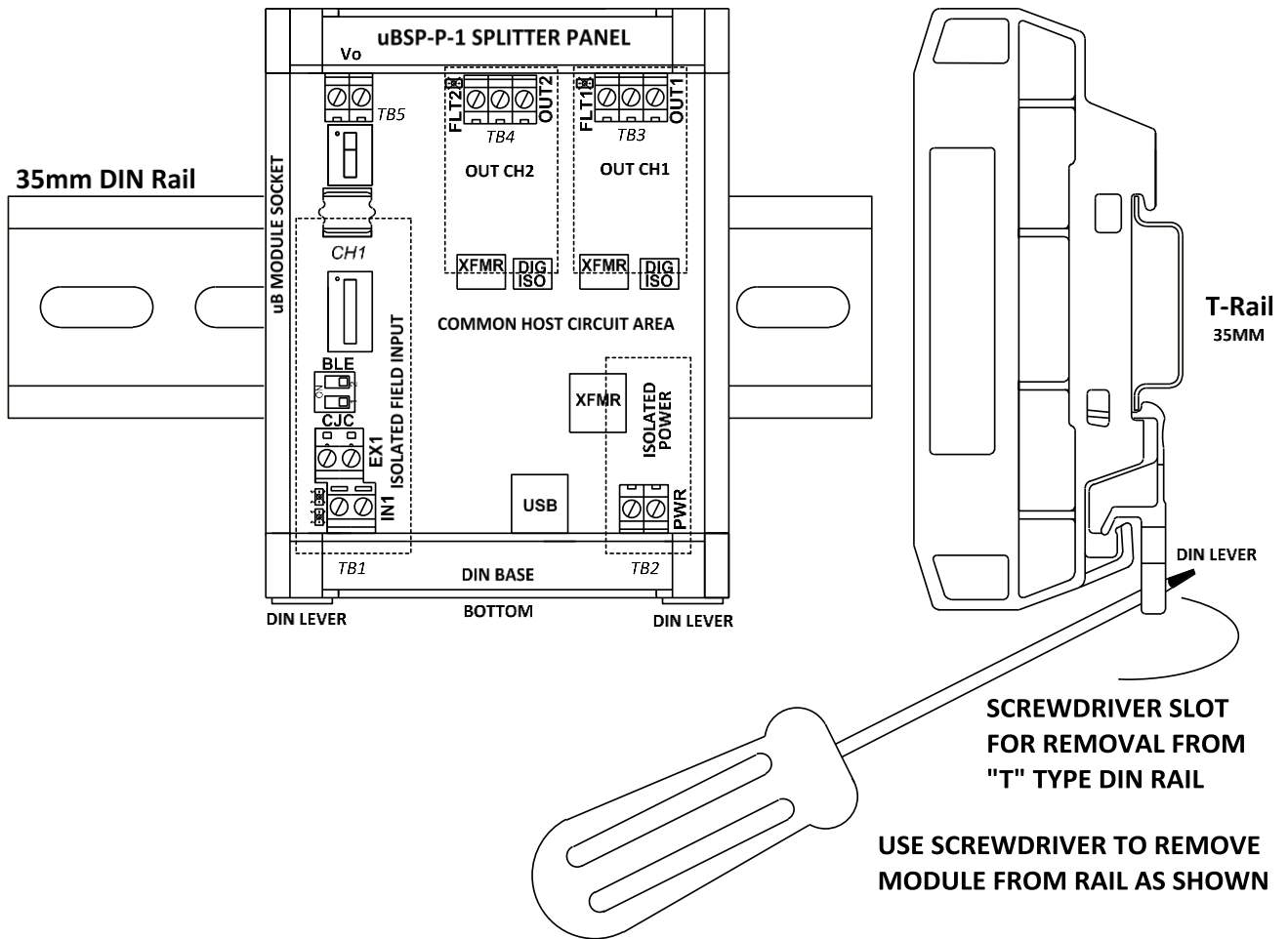
ELECTRICAL CONNECTIONS

⚠

WARNING – EXPLOSION HAZARD – Do not disconnect equipment unless power has been removed or the area is known to be non-hazardous.
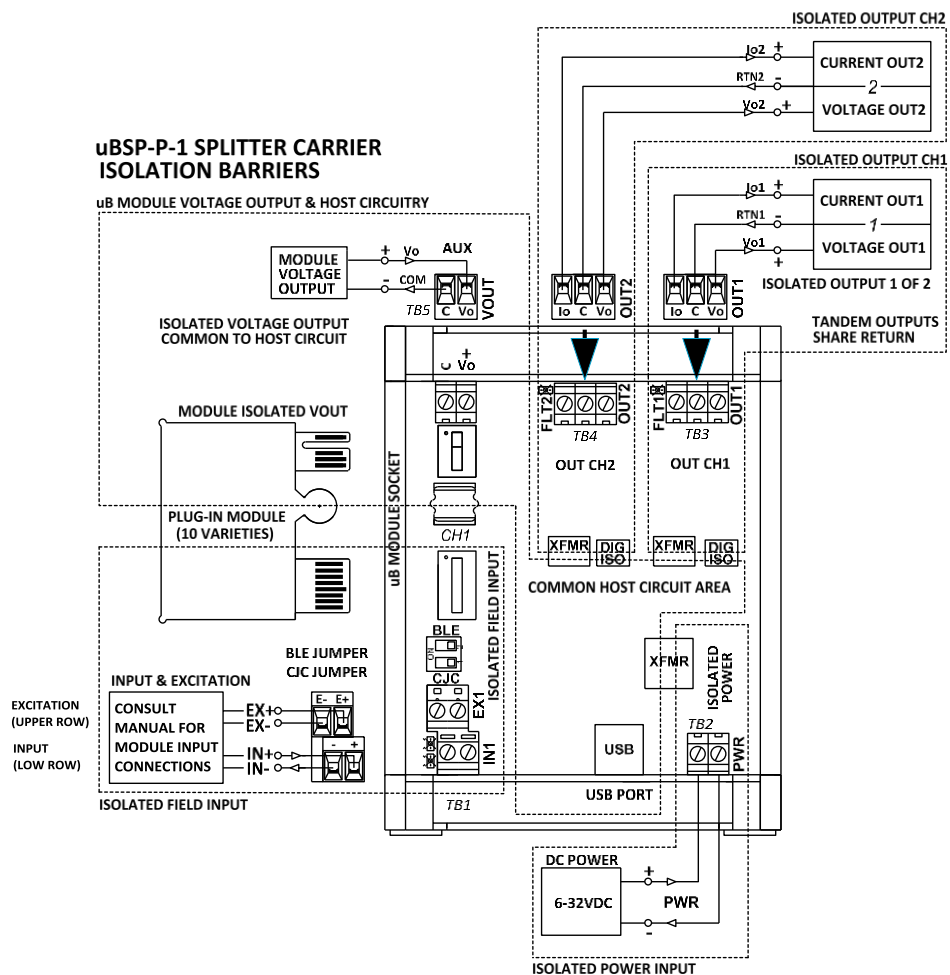**WARNING** – EXPLOSION HAZARD – Substitution of any components may impair suitability for Class I, Division 2.
WARNING – EXPLOSION HAZARD – The area must be known to be non-hazardous before servicing/replacing the unit and before installing.

Carrier terminals can accommodate 16–26 AWG (1.31–0.13mm^2) solid or stranded wire with a minimum temperature rating of 85°C. Input wiring may be shielded or unshielded type (twisted pair or shielded twisted pair input wiring is recommended). Strip back wire insulation 0.25-inch on each lead and insert the wire ends into the cage-clamp terminal block connector. Use a screwdriver to tighten the screw by turning it clockwise to secure the wire (use 0.22-0.25nM torque). Since common mode voltages can exist on I/O wiring, adequate wire insulation should be used and proper wiring practices followed. As a rule, input wires are normally separated from power, output, and relay wiring for safety and isolation support, as well as for low noise pickup.

Isolation Barriers

How to Enable or Disable CJC and BLE Linking

CARRIER MODULE SOCKET

OUTPUT (HOST-SIDE)

uB MODULE SOCKET

METAL CLIP
(RETAINS MODULE)

CH1

BLE

CJC

EXC

INP

CJC ENABLE SWITCH
PER CHANNEL

BLE ENABLE SWITCH PER CHANNEL:
SET THIS SWITCH ON (LEFT) TO
ALLOW BLUETOOTH TO LINK TO
RADIO- EQUIPPED MODELS ("-B"
MODELS). SET IT OFF (RIGHT) TO
LOCK-OUT LINK ABILITY.

BLUE LED IS ON IF
BLE IS ENABLED.

FIELD (INPUT SIDE)

- +

GREEN LED ON IF POWERED.
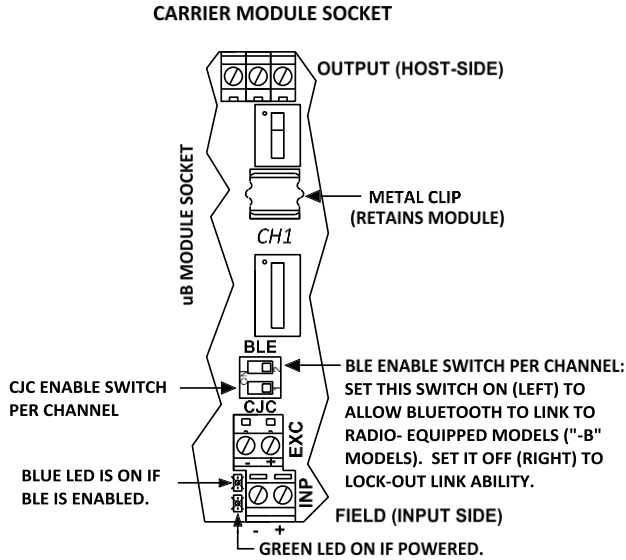
DIP switches are used on this carrier to separately enable BLE linking and CJC connection, and act identical to their same settings as on standard uB back-panels.

MODULE	CJC SWITCH SETTING
uB30 & uB40	Set CJC to ON
uB31 & uB41	Set CJC ON or OFF
uB32 & uB42	Set CJC ON or OFF
uB34 & uB35	Set CJC to OFF
uB37 & uB47	Set CJC to ON

Refer to table above and determine if the CJC must be enabled for your module model and set CJC ON or OFF as required.

Note that while this splitter also supports Bluetooth wireless technology enabled input models, its functionality as a splitter cannot be configured wirelessly. However, it may function as a simple single channel I/O carrier for Bluetooth wireless technology modules and you may configure a "-B" module on this carrier to drive its single AUX output using Bluetooth wireless technology by enabling linking for the channel. Setting the channel BLE switch ON allows you to link to the installed uBxx-B module from your smartphone or tablet (set it to OFF to block wireless access). Refer to the figure above. Splitter outputs can only be configured via a wired USB or USB-OTG connection.

Input Connections

A single microBlox® input module plugs into sockets of this carrier and is retained by a spring-loaded clip. Field input and AUX output connections are wired to carrier terminals in the same fashion as input/output connections wired to the module when mounted on a standard uB back-panel. Please refer to your specific uB module manual (see below) for information on making input connections, CJC connections, or enabling Bluetooth wireless technology linking.

EXCITATION
(UPPER ROW)

E- E+

FIELD (INPUT)
TERMINALS AT TB1

INPUT
(LOWER ROW)

- +

CONSULT YOUR SPECIFIC MODEL USER
MANUAL FOR INPUT CONNECTIONS.
OBSERVE PROPER POLARITY.

Input Connections...

TB1 at the bottom edge (input side) of this carrier carries the field INPUT ± (TB1 lower row), and EXC ± (TB1 back row) connections. Refer to your module instructions to make wired connections and observe proper polarity. Be sure to ground your input as shown in your module's respective connection drawing (refer to your module manual instructions listed below).

REFERENCE	DESCRIPTION
8501-037	uB31 & uB41 Voltage Input User Manual
8501-040	uB30 & uB40 mV Input User Manual
8501-041	uB32 DC Current Input User Manual
8501-042	uB42 DC Current Input w/2-Wire Excitation User Manual
8501-043	uB34 2/3-Wire & uB35 4-Wire RTD Input User's Manual
8501-044	Introduction to Agility Configuration Tool for microBlox®
8501-047	uB37 & uB47 TC Input User Manual
8501-050	uB04/uB08/uB16 Back-Panel User Manual

Power Connections

Power input to the carrier is safety isolated (250VAC) and reverse polarity protected up to 60V. Connect DC power supply from 6-32V at TB3 as shown below while observing proper polarity, using 14 AWG wire rated for at least 85°C. Do not exceed 36V DC peak.

IMPORTANT: It is recommended that supplies capable of delivering more than 2.5A of power to the carrier be fused with a surge tolerant fuse. Unit includes a transient voltage suppressor clamp across its power input that will clamp overvoltage conditions. A sustained over-voltage condition from an unfused power supply could drive excessive fault current flow that can damage the carrier if allowed to exceed 3A.

POWERING THE uBSP-P-1 SPLITTER
UNIT IS DC-POWERED ONLY AT 6 TO 32V DC.
POWER INPUT IS ISOLATED FROM INPUT AND OUTPUT CIRCUITS.

IT IS BEST TO APPLY EARTH GROUND CLOSEST TO THE CARRIER, BUT NOT AT BOTH ENDS OF THE CONNECTION.

THE GREEN CHANNEL POWER LED WILL LIGHT WITH POWER APPLIED IF MODULE IS OK.

CAUTION: DO NOT EXCEED 36VDC, OR DAMAGE TO THE UNIT MAY RESULT.

NOTE: IT IS RECOMMENDED THAT SUPPLIES CAPABLE OF DELIVERING MORE THAN 2.5A TO THE CARRIER BE FUSED WITH A HIGH SURGE TOLERANT FUSE.
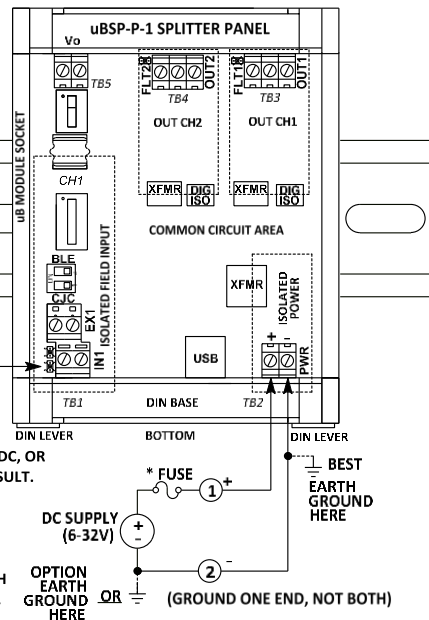
Earth Ground Connections

Your connection to Earth Ground is important to the safety of your equipment, your personnel, and the integrity of your measurement. **The unit housing is plastic and does not require an earth ground connection to itself.** But if mounted in a metal housing, an earth ground wire connection to that housing's ground terminal (green screw) is usually required using suitable wire per applicable codes. Isolated circuits wired to this splitter are each normally earth grounded. Power connections usually earth ground at DC-. Output connections apply earth ground at the output common terminal and circuits wired to analog inputs should be earth grounded as reflected in their connection diagrams for the specific plug-in module model. Ground connections noted are recommended for best results and help protect the unit and its isolated circuits by giving each isolated circuit a low impedance path to steer potentially destructive transient energy away from sensitive circuitry, where it can be dissipated safely. Refer to the Electrical Connection Drawings for recommended input, splitter output(s), and power ground connections.

Split Output Connections (Each Splitter Output Supports Voltage or Current)

This carrier includes both a voltage output and current output terminal at each of two isolated output channels at TB3 and TB4 and these outputs share a common connection in the channel. Choose which output signal you need for your application and load only the output of interest (do not load both outputs of a channel simultaneously). A connection to earth ground connection is normally made at the common terminal of each isolated output as shown below.

ISOLATED ANALOG OUTPUT CONNECTIONS

THE CHANNEL ANALOG OUTPUT TERMINALS ARE LOCATED ALONG THE TOP EDGE OF THE PANEL AT TB3 (CH1) AND TB4 (CH2). NOTE THAT THE Vo & Io OUTPUTS OF A CHANNEL SHARE COMMON AND COMMON CAN BE TIED TO EARTH GROUND LOCALLY AT THE CARRIER (RECOMMENDED), OR AT ONE LOAD (OPTIONAL).
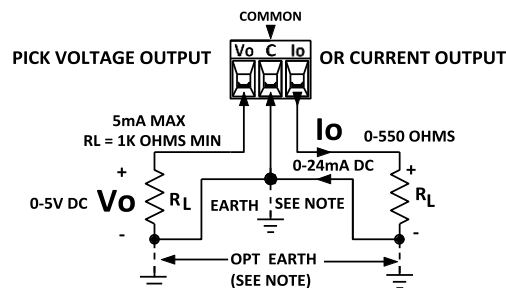
DO NOT LOAD BOTH CURRENT AND VOLTAGE OUTPUTS SIMULTANEOUSLY.

NOTE: IT IS BEST TO EARTH GROUND THE OUTPUT CIRCUIT LOCAL TO THE PANEL AT THE COMMON TERMINAL. YOU MAY OPTIONALLY EARTH GROUND THE OUTPUT SIGNAL AT THE LOAD, BUT AVOID MAKING MORE THAN ONE CONNECTION TO EARTH GROUND AT DIFFERENT POINTS OR AT BOTH LOADS OF AN OUTPUT AT THE SAME TIME.
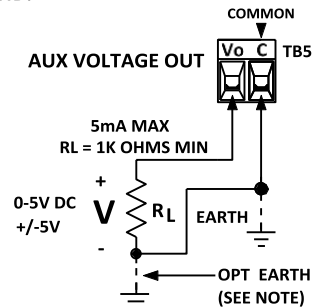
AUX Voltage Output Connections

A third isolated voltage output is available at TB5 (not a split output). This independent output is driven by the microBlox® module itself (see module specifications) and is common to the Host circuit and to carrier USB.

Be careful to isolate USB connections to the unit if you connect grounded equipment to AUX.

AUX VOLTAGE OUTPUT CONNECTIONS

THE uB CHANNEL AUX VOLTAGE OUTPUT TERMINALS ARE LOCATED ALONG THE TOP EDGE OF THE PANEL AT TB5. THIS TERMINAL OPERATES THE SAME AS THE VOLTAGE OUTPUT TERMINAL OF uB BACK-PANELS. IT IS DRIVEN BY THE 16-BIT OUTPUT DAC OF THE uB MODULE ITSELF AND ITS COMMON CONNECTION IS COMMON TO USB SIGNAL GROUND.

COMMON

AUX VOLTAGE OUT   Vo C   TB5

5mA MAX
RL = 1K OHMS MIN

0-5V DC
+/-5V
+
V R_L EARTH
-

OPT EARTH
(SEE NOTE)

NOTE: IT IS BEST TO EARTH GROUND THE OUTPUT CIRCUIT LOCAL TO THE PANEL AT THE COMMON TERMINAL. YOU MAY OPTIONALLY EARTH GROUND THE OUTPUT SIGNAL AT THE LOAD, BUT AVOID MAKING MORE THAN ONE CONNECTION TO EARTH GROUND AT DIFFERENT POINTS OR BOTH LOADS AT SAME TIME.
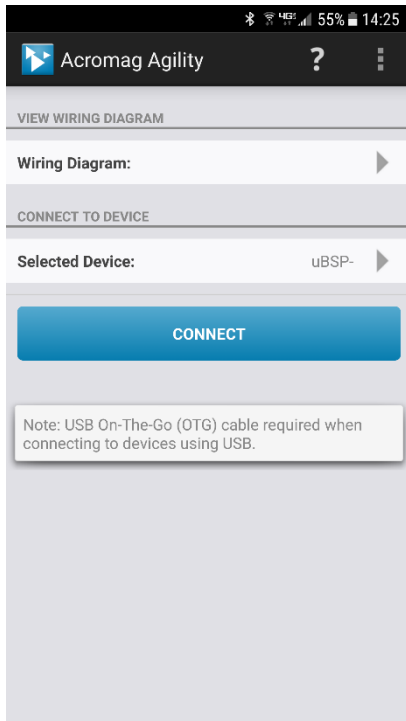
CONFIGURATION SOFTWARE

This carrier supports all standard uB input model types (except uB45 frequency type) and allows module I/O and splitter behavior to be programmed via a wired USB connection to Windows based personal computers/laptops, or a USB-OTG connection to Android smartphones/tablets with the Agility APP. The Windows USB software for your model operates like the Agility APP software. Below is a brief introduction to set up and calibrate using the Agility mobile app and a USB-OTG connection to your Android or iOS smartphone or tablet. You can download the Agility software free of charge from our web site at www.acromag.com.

Note: Note that while this splitter also supports the reconfiguration of Bluetooth wireless technology enabled input models for use on this splitter, its splitter functionality cannot be configured wirelessly, only via a wired USB connection.

This splitter and its USB software can be used to reprogram all uB input module types except uB45 using a wired USB connection to a Windows based PC, or by using Aglity and a wired USB-OTG connection to an Android smartphone or tablet.

CONFIGURATION SOFTWARE

Quick Overview – Android Reconfiguration

This splitter can be configured & calibrated via the Acromag Agility™ Config Tool App with a wired USB-OTG connection to an Android smartphone or tablet. This software app can be downloaded free of charge from the Google Play store play.google.com and is compatible with Android devices using Ice Cream Sandwich OS 4.0 or later.

To connect to this splitter, a USB OTG (On-The-Go) cable (Acromag 5028-565) and USB A to Mini-B cable (Acromag 4001-113) are also required. When you start the app, the initial Agility Connection screen at left will be presented and if you have also connected a module using a USB OTG cable, your module will be listed in the "Selected Device:" field of the Connection screen as shown.

The ability to select other devices only applies to Bluetooth devices which also utilize this app. Tap the **[CONNECT]** button to open communication with the device indicated to the right of "Selected Device" and move to the main portion of the app shown in the second screen at left. Note Android requires user permission to access external hardware--If the Device List displays "No Device Permission", select the device and when prompted to give permission to access the USB device, and tap **[OK].**

If you wish to view a wiring diagram for your splitter model, tap the arrow next to "Wiring Diagram". You may swipe left or right to view more diagrams.
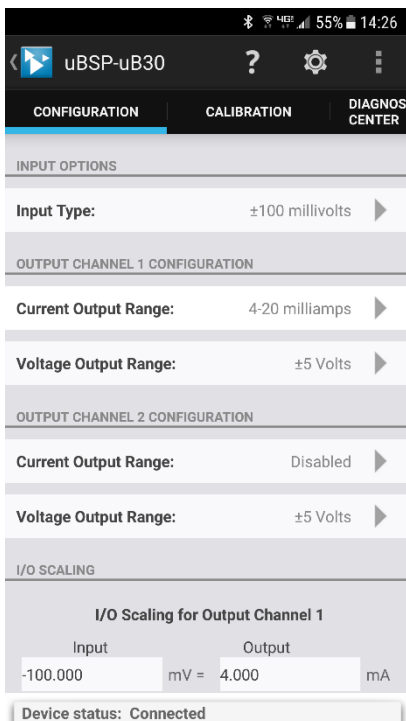
The main screen also has three icons across the top: an Acromag logo w/connected model indicated, a question mark, a gear icon, and three vertical dots. These icons access additional features of this software as follows:

This icon located in the top left-hand corner of most app screens serves as a Home button, which when tapped will return you to the Connection page of the app from subsequent pages.

Tapping the question mark will access a Self-Test utility useful for testing your device connection.
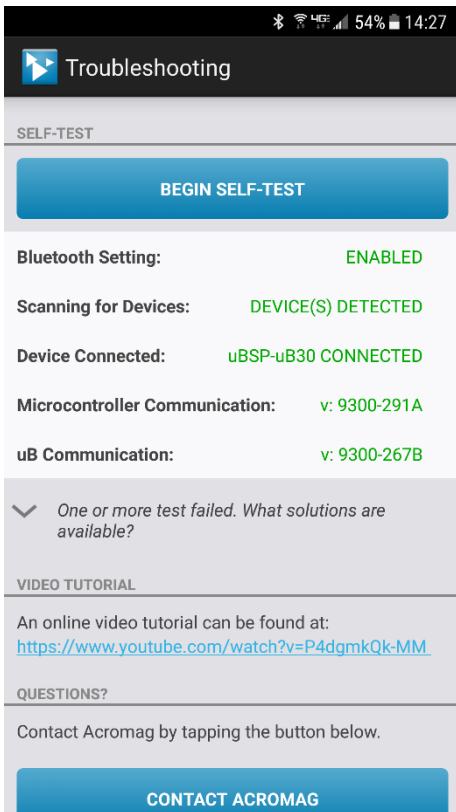
Tapping the Gear/Settings icon will access a Utility Page to do a device Reboot, Reset Factory Calibration, or restore factory Settings.

Tapping this icon will return "About" & "Contact Acromag" Information.

A short description of what each icon does follows:

Quick Overview – Android Reconfiguration...continued

The HELP area of the application invokes a Self-Test feature that can be used to determine if your smart phone or tablet has its Bluetooth wireless technology enabled (useful for uB applications), whether any modules can be detected by rescanning, whether a device is connected, and whether the microcontroller of the connected module is operational. You simply tap **[BEGIN SELF-TEST]** to perform the diagnostic exchange and review the results returned. If one or more tests indicate Failed, you can also tap the down arrow message below the self-test report to access additional information regarding failed tests. Optionally, you can review an online video tutorial on working with the unit by tapping the Video Tutorial URL line.

Or, if you wish to contact Acromag for assistance, you can tap the **[CONTACT ACROMAG]** bar to obtain the phone and email information window shown below for talking to Acromag directly (the same information is also obtained via the menu dotted action bar icon and "Contact Acromag" selection).
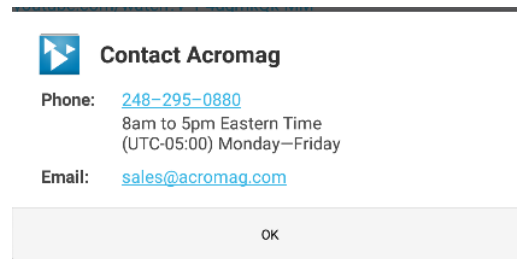
You may also refer to the Troubleshooting Table in this manual which lists common issues related to working with these splitters and some recommended remedies.

Quick Overview – Android Reconfiguration...continued
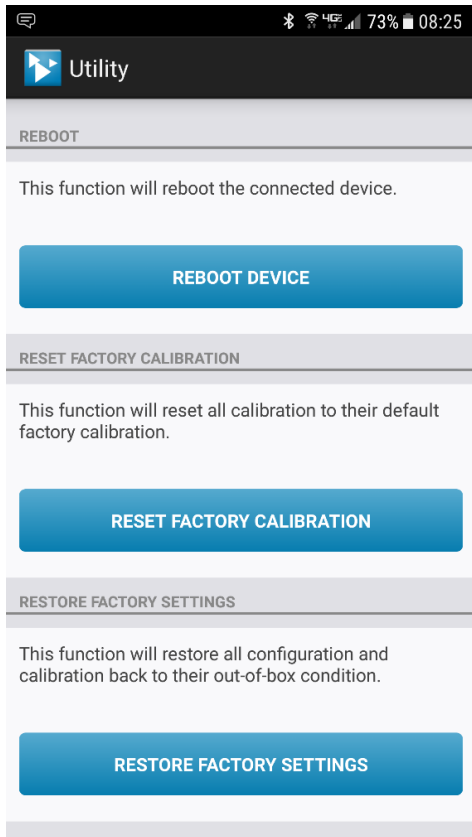
Tap the **[Gear]** icon in the Action bar to access the Utility Page shown at left. Utilize these features if you if you encounter erratic behavior with your splitter and need to get out of trouble, perhaps if you ever inadvertently misconfigure or improperly calibrate a splitter.

You can tap **[REBOOT DEVICE]** on this page to reset/restart the connected splitter, perhaps if it ever appears to freeze, or exhibits erratic operation. This is akin to a power-on reset of the splitter.

You can tap **[RESET FACTORY CALIBRATION]** to get out of trouble if you ever miscalibrate a splitter (this only affects splitter calibration).

You can tap **[RESTORE FACTORY SETTINGS]** to get out of trouble if you ever misconfigure or miscalibrate a transmitter (this affects both splitter calibration and configuration). You can also use this feature to de-commission a splitter.

If you tap the right-most dotted Menu icon of the action bar at the top right of your screen, you will get a selection menu for "About" information on this software application, and "Contact Acromag" for contact information, both shown at left

Below the icons of the top line are file three tabs: Configuration, Calibration, and Diagnostic Center, each of which are described in the following pages.

Quick Overview – Android Reconfiguration...continued
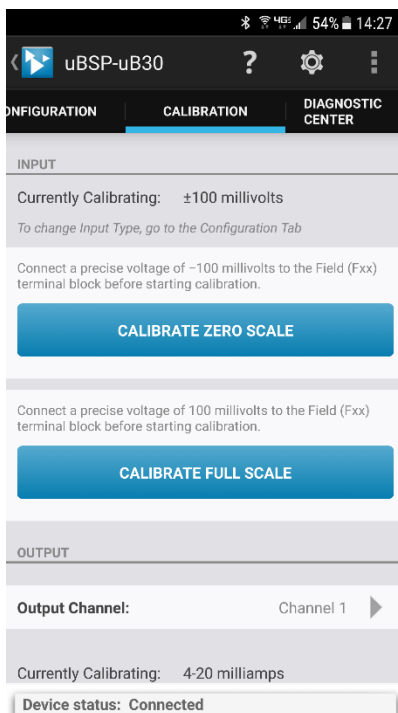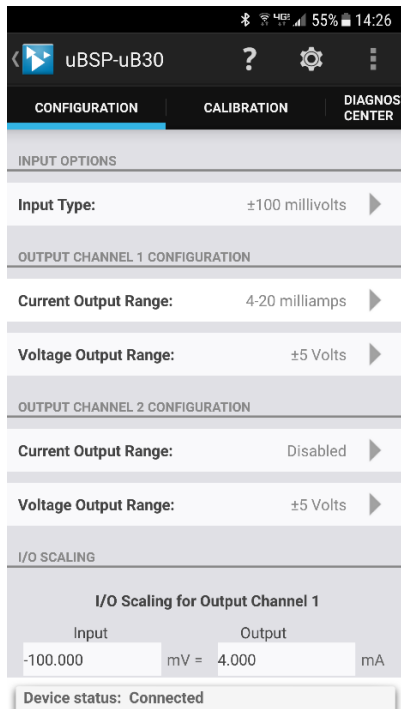
Input/Output Configuration

The I/O Configuration screen is shown at left and is used to Configure your splitter Input, splitter Outputs, and AUX output. Scroll down this screen to set your input type/range, input digital filtering level, rescale each output, enable and scale the AUX output, and even scale the input differently for each output via this screen.

Note that if your unit is connected when you select this tab, the app automatically reads your splitter's current I/O and scaling information and displays it.

Likewise, changing any option on this page sends the changes to the splitter immediately.

Note that the Device Status is indicated at the bottom of all pages and will report if changes were sent successfully (Connected).

Input Calibration

If you have correctly setup your unit and encounter excessive error, you may click the Calibration tab to display the Calibration control screen shown at left, which presents Input calibration controls first, followed by Output calibration controls as you scroll down the page.

IMPORTANT: The splitter has had its input & output channels factory calibrated with high precision. Attempting to recalibrate the input or outputs may degrade performance if done improperly, or using low grade equipment. Consider recalibration carefully.

The selected input range is indicated at the top and this is the range that will be calibrated. The software does not use your scaled range zero to calibrate, but the zero of the nominal input range selected. Some sub-ranges have their calibration extrapolated from the calibration of a larger native range. Always calibrate the largest native range first to keep its recalibration from over-writing any sub-range calibration.

For input zero calibration, connect a precise input signal level for the zero of your range, then tap the **[CALIBRATE INPUT ZERO]** button one time to set the input ADC level to its input range zero (0%) point.

For full-scale calibration, connect a precise input signal level for the full-scale value of your range, then tap **[CALIBRATE INPUT FULL-SCALE]** one time to set the input ADC level to its input range full-scale (100%).

The device status at the bottom of the page will report if the calibration was sent successfully.

Quick Overview – Android Reconfiguration...continued
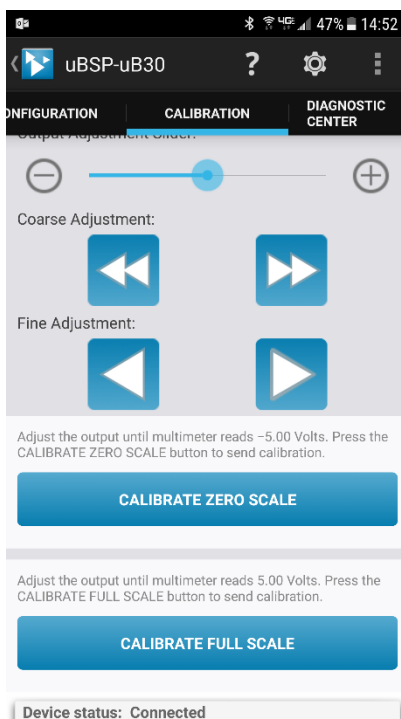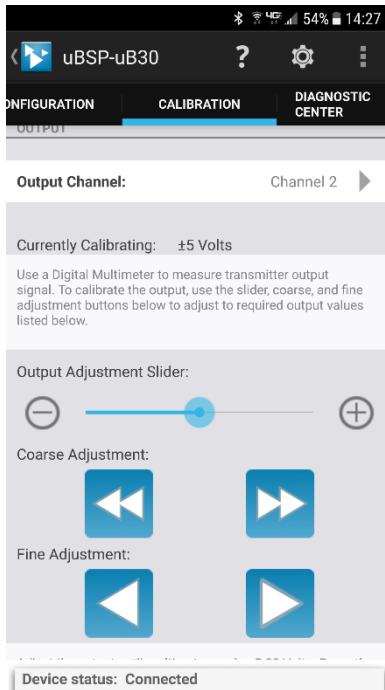
Output Calibration (Each of Two Outputs)
Scroll down the Calibration page to access the Output Calibration controls: output channel selector, adjustment controls, and the **[CALIBRATE OUTPUT ZERO]** and **[CALIBRATE OUTPUT FULL-SCALE]** buttons.

First select the Output channel to calibrate, and its output range will be displayed along with some instructions on how to proceed.

For Output Zero calibration, use the output adjustment slider and the coarse and fine adjustment controls to precisely set your output zero level while precisely monitoring your output signal. Be sure to use a meter with an accuracy at least 4x greater than the signal you are measuring for best results. Note that the output adjustment controls temporarily remove control of the output from the input to accomplish calibration (control of the output level returns to the input signal after 30 seconds).

Once your output level is precisely set to its zero point (4.000mA for this splitter), tap the **[CALIBRATE OUTPUT ZERO]** button one time to set the output DAC level (its corresponding digital count) to correspond to the zero (0%) of your output range.

For Full-Scale calibration, use the output adjustment slider and the coarse and fine adjustment controls to precisely set your output full-scale level while precisely monitoring your output signal. Be sure to use a meter with an accuracy at least 4x greater than the signal you are measuring for best results. Note that the output adjustment controls temporarily remove control of the output from the input level to accomplish calibration (control of the output level returns to the input signal after 30 seconds).

Once your output level is precisely set to its full-scale level (20.000mA for this splitter), tap the **[CALIBRATE OUTPUT FULL-SCALE]** button one time to set the output DAC level (its corresponding digital count) to correspond to the full-scale (100%) level of the output range.

Repeat the Output Calibration of zero and full-scale for the second output as required by selecting the opposite channel.

If following calibration, your output acts erratic or appears imprecise, you may need to repeat input or output calibration, being very careful to take accurate measurements and input correct signal levels. If you are measuring voltage across an output load resistance to measure the current level (recommended), make sure that you use exact resistance when calculating the measured loop current. When rescaling I/O, make sure that you have adequate I/O span, as "too-tight" input or output spans will have diminished resolution and magnify error.

Quick Overview – Android Reconfiguration...continued
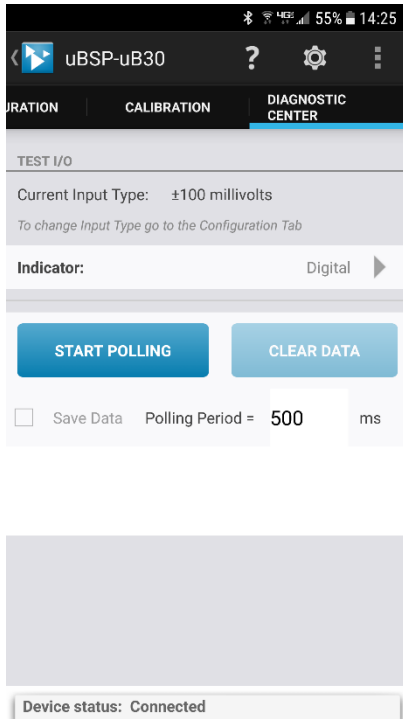
Performing Diagnostics (Polling & Trending the Input)

The Diagnostic Center screen tab is shown at left and used to verify input/ microBlox™ operation of your splitter. This page can be used to poll the input data from the module and display its value or graph the input data and trend its value. The input type of the plug-in module is shown at the top of the screen (actual input value, not the scaled input value is polled).

Select the Indicator pointer to set your desired indication to "Digital" (value) or "Graph" (trend).

You can specify a polling period to set the interval between polled readings by over-typing the value in the Polling Period field.

Start polling the input by tapping the **[START POLLING]** button.

Clear the polling data by tapping **[CLEAR DATA].**

Check the "Save Data" box if you wish to log the polled values to a CSV (Comma Separated Value) data file for reference.
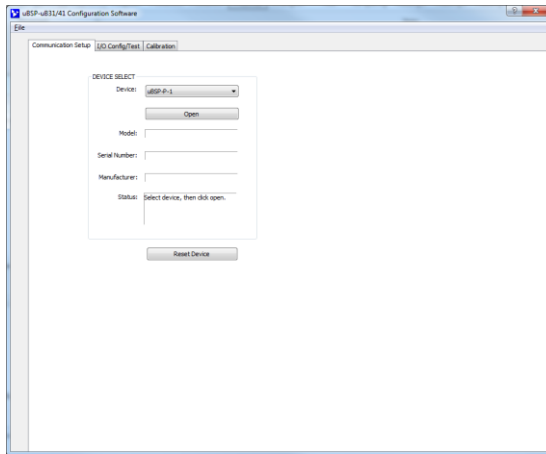
Note the Communication Status of the device is indicated at the bottom of the screen.
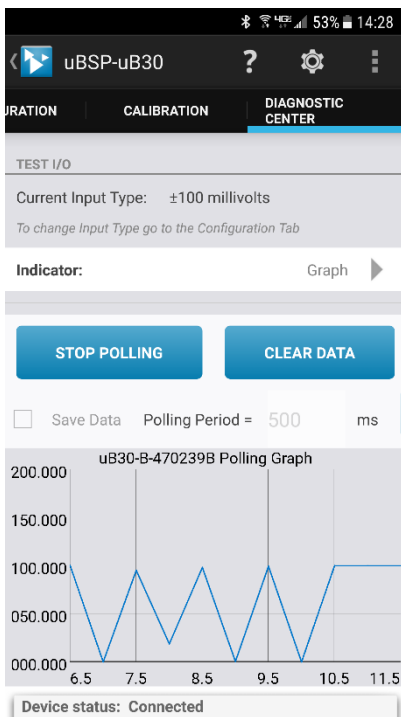
Quick Overview – Windows USB Reconfiguration

Click "Open" to connect to the uBSP-P-1 and your screen will look like the following:

Delay reopening communication up to 15 seconds after cycling power, resetting the unit, or restoring to allow the unit and its module to reinitialize, otherwise the data transfer may appear to freeze-up. If this happens, try closing this software & recycling power, then reboot the software to recover (unplugging/re-plugging the USB cable to the unit may also help).
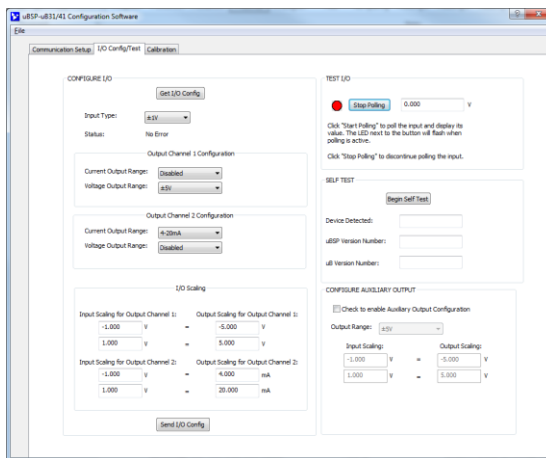
In addition to the Android Agility mobile app and a wired USB-OTG connection, this splitter can also be configured and calibrated via Windows USB Configuration Software and a USB connection to your PC or laptop. The configuration software is module model specific and can be downloaded free of charge from our web site at www.acromag.com. This software is also included on a CDROM bundled with the Configuration Kit TT-SIP (see Accessories section). For Windows software, look for the program uBSP-uBxx Config.exe, where uBxx corresponds to the plug-in uB module of interest (software is compatible with Windows 7 or later versions of the Windows operating system).

The initial configuration software screen for this model is shown at left. The Configuration screen is divided into three pages as follows: Communication Set up, I/O Config/Test, and Calibration. A short description of each of these pages follows.

This section is used to select a connected transmitter, and open/close communications with it. Device connection Status is also indicated here, along with the connected transmitter's ID info (Model, Serial Number, & Manufacturer).

Communication Set up – DEVICE SELECT (First Connect Unit Here)
- Select from connected transmitters using the Device scroll field and [Open]/[Close] communications with them.
- Display the Model, Serial Number, and Manufacturer of the connected transmitter, and report the Status of the connection communication.

I/O Config/Test – CONFIGURE I/O (Reconfigure/Test Unit Here)
- You can click the **[Get I/O Config]** button to retrieve the I/O configuration of the currently connected uB/carrier combo.
- Select the Input Range for your uB module. For the uB30/40 model, ±100mV is indicated. Some uB models will only have one input range, but it can be scaled as required.
- View the unit's configuration communication status in the Status field.
- Set the output range for each output including AUX. Select a current or voltage range for the splitter outputs (you should only load one or the other, not both together).
- Use the I/O Scaling fields to specify the specific input range endpoints that are to correspond to the output range zero and full-scale endpoints at each output.
- Use TEST I/O to Poll the installed uB module's input signal.
- Use [Begin Self Test] to check the plugged in uB module.
- Last, after making I/O changes, send your settings to the unit by clicking the **[Send I/O Config]** button and following the on-screen prompts.

Quick Overview – Windows/USB
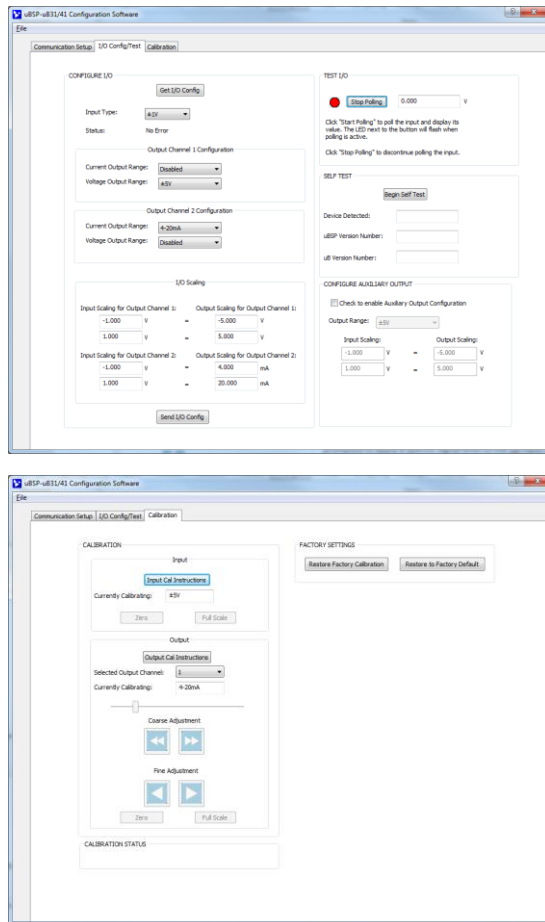
HELP – Press F1 for Help on a selected/highlighted field or control. You can also click the [?] button in the upper-right hand corner of the screen and then click to point to a field or control to get a Help message pertaining to the item you point to.

I/O Config/Test - TEST I/O (Optional, Verify Unit Operation Here)

After making I/O configuration changes, you can use the TEST I/O controls to Start/Stop Polling the input, or SELF TEST to interrogate the plugged in uB module.

- Click **[Start Polling]** to periodically read your input and validate its operation. Click **[Stop Polling]** to stop polling the input channel. Note the simulated red lamp left of the button flashes slowly when the software is polling the input channel.
- Click **[Begin Self Test]** to interrogate the plugged in uB module.

CALIBRATION (Calibrate the uB input and/or Outputs as Needed)

The uB module and the splitter outputs have already been factory calibrated. If you encounter excessive error, you can click the Calibration tab to display the Calibration control page shown in the second screen at left. To calibrate the uB Input module or each Output stage of this carrier, simply click the respective Input or Output "Instructions" button to get started and follow the on-screen prompts (be sure to also select which output of this splitter you are calibrating).

Input…First set the Input Range to calibrate in the I/O Config/Test page and be sure to click the **[Send I/O Config]** button before attempting calibration. On the Calibration page, click **[Input Cal Instructions]** to begin input calibration. When you click the **[Zero]** or **[Full Scale]** buttons of the Input Calibration section, you will be prompted to apply a specific signal level to the uB input (refer to module instructions for wiring). Once you have applied this signal correctly, click the **[OK]** button of the prompt to calibrate the plug-in module input and follow the on-screen instructions.

Output…Select output channel to calibrate, then click the **[Output Cal Instructions]** button to begin calibration. You will be prompted to adjust the input signal as required to drive the output range to precisely (Zero) or (Full-Scale). Once the output is driven to zero or full-scale, you simply click the corresponding **[Zero]** or **[Full-Scale]** button of the CALIBRATION - Output section to set the output range zero or full-scale endpoint.

Factory Settings (In Case of Trouble or for Sanitation Purposes)
- **[Restore Factory Calibration]** to set unit to factory *calibration*.
- **[Restore Factory Default]** to set unit to its initial factory *configuration*.

You can click the **[Restore Factory...]** buttons if you ever misconfigure or improperly calibrate a transmitter such that its operation appears erratic.

Calibration Status (Bottom of Screen)
- Displays communication status for the calibration process.

The CALIBRATION STATUS message bar at the bottom of the screen will display status messages relative to calibration.

Note: A bonus feature of the uBSP-P-1 splitter and its USB software is that it allows all versions of microBlox input modules to be reconfigured using a wired USB connection (both "-B" and fixed range uB models except uB45), like using the Agility mobile APP to wirelessly reconfigure microBlox "-B" wireless models.

TECHNICAL REFERENCE

Block Diagram

uBSP-P-1 SPLITTER SIMPLIFIED SCHEMATIC
FILTERING AND OTHER DETAIL OMITTED FOR CLARITY.
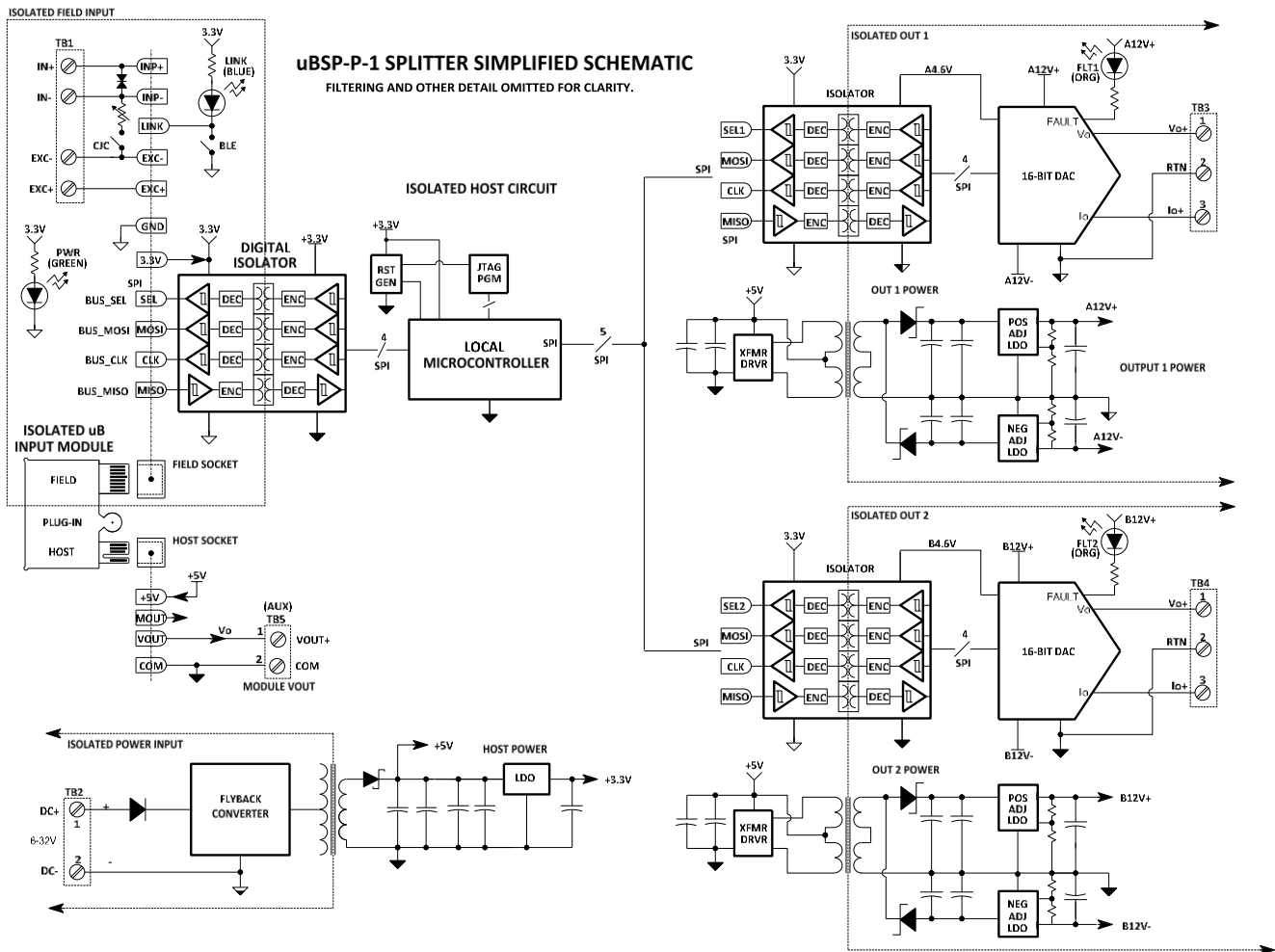
How It Works

Key Points of Operation

- Plug-in modules support current, voltage, RTD, & TC input types.
- Host circuit ground is common to USB ground (and AUX ground).
- Isolated 6-32V DC Powered.
- Input, Outputs, and Power, are isolated from each other.
- Dual Isolated Outputs each with current & voltage terminals.
- Includes a third output AUX, which is the voltage output of the microBlox module itself.
- The uBSP-P-1 can be used as a program platform for both fixed and "-B" wireless uB models.

A microBlox® input module is captively-plugged into this carrier's socket to split its input signal into two proportional and isolated current or voltage output channels. The splitter includes separate AUX voltage output terminals for an extra channel of output voltage driven directly by the module. A local 32-bit microcontroller on the splitter handles reconfiguration of the module/splitter via USB, as well as reading the microBlox® module's A/D input and writing each splitter DAC, via a digitally isolated serial bus interface (SPI). The module input signal is scaled and transmitted to 16-bit output DACs of the splitter which drive separate voltage and current terminals at each output channel, plus its own internal DAC which drives an AUX voltage output on the splitter. The carrier drives isolated 5V power to the module from a flyback converter on-board that operates from 6-32V. This 5V is also used to drive separate transformer drivers in each output channel that produce ±13V.

Set up involves selecting the input range specific to the microBlox® model, selecting the output range at each output channel (current or voltage), and scaling input range endpoints to each output range zero/full-scale endpoints. I/O scaling in a channel can be done in reverse to produce a reverse acting output signal. Refer to the block diagram to gain a better understanding of how this splitter works. The AUX voltage output/USB circuit, each split output, the microBlox® input, and power circuits are all isolated from each other. The unit does not draw power from USB, but the USB port ground is common to the AUX output circuit common. The USB port ground of most PC's is also common to the USB cable shield and earth ground. Output voltage monitors could additionally be grounded or ungrounded. If optionally wired to the AUX output, it is recommended that USB signals to the unit be isolated to prevent a ground loop from occurring between the connecting PC earth ground, and a grounded AUX voltage monitor/load.

TROUBLESHOOTING

Diagnostics Table

Before attempting repair or replacement of this carrier, be sure that all installation and configuration procedures have been followed and that the carrier is wired properly. Verify that 6-32V power is applied to the carrier. Verify that any input module plugged into this carrier is also operating properly.

POSSIBLE CAUSE	POSSIBLE FIX
Green RUN LED of Splitter does not light…	
Is Power ON at the Splitter?	Check splitter power and determine if the Green PWR LED is ON (module must be plugged in, LED is powered by the module)?
The plug-in Module's +3.3V rail drives this LED and has failed, or the carriers 5V power to the module has failed.	Check carrier power which drives 5V to the module. The green PWR LED is sourced by the module's 3.3V rail. You could check if module is bad by plugging-in a known good module and checking the green LED. Return failed modules for repair or replacement. If module is good (green LED ON), the carrier's power converter is likely good too. If the green LED is OFF for a known good module, the carrier's power converter is likely bad and the carrier should be returned for repair or replacement.

TROUBLESHOOTING

Diagnostics Table

If you still have a problem after reviewing this information and checking your power, wiring, and input module, or if other evidence points to an unknown problem with the carrier, an effective and convenient fault diagnostic method is to exchange the questionable carrier and/or carrier module with known good units. Acromag's Application Engineers can provide further technical assistance if required and repair services are also available from Acromag.

POSSIBLE CAUSE	POSSIBLE FIX
Cannot Communicate with Module with Bluetooth wireless technology...	
Blue BLE LED of Carrier Channel does not light…	
Is the BLE DIP switch for the channel set ON to enable Bluetooth wireless technology at the module? Note that Splitter Functionality cannot be wirelessly configured, but this splitter can be optionally used as a single-channel carrier for any uB input module, including Bluetooth wireless technology enabled versions.	Splitter functionality can only be configured via wired USB. However, the splitter panel does support Bluetooth wireless technology enabled modules. And these modules could be configured wirelessly for optional operation as a single channel carrier with a single output wired to AUX. In this case, check the BLE DIP switch setting and set it ON to turn the blue BLE LED ON and allow wireless linking to a plugged-in Bluetooth wireless technology enabled module using the Agility mobile app to reconfigure I/O functionality (not splitter). Setting this ON or OFF has no effect on standard microBlox® modules.
Unit Fails to Start-up or Initialize…	
Check power voltage level and capacity, making sure that it is at least 6V and of sufficient capacity (select a current capacity 2x the max current draw of splitter/module at its voltage level). Note that you can reduce current consumption by raising the power voltage level.	Check power voltage level and current capacity, making sure that it is at least 6V and of sufficient capacity (select a current capacity 2x the max current draw of splitter/module at its voltage level). Note that you can reduce current consumption by raising the power voltage level.
Input Polarity is Wrong…	
Are your input terminals reversed? Current is input and voltage is positive at input+.	Check your input wiring and observe proper polarity (refer to uB module's user manual).
Your uB Module Does Not Appear to Work in This Carrier	
Is your module a Model uB45 frequency model?	The uB45 frequency model is not compatible with the splitter output function.
Output Signal Appears Noisy or Unstable...	
Is the uB input module fully inserted into the carrier socket?	Check that the module is fully plugged into its socket. Note uB45 models are not compatible with this splitter.
Have you grounded your input signal? Ungrounded I/O requires earth ground connection as noted in the module specifications. Be careful not to connect AUX output to earth ground without using a USB isolator (USB carries earth ground from the PC).	Earth ground keeps isolated signals from floating and provides a safe shunt path for destructive transient energy. If your input source is not already earth grounded, then refer to its connection diagram and apply earth ground as noted (inputs typically tie earth to the IN- terminal, see module wiring specific to your model). Splitter outputs are normally grounded at output return.

TROUBLESHOOTING

Diagnostics Table

POSSIBLE CAUSE	POSSIBLE FIX
USB Software Appears to Freeze During Communication...	
This sometimes occurs if you quickly attempt to connect or communicate to the unit immediately after powering up, resetting, or restoring the unit.	Delay clicking [Open] or [Reset Device] immediately after powering-up until the unit and its module have initialized (wait up to 15 seconds), otherwise the data transfer or reconfiguration may freeze-up. If this happens, try closing the USB software & recycling power, then reboot the software and reconnect after waiting up to 15 seconds (unplugging/ re-plugging USB to the unit may also help).
Output Signal Appears Noisy or Unstable...	
AUX Voltage Output is noisy	The AUX voltage output of this carrier is driven directly by the plug-in uB module. If noisy, the field input signal may be floating or is not earth grounded, or perhaps output COM is not grounded.
AUX output minus is common to PC USB return which is normally earth grounded if not isolated.	You may have two connections to earth ground that are at different points if USB is not isolated and your AUX output is grounded
Check CJC Setting	Refer to your module specifications and determine the required CJC status for your model. Enable or disable CJC as required for your module by setting the channel CJC DIP switch accordingly.
AUX Voltage Output is Over-Loaded	The AUX voltage output can only drive up to 5mA into loads greater than or equal 1KΩ.
The current output cannot drive full-scale current of 20mA—is the orange output Fault LED ON? At the output channel.	Your output current load may be OPEN or have greater resistance than 525Ω. If load resistance is 525Ω or less, then the output's 13V rail may have failed or fallen out of regulation and the carrier can be returned for repair or replacement.

Service & Repair Assistance

Plug-in uB modules are encapsulated and cannot normally be repaired, except for possible reconfiguration and factory reprogramming. The carrier itself contains solid-state components and requires no maintenance, except perhaps for periodic cleaning. Additionally, the carrier plastic is not meant to be snapped apart and requires a special tool to do so. It is recommended that a non-functioning carrier be returned to Acromag for repair or replacement. Acromag has automated test equipment that thoroughly checks and calibrates the performance of each unit, and can restore or update firmware if needed. Please refer to Acromag's Service Policy and Warranty Bulletins, or contact Acromag for complete details on how to obtain repair or replacement.

ACCESSORIES

Software Interface Package

Software Interface Package/Configuration Kit – Order TT-SIP
- USB Signal Isolator
- USB A-B Cable 4001-112
- USB A-mini B Cable 4001-113
- Configuration Software CDROM 5040-TBD

This kit contains all the essential elements for configuring TT transmitters and SP/uBSP Splitters. Isolation is recommended for USB port connections to these transmitters and splitters and will block a potential ground loop between your PC and a grounded input. A software CDROM is included that contains the Windows software used to program TT transmitters and SP splitters.

USB Isolator

USB Isolator – Order USB-ISOLATOR
- USB Signal Isolator
- USB A-B Cable 4001-112
- Instructions 8500-900

This kit contains a USB isolator and a 1M USB A-B cable for connection to a PC. This isolator and cable are also included in TT-SIP (see above).

USB A-B Cable

USB A-B Cable – Order 4001-112
This is a 1 meter, USB A-B replacement cable for connection between your PC and the USB isolator. It is normally included with the TT-SIP Software Interface Package and with the isolator model USB-ISOLATOR.

USB A-mini B Cable

USB A-mini B Cable – Order 4001-113, used with model specific Windows USB software to configure the splitter and optionally reprogram uB modules.

This is a 1 meter, USB A-miniB replacement cable for connection between the USB isolator and the SP splitters. It is normally included in TT-SIP.

USB OTG Cable

USB OTG Cable – Order 5028-565, used with Agility and a wired USB-OTG to an Android smart-phone or tablet

This is a 6 inch, USB On-The-Go cable for connection between the USB A-mini B Cable and a mobile phone or tablet. It is required to use the Acromag Agility™ Config Tool App.

Note that the Acromag Agility ™ Config Tool is available free of charge, online at the Google Play store. Software for all SP Series models is available free of charge, online at www.acromag.com.

SPECIFICATIONS

Model Number

uBSP-P-1: uB Module Signal Splitter w/dual isolated current/voltage outputs, plus an AUX voltage output.

This carrier is DIN-Rail mounted and allows one plug-in microBlox® module to drive two separately isolated voltage and/or current outputs.

The model "uB" prefix denotes this as a member of the popular Acromag microBlox® family, while "SP" denotes the SPlit output function, its "-P" suffix denotes a Panel type carrier, and the trailing "-1" suffix denotes a single microBlox® module channel. This carrier is DC-powered and includes CE and UL/cUL Class I, Division 2 Approvals.

This carrier/splitter is normally mounted on standard 35mm "T" Type DIN rail. The reconfiguration of splitter I/O for a module plugged into this carrier can be done using a wired USB connection to a Windows-based computer or laptop running USB reconfiguration software for the input module, or may optionally use a USB-OTG cable connection to an Android smartphone or tablet running our free Agility App to set up an input module plugged into the carrier channel.

Analog (Field) Input

The Splitter input connects to TB1 terminals of this carrier. Input connections use the same convention as modules mounted on uB back-panels and alarm carriers (refer to your plug-in module instructions for wiring).

Accuracy: Better than ±0.05% of span typical relative to the installed module plus an additional ±0.05% of span relative to its operation on this carrier, for a net combined accuracy of ±0.1% of span. This includes the effects of repeatability, terminal point conformity, and linearization, but does not include sensor error.

Input (field) specifications are specific the microBlox® input module plugged into this carrier. Refer to your module's instructions for detailed field connections. The following uB <u>input</u> model types are compatible with this alarm carrier (the uB45 frequency model is not compatible with this carrier for splitter functionality):

The input to this carrier belongs to the specific uB input module plugged into it. Refer to your module's instructions for detailed input and connection specifications.

Table 1: uB Plug-In Module Types That May Utilize this Carrier

uB Model	Nominal Module Input
uB31/uB41	±1V to ±60V
uB30/uB40	±10mV to ±100mV
uB32/uB42	4-20mA/0-11.17mA DC
uB34/uB35	2/3/4-Wire Pt RTD
uB37/uB47	J/K/T/R/S Thermocouple

The uB module must be configured and set up for use on this carrier using either a wired USB to Windows PC interface, or a USB-OTG connection to an Android smartphone or tablet running Agility software.

Module field input, carrier power, and each isolated output must be wired and configured for its intended input/output type (see Electrical Connections section for details).

I/O Cable Length: For rated performance, I/O port interface cables should not exceed 30m in length.

Split Analog Outputs

There are two isolated output channels at TB3 (CH1) and TB4 (CH2). Each output channel has separate terminals for voltage and current.

While this splitter also supports Bluetooth wireless technology enabled input models, its functionality as a splitter cannot be configured wirelessly, only via wired USB.

Output Range Selection: Separate isolated output channels are located at TB3 (CH1) and TB4 (CH2). Each output channel has separate voltage and current output terminals that share a return terminal. Only one output signal, voltage or current, may be loaded per output channel at one time. Supported output ranges with over-range are shown in Table 2 below.

Output Resolution: Each output is driven by a 16-bit voltage/current DAC, Texas Instruments DAC8760IPWPR. The resolution per nominal output range is indicated in the Table 2 below. Note that nominal ranges may be rescaled in the unit and resolution will drop 1 bit for every halving of the range. The actual I/O resolution of a unit will be the lowest resolution of the input module, and output D/A relative to the selected/scaled I/O range.

16-bit DAC COUNT	TABLE 2: OUTPUT RANGES AND RESOLUTION w/OVER-RANGE					
	Voltage Output				Current Output	
	0-5V	0-10V	±5V	±10V	0-20mA	4-20mA
0	*0V*	*0V*	*-5.5V*	*-11V*	*0mA*	*0mA*
2979			**-5.0V**	**-10V**		
10923					4mA	**4mA**
54612					**20mA**	**20mA**
59577	**5.0V**	**10.0V**				
62556			**+5.0V**	**+10V**		
65535	5.5V	11.0V	+5.5V	+11V	24mA	24mA
RES	**1/59577**	**1/59577**	**1/59577**	**1/59577**	**1/54612**	**1/43689**
1 lsb	83.925uV	167.8uV	167.8uV	335.7uV	0.34132uA	0.34132uA
%Span	0.001678%				0.001707%	0.002133%

Note: Scaling uB module inputs and rescaling splitter outputs smaller than their nominal ranges can increase potential error as the I/O resolution and input signal-to-noise ratio are diminished for very small input spans. In general, rated accuracy can be achieved for effective I/O resolution equal or greater than 12-bit (1/4096).

Output Load: The voltage output can drive loads down to 1KΩ minimum (5mA max). The current output can drive 21mA DC into 0-525Ω.

Output Accuracy: Better than ±0.05% of span, typical, ±0.1% maximum, with nominal input and output ranges and minimum 12-bit scaled I/O resolution (1/4096). This includes the effects of repeatability, terminal point conformity, and linearization, but does not include sensor error.

Output Noise/Ripple: Less than ±0.1% of output span, typical.

Note (High Speed Acquisition): Additional filtering at the load is recommended for sensitive applications with high-speed acquisition rates. For excessive 60Hz supply ripple with current output, a 1uF or larger bulk capacitor is recommended at the load. High frequency noise is often reduced or eliminated by placing a 0.1uF or 0.01uF capacitor directly across the load (this can also raise RF immunity).

Output Ambient Temperature Drift: Better than ±80ppm/°C (±0.0080%/°C) over the ambient temperature range. This includes the combined effect of zero and span drift for reference test conditions (see Input Specifications).

Split Analog Outputs...

Output Response Time: Varies with input module installed. Refer to your uB module response time specification and add 7ms to that value for the output response time with module mounted on this carrier. For example, with a uB41 input module (2ms) installed, the maximum time measured for the output signal to reach 98% of its transition for a step change in the input while driving the current output to a 500Ω load is 9ms.

AUX Voltage Output

The local AUX voltage output at TB5-1 is equivalent to that produced by the microBlox® module itself when plugged into this carrier. Its signal return COM at TB5-2 is common to the USB signal ground, which may be common to earth ground of the host PC if not using a USB isolator to make a USB connection to this carrier.

Re-transmitted from module.

Voltage Range (AUX): 0-5V, ±5V, 1-5V, equivalent to the microBlox® module voltage output, but accessed at this carrier's AUX voltage output terminals TB5-1,2. Refer to module specifications.
Voltage Load: 5V into 1KΩ minimum, or 5mA Maximum.
Accuracy: ±0.05% of span typical (from module). Refer to your module specifications for details.

Splitter Controls
LED Indicators

Channel PWR (Green) – Channel Green ON indicates power is applied to carrier and the plugged-in uB module is operating normally (LED sourced from module).
Channel BLE (Blue) – Channel Blue ON indicates Linking to channel is enabled for uBxx-B Bluetooth wireless technology enabled models (via the BLE DIP switch of the channel). This LED is sourced from module. Note that splitter functionality cannot be wirelessly configured via Bluetooth wireless technology.
Output Fault LED Indicators (Orange, Each Output, FLT1 & FLT2) - Orange FLT LED per output channel. ON indicates current output is open circuit, or the corresponding current output load resistance is too high to drive accurate current to it (load resistance is greater than 550Ω). ON may also indicate over-temperature if the output driver die temperature has exceeded 142°C.

BLE DIP Switch

(Splitter Functionality cannot be setup wirelessly)

Set this DIP switch to ON (left) to allow Bluetooth wireless technology linking to uBxx-B models plugged into the carrier socket. Note that splitter functionality cannot be wirelessly configured, but this panel may also function as a simple single-channel carrier with a single AUX output for any uB module, including Bluetooth wireless technology models.

CJC DIP Switch

Set this DIP switch to the ON position (left) to make a CJC connection at the input. Some models require CJC to be set ON or OFF depending on the model as follows (also consult your specific module instructions):

CJC	uB30/40	uB31/41	uB32/42	uB34/35	uB37/47
ON or OFF		√	√		
Set ON	√				√
Set OFF				√	

Software Configuration via wired USB to a Windows based personal computer or tablet running Windows software, or wired USB OTG (On-The-Go) to an Android smartphone or tablet using our Agility Configuration App.

Splitter Controls...

This splitter drives dual analog current or voltage outputs proportional to a sensor input signal measurement made by the microBlox® module input ADC. Both splitter outputs can be scaled/calibrated identically, or you may scale each output separately. You can even rescale the uB input differently for each output channel. The third or AUX splitter output is fixed to that of the uB module itself (see module model specifications). No switches or potentiometers are used to adjust the I/O of this splitter. Its behavior as an isolated signal splitter is determined via programmed variables set using a wired USB connection to a host computer or laptop running a Windows-compatible configuration software program specific to the splitter model, or using a wired USB OTG (On-The-Go) cable connection to an Android smartphone or tablet running Agility software. The software provides the framework for digital control of all configuration and calibration parameters, and this information is stored in non-volatile memory.

USB Interface

⚠️

CAUTION: Do not attempt to connect USB in a hazardous environment. Transmitter should be set up and configured in a safe environment only.

This splitter includes a USB mini-B socket for temporary connection to a Windows-based PC/laptop (USB 2.0), or for a wired USB-OTG connection to an Android smartphone/tablet. The USB interface is used to configure and calibrate the input of the module plugged into this carrier, and each output of this splitter. Because the input module, power, and each splitter output are themselves individually isolated, adding USB isolation is not required for this carrier, except if you are also wired to the third AUX voltage output of the splitter (which shares common with the host circuit including USB, and could otherwise be earth grounded by a voltage monitor tied to AUX[1]).

Data Rate: USB v1.1 full-speed only, at 12Mbps. Up to 32K commands per second. USB 2.0 compatible.

Transient Protection: Adds voltage protection on USB power & data lines.

Cable Length/Connection Distance: 5.0meters maximum.

Driver: No special drivers required. Unit uses built-in USB Human Interface Device (HID) drivers inherent to the Windows Operating System (Windows 7 or later versions only).

USB Connector Socket (on Carrier): 5-pin, Mini USB B-type socket, Hirose UX60-MB-5S8.

USB PIN	DEFINITION
1	+5V Power (Transient Protected, but not used by the splitter)
2	Differential Data I/O (+)
3	Differential Data I/O (-)
4	NC – Not Connected
5[1]	Power Ground (Connects to Host Signal Ground)
SHLD[1]	Signal Ground (Connects directly to Host Signal Ground)

[1]Note: Most Host Personal Computers (except battery powered laptops) will connect PC earth ground in common to their own USB shield and signal ground. The third (AUX) output of this splitter shares this common ground and you should be careful when wired to AUX to not inadvertently add a second earth ground connection to the host (earth ground should only be applied at one-point in any isolated circuit).

Power

Connect power at TB3-1 (+) and TB3-2 (-).

CAUTION: A terminal voltage at or above 6V min should be maintained to the unit during operation. Do not exceed 36VDC peak to avoid damage to the unit.

Observe proper polarity. Reverse voltage protection up to 60V is built-in. Your supply should be rated at twice the maximum current draw to allow for potential inrush current.

Connect 6-32V DC SELV (Safety Extra Low Voltage), up to 2.1W including input module. Your current draw will be dependent on your choice of input module, whether you use one or both splitter output channels, output current or voltage, voltage load, and AUX load. You can approximate power consumption by combining power of major features you are using and this applies quite well for voltage levels from 9-32V (multiply this by 1.07 below 9V). A uB41 module is represents a standard load, and a uB42 represents the largest module load.

POWER FEATURE	TYP REQD POWER AT SUPPLY
uBSP-P-1 Splitter w/o Module	0.44W
+uB41 Input Module (Standard Load)	0.29W
..or uB42 Input Module (Maximum Load)	0.66W
+Current Output at 4mA[1]	0.08W each
or Current Output at 20mA[1]	0.40W each
+5mA AUX Voltage Output (10V/2KΩ)	0.06W
+Voltage Output of 10V into 2KΩ	0.12W
MAX TOTAL w/uB41or equivalent	**1.59W Typical**
MAX TOTAL w/uB42 or equivalent	**1.96W Typical**

[1]**Note**: Incremental power consumption of current output is ~0.02W/mA.

MODEL	POWER REQUIRED BY FEATURE				BY MODULE		TYP
	BASE	V-OUT	I-OUT	AUX	uB41	uB42	Ptot
uBSP-P-1/uB41	0.44	~~0.12 x2~~	0.40 x2	0.06	**0.29**	~~0.68~~	**1.59**
uBSP-P-1/uB42	0.44	~~0.12 x2~~	0.40 x2	0.06	~~0.29~~	**0.66**	**1.96**

The rightmost column represents typical input power with a 9-32V supply, a module installed, and full-scale outputs. For voltage below 9V, multiply Ptot by 1.07. To calculate current draw, divide Ptot for your splitter/module/feature combination by your supply voltage to get typical current ±5% for loaded conditions (see Table 3 below for computed values).

Power...

Note: It is recommended that supplies capable of supplying more than 2.5A to the carrier be fused with a surge tolerant fuse.

Choose a fuse rated for 2x current. Limit maximum fuse rating below 3A Supplies capable of supplying more than 2.5A to a carrier should be fused with a surge tolerant fuse

Multiply current by 1.1 for maximum current. Current provided below assume a loaded carrier with uB module installed, full-scale output currents, and AUX voltage output loaded w/1KΩ.

Table 3 POWER SUPPLY	uBSP-P-1 Current Draw w/Standard uB41 Module		uBSP-P-1 Current Draw w/Loaded uB42 Module	
	TYP	MAX	TYP	MAX
6V	284mA	312mA	350mA	384mA
9V	177mA	194mA	218mA	240mA
12V	133mA	146mA	163mA	180mA
15V	106mA	117mA	131mA	144mA
24V	66mA	73mA	82mA	90mA
32V	50mA	55mA	61mA	67mA

Power Supply Effect: Less than ±0.001% of output span effect per volt DC change.

Enclosure & Physical

Board is held in place by a plastic panel holder with an integrated DIN clip for mounting on 35mm "T-type" DIN rail.

Dimensions: Width = 75.2mm (2.96inches along rail), Height = 72.0mm (2.83inches perpendicular to DIN rail), Depth = 36mm (1.42inches vertical w/o modules). Refer to Mechanical Dimensions drawing. Note that the plug-in module extends approximately 1.4" above the splitter panel (a splitter with a module will have a maximum depth of 71mm or 2.8inches).

Input, Output, and Power Connectors: Fixed type terminal blocks rated for 12A/250V; AWG #28-16, stranded or solid copper wire.

Carrier Material: Self-extinguishing polyamide, UL94 V-0 rated, color light gray (black end caps). General purpose NEMA Type 1 enclosure.

Circuit Board: Military grade fire-retardant epoxy glass per IPC-4101/98.

DIN-Rail Mounting: Unit is normally mounted to 35x15mm, T-type DIN rails. Refer to the DIN Rail Mounting & Removal section for more details.

Unit Weight: 0.25 pounds (0.12 Kg).

Environmental

Limits represent the minimum requirements of the applicable standard, but this product has typically been tested to comply with higher standards in some cases.

Operating Temperature: -40°C to +75°C (-40°F to +158°F).

Storage Temperature: -40°C to +85°C (-40°F to +185°F).

Relative Humidity: 5 to 95%, non-condensing.

Isolation: Input/field isolation is provided by the plug-in uB module sold separately. Host/USB/AUX, uB input, power, and output circuits are all isolated from each other for common-mode voltages up to 250VAC, or 354V DC off DC power ground, on a continuous basis (will withstand 1500VAC dielectric strength test for one minute without breakdown). This complies with test requirements of ANSI/ISA-82.01-1988 for voltage rating specified.

Installation Category: Suitable for installation in a Pollution Degree 2 environment with an Installation Category (Over-Voltage Category) II rating per IEC 1010-1 (1909).

Shock & Vibration Immunity: Conforms to: IEC 60068-2-6: 10-500 Hz, 4G, 2 Hours/axis, for sinusoidal vibration; IEC 60068-2-64: 10-500 Hz, 4G-rms, 2 Hours/axis, for random vibration, and IEC 60068-2-27: 25G, 11ms half-sine, 18 shocks at 6 orientations, for mechanical shock.

Electromagnetic Compatibility (EMC)

Minimum Immunity per BS EN 61000-6-1:

1) Electrostatic Discharge Immunity (ESD), per IEC 61000-4-2.
2) Radiated Field Immunity (RFI), per IEC 61000-4-3.
3) Electrical Fast Transient Immunity (EFT), per IEC 61000-4-4.
4) Surge Immunity, per IEC 61000-4-5.
5) Conducted RF Immunity (CRFI), per IEC 61000-4-6.

This is a Class B Product with Emissions per BS EN 61000-6-3:

1) Enclosure Port, per CISPR 16.
2) Low Voltage AC Mains Port, per CISPR 14, 16.

Agency Approvals

Electromagnetic Compatibility (EMC): CE marked, per EMC Directive 2014/30/EU.

FCC Conformity: This device complies with Part 15, Class B of the FCC rules.

Safety Approvals: UL Listed (USA & Canada). Hazardous Locations – Class I, Division 2, Groups A, B, C, D Hazardous Location or Nonhazardous Locations only. These devices are open panel type circuits that are intended to be installed in an enclosure suitable for the environment.

ATEX / IECEx Certified: Model uBTA-P-1 carries are ATEX Certified for Explosive Atmospheres per ATEX Directive 2014/34/EU which complies with standards IEC 60079-0 Edition 6, IEC 60079-15 Edition 4, EN 60079-0:2012+A11:2013, and EN 60079-15:2010.

⟨Ex⟩ II 3 G Ex nA IIC T3 Gc -40°C ≤ Ta ≤ +75°C

DEMKO 18 ATEX 2086**X**   IECEx UL 18.0092**X**

X = Special Conditions:
1) The equipment shall only be used in an area of not more than pollution degree 2, as defined in EN/IEC 60664-1.
2) The equipment shall be installed in an enclosure that provides a degree of protection not less than IP 54 and only accessible with the use of a tool in accordance with EN/IEC 60079-15.
3) Transient protection shall be provided set to a level not exceeding 140% of the peak rated voltage value at the supply terminals to the equipment.

Reliability Prediction

Reliability Prediction
MTBF (Mean Time Between Failure): MTBF in hours using MIL-HDBK-217F, FN2. *Per MIL-HDBK-217, Ground Benign, Controlled, $G_B G_C$*

uBSP-P-1	MTBF (Hours)	MTBF (Years)	Failure Rate (FIT)
25°C	TBD hrs	TBD years	TBD
40°C	TBD hrs	TBD years	TBD

REVISION HISTORY

The following table shows the revision history for the document:

Release	Version	EGR/DOC	Description of Revision
10-APR-2018	A	BC/MO	Initial Release
27 NOV 2018	B	CAP/ARP	Added UL / ATEX / IECEx / FCC statements.