BIO RECOGNITION SYSTEMS

TECHNICAL TIPS

PRODUCT: BioLock+ Standalone

Subject: BioLock+ Standalone with multiple SIOBs

Date: 19th November 2007
Revision: 3

BioLock+ Standalone now has support for multiple Secure Input Output Boards (SIOBs, also known as relay boards).

Multiple SIOBs can be very useful for applications where several different devices or doors need to be controlled by one BioLock+ (for example, in a residential application one BioLock+ might control both a front door and external lighting, or trigger an alarm disable).

Hardware/firmware required

Standard BioLock+ kits are shipped with a single SIOB. You will need to order more SIOBs as required for your application.

Multiple-SIOB support is incorporated in BioLocks shipped by BRS from November 19th 2007 onwards (firmware version 2.x.x or greater), and SIOBs firmware version 2.00 or greater.

SIOBs with firmware version 2.00 onwards can be recognised in two ways: the firmware version is labelled on the underneath (non-component side) of the SIOB, and version 2.00 and later SIOBs have only two of the five pins remaining on the multi-pin connector labelled J3 adjacent to the SIOB reset switch.

Adding more SIOBs to an existing single-SIOB installation may require BioLock+ firmware to be upgraded, and may require the current SIOB firmware to be reprogrammed (this must be done by returning the SIOB via your point of purchase to the manufacturer).

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Cabling

BRS does not ship cabling kits for multiple SIOBs. Each cabling application will be site-specific. Please refer to our Technical Tip #2 (Cabling) for more detail on cabling requirements.

As the number of SIOBs, the total length of cabling increases, or the environment degrades (electrical noise, grounding), the cabling installation will generally become more difficult. The two main concerns are avoiding noise on the RS485 communications line, and avoiding power supply problems (in particular avoiding exceeding current ratings and ground loops).

RS-485 Cabling

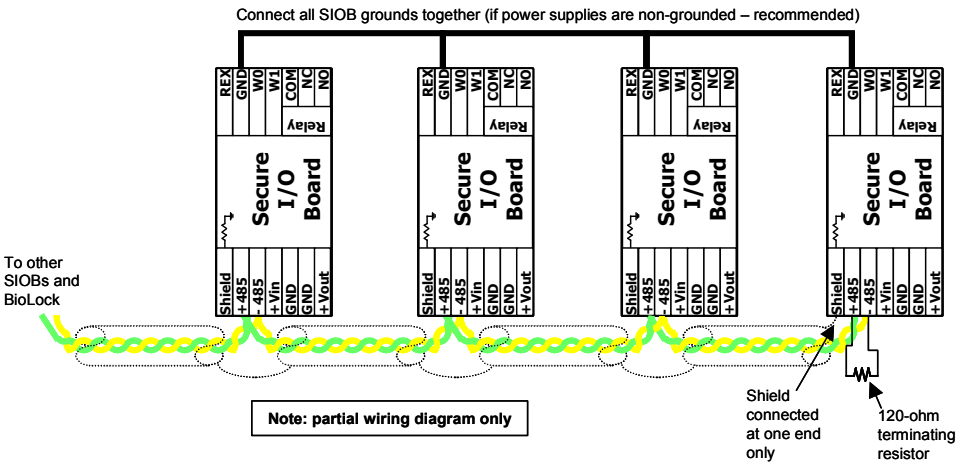
This website is an good source of information on RS-485 cabling:
http://www.maxim-ic.com/appnotes.cfm?appnote_number=763&CMP=WP-1

The RS-485 cabling used for connecting multiple SIOBs should be of good quality (shielded twisted-pair data cable). Belden part number 9841 at http://www.belden.com/ or similar will give good performance (note that BRS does not guarantee performance of products supplied by 3rd parties).

Note that using Ethernet Cat5 (unshielded twisted-pair) cable is not recommended for any but the shortest of cabling. Cat5 unused pairs will self-resonate and couple noise into the data wires. They will still self-resonate if they are grounded at one end or both ends. If Cat5 is used (not recommended), all unused wires should be terminated into the SIOB "Shield" connector as it is better for the associated resister to dissipate the resonant energy.

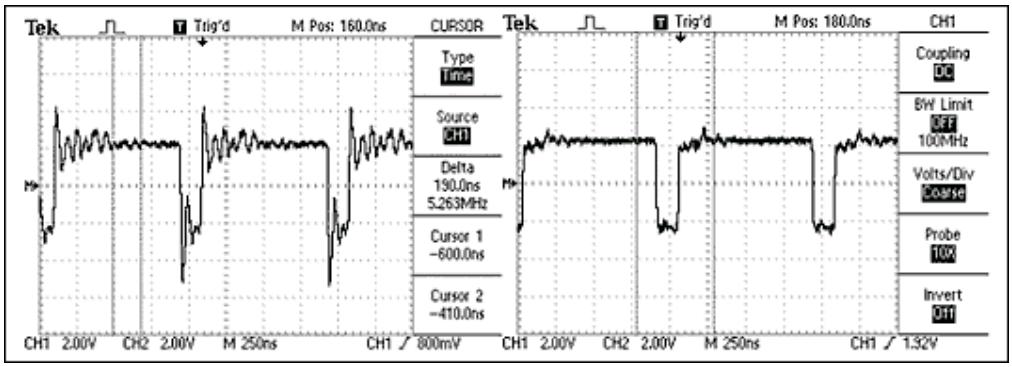
The shield of each data-cable segment should be connected to the following segment. At one SIOB (only) the shield of the data cable should be connected to the "Shield" connector of the SIOB.

A partial wiring diagram is shown below.



GREEN is –COM and Yellow is +COM

RS-485 cabling must be daisy-chained (with no stubs). The BioLock+ should be at one end of the daisy-chain. It should not be a “star” topology:



An RS-485 network that has a 10-foot stub and its resultant waveform (left), compared to a waveform obtained with a short stub (right).

The most remote SIOB (on the daisy-chain at the far end from the BioLock+) should have a terminating resistor added by the installer between the RS-485 +/- connectors. The BioLock+ has a built-in terminating resistor, the correct terminating resistor must be added to the last (most remote) SIOB only (no terminating resistors on the intermediate SIOBs). Having no terminating resistor can have a dramatic effect:

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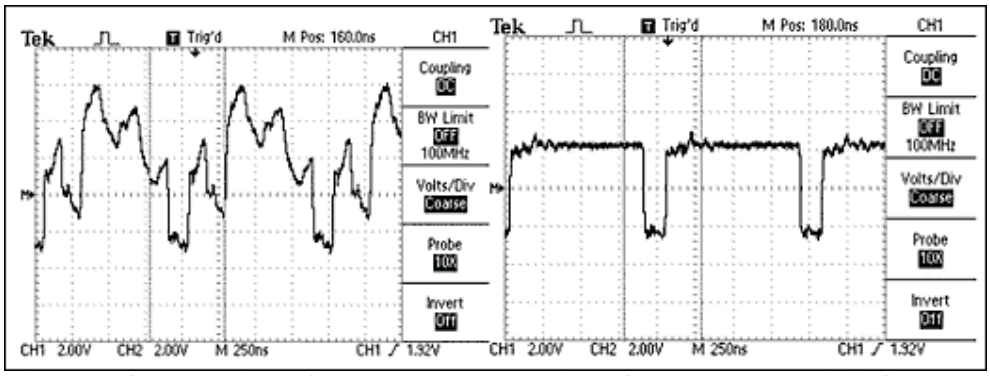
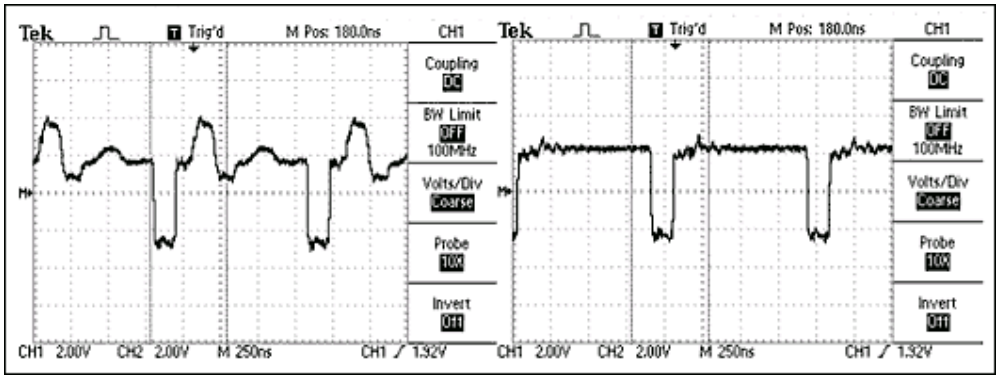


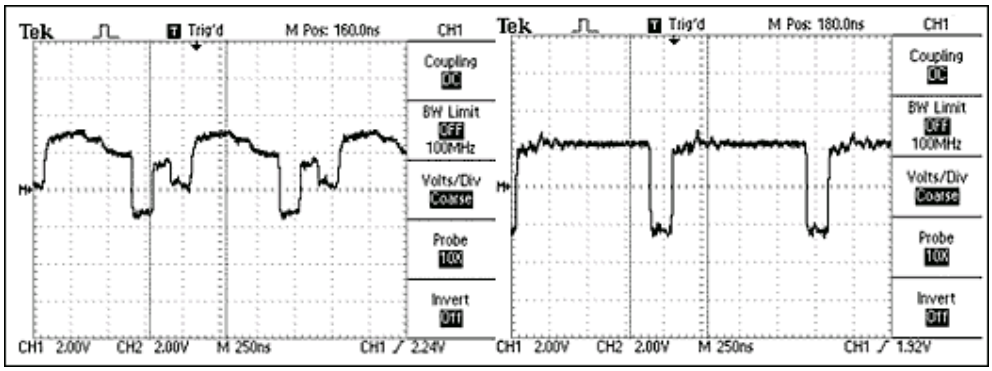
The waveform resulting from an unterminated 200ft RS-485 network (left), compared with a waveform obtained from a correctly terminated network (right).

Having the correct-value terminating resistor is important. The value of this resistor should be equal to the impedance of the data cable (often 120-ohms, and often stencilled on the cable insulation):



The waveform on the left was obtained from a 200ft RS-485 circuit driving a 120Ω twisted-pair cable terminated with 54Ω. The waveform on the right was obtained with the cable terminated properly with 120Ω.

The terminating resistor should be at the most remote SIOB. Placing it at an intermediate SIOB can also cause data errors:



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The resultant waveform (left) of an RS-485 network with the termination resistor placed at the wrong (intermediate) location, compared to a properly terminated network (right).

Power Cabling

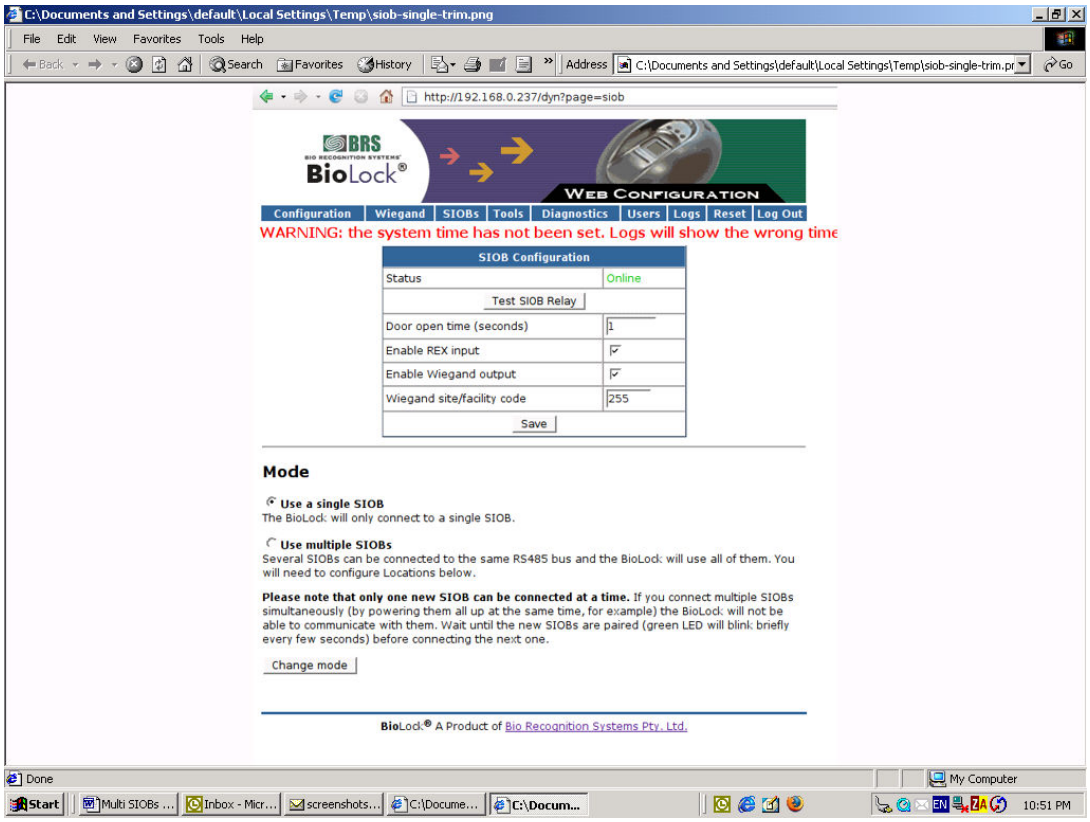
Note that power cabling should be of sufficient gauge. If extending the length over which power is transmitted, it is important to avoid excessive voltage drops. Up to around 20m distance, wire with copper conductors of a minimum cross-sectional area of 1.5mm^2 should be adequate, up to 100m distance, a cross-sectional area of 2.5mm^2 should be adequate. In any case, the supply voltage measured at the BioLock+ end should not be less than 4.8VDC (with the BioLock+ connected and powered up).

Each SIOB will need to be powered with an adequate supply. The SIOB that also supplies the BioLock+ will consume a peak current of around 320mA, additional SIOBs will consume approximately 33mA each (plus the doorstrike or other accessory current, if powered from the same power supply). The standard BRS doorstrike consumes up to 600mA inrush current, other devices will differ. Note that back-EMF protection should be used, if appropriate (see the Cabling Technical Tip).

Non-grounded (isolated or floating) power supplies such as those supplied with the BioLock kits are recommended. Using multiple grounded power supplies may cause excessive ground loop currents through the BioLock system components, or cause grounding-related noise to interfere with the RS485 communications. If using floating power supplies as recommended, a “GND” connection on each SIOB should be connected together. One (only one…) SIOB “GND” should be connected to a building ground point, preferably the quietest one (electrically-speaking – away from high-powered devices such as motors, away from high-frequency equipment such as radio aerials etc).

Up to 31 SIOBs may be connected to a single BioLock+. In many cases, the number is likely to be much less than this – if you have applications for many relay outputs that are close to each other, a better solution might be to use BRS’ Multi IO Board, an Ethernet-connected device with up to 16 relay outputs (and which can be stacked for multiples of that number). Contact BRS for more information.

Firmware Setup



BioLock+ is shipped by default in “single SIOB” mode. However you will notice an “SIOB” configuration tab on the built-in BioLock+ webserver (see above). Navigating to that tab the default mode is Single-SIOB. Clicking on the “Use multiple SIOBs” option (then “Change mode”) will cause the webserver pages to change to multi-SIOB mode.

To install, wire up all SIOBs and the BioLock+, including power and RS485 communication cabling to the SIOBs. Pay attention to power consumption, wire gauges and lengths, shielding and grounding as per the above.

A computer (with web browser running) is required for multiple-SIOB configuration, connected via the Ethernet RJ45 connector on the BioLock+. If a laptop is being connected directly to the BioLock+ (with no intervening Ethernet hub/switch), a Cat5 Crossover cable will be required between the BioLock+ and laptop.

Pairing procedure

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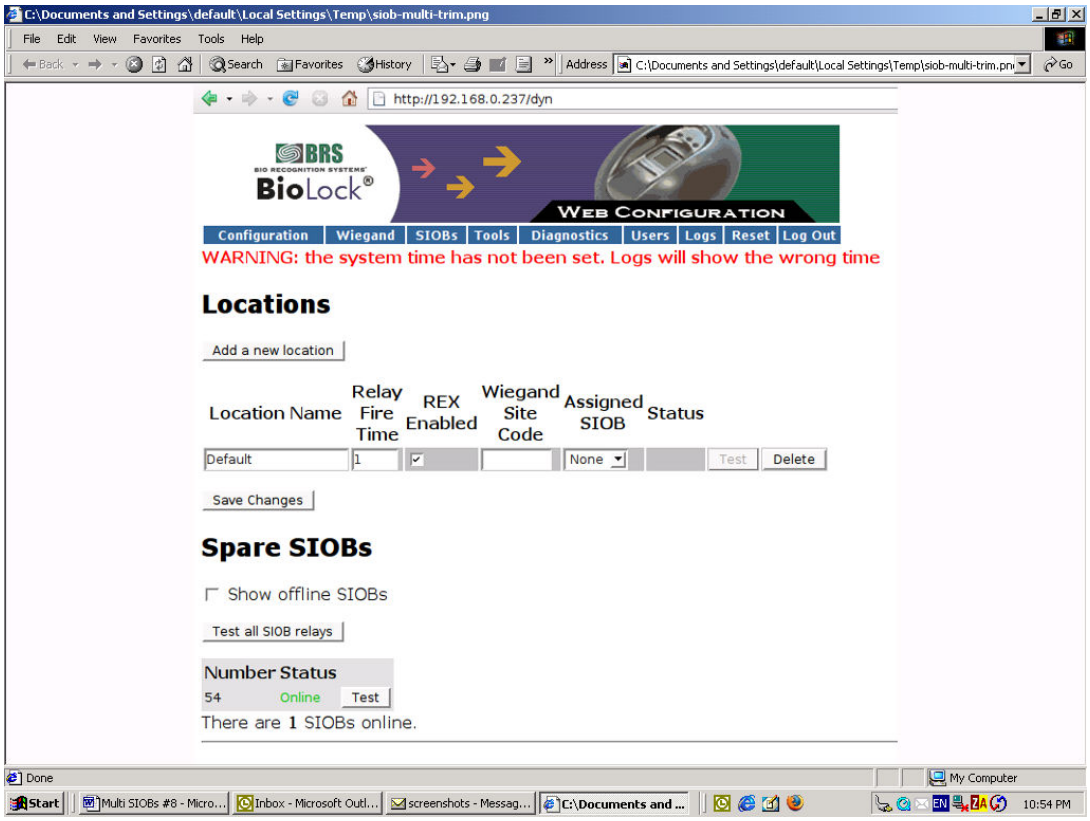
SIOBs need to “pair” with the BioLock+. This can only be done individually (two or more SIOBs cannot pair simultaneously). No harm is done by several SIOBs trying to pair simultaneously – but they will not succeed. SIOBs should be held in the reset state until they are paired one by one. If only a small number of SIOBs are connected, or they are in close proximity, the reset buttons can be held down on all SIOBs. However if the SIOBs are in inconvenient locations (not all within reach), jumpers should be used connecting the two remaining pins (4 and 5) on the multi-pin connector (labelled J3) adjacent to the reset switch on each SIOB.

Pair the SIOBs one by one by removing the reset jumper (or releasing a reset button if you are holding them down with your fingers). As each SIOB pairs it should become visible on the SIOB web page tab as an on-line SIOB (the web page may need to be refreshed – click again on the SIOB tab) and be randomly assigned an address number between 1 and 63.

Test each connected SIOB and determine which SIOB corresponds to each sequence number. Assign each connected SIOB with a label (use descriptive labels such as “Front door”) in the Locations section of the SIOB tab.

Remove the reset jumpers (or pushbutton) one by one until all SIOBs are on-line. Wait at least 5 seconds between removing each reset.



SIOB Diagnosis
SIOBs that are correctly paired can be recognised by a very short flash of their on-board green LED every three seconds. During successful pairing, the green LED will flash longer for a few seconds. Unpaired SIOBs will have a solid green LED, duplicate SIOBs that are (unsuccessfully) trying to pair at the same time will have a longer green LED blink every three seconds (in this case, you will need to hold all except one of these SIOBs in reset for a few seconds until the non-reset one pairs, then repeat for one fewer SIOB until all are paired).

Configure each SIOB's REX, relay fire-time, and Wiegand site code as required. Test each SIOB (via the associated Test button on the web page) to ensure that the correct SIOB fires and its outputs are as desired.

Then navigate to the Users page. The first shaded area is the default configuration for newly-enrolled users, where the available SIOBs can be set (note that multiple SIOB actions can be performed for any one user verification). As new users are added (enrolled), either the default actions can be used, or if the "Use default actions on verify" is un-ticked, the individual SIOB actions for that particular user can be modified. See the screen image below.

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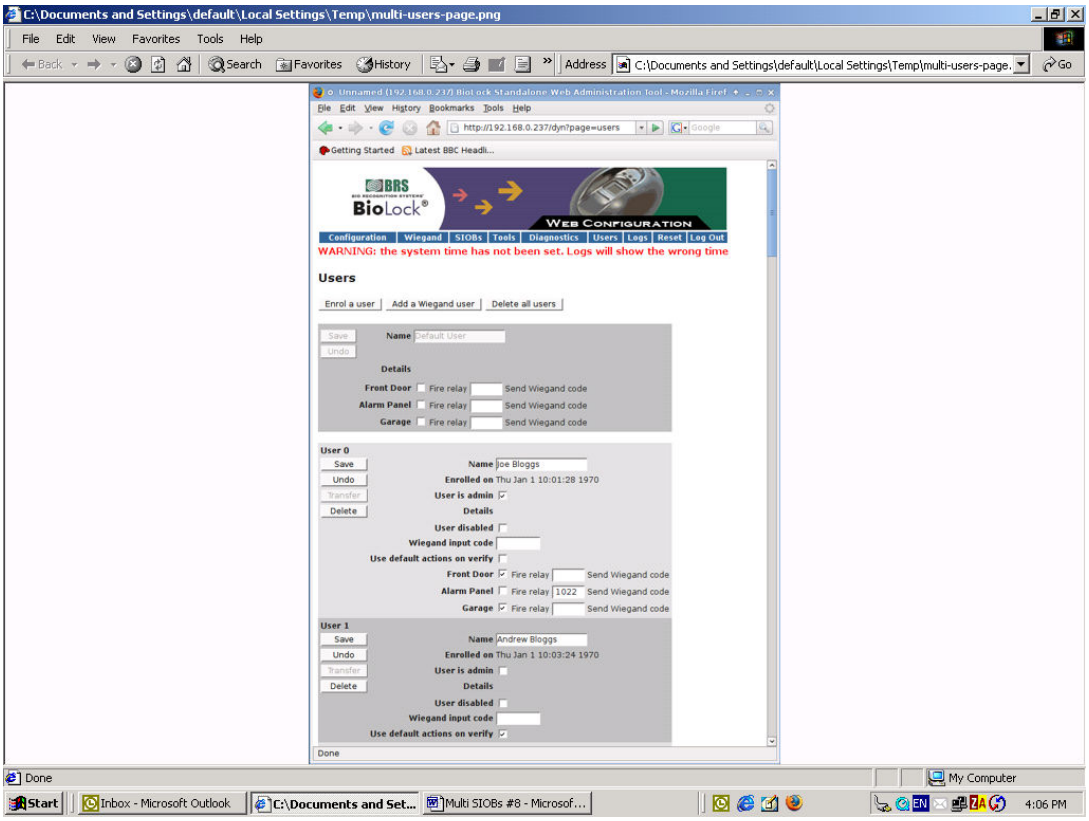

Do not forget to “save” any changes you make to a user’s set-up.

Finally, test the system operation with known fingers and verify correct operation.

FURTHER INFORMATION:

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Bio Recognition Systems Pty Ltd is a 100% Australian owned and operated hardware and software developer and manufacturer. Located in Lane Cove, Sydney, Bio Recognition Systems Pty Ltd began by offering its customers software and hardware solutions in 1999. Its leading edge BioMetric technology harnesses the power of the newest technology in fingerprint recognition.

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