Kaco Direct Attach – Domestic Installation

Inverter summary

Inverter Manufacturer	Kaco
Inverter Model	All models
Inverter Size	From 1.5kW to 30kW
RS485 Interface	Included with all models
Maximum number of inverters connected to a single SPLASH Monitoring STREAMbox	32

List of parts required for connection of inverter to SPLASH Monitoring

To enable you to connect the above inverter to SPLASH Monitoring you will need a SPLASH Monitoring STREAMbox and connection cables, these parts are listed below:

Part description	Part number
Inverter Make / Model	As above
SPLASH Monitoring STREAMbox	SMSB II - Hardwired network and inverter connections
Connection cable STREAMbox to inverter	Part numbers FTDI RS485 to USB converter SMA D9F-tails 3m SMA D9F-tails 10m
Connection cable STREAMbox to clients router or LAN	Part numbers SM CAT5 1m – 1m CAT5 cable SM CAT5 2m – 2m CAT5 cable SM CAT5 5m – 5m CAT5 cable SM CAT5 10m – 10m CAT5 cable
Optional	USB to RS485 D9F Adapter SM FTDI RS485-USB 3m Adapter

## Installation Guidelines

To ensure long term reliable monitoring;

1. Install the Streambox and its power supply away from daily operational areas where the hardware could be accidently turned off such as someone's desk or work bench.

2. Locate or secure the equipment to prevent it from falling, slipping and becoming disconnected

3. Secure the power cord to the STREAMbox using the supplied "P" cable clamp (see below)

4. Ensure the Ethernet CAT 5 / 6 cables are in good condition with their retaining clips intact and make sure they are securely fitted to the equipment by giving them a gentle tug.

5. Secure cables to protect them from accidental snagging

6. Do not stretch cables to the point where any movement could cause them to become disconnected.

7. The equipment and power supplies will be labelled 'DO NOT SWITCH OFF', but you should inform people with access to the installation area that this equipment should not be turned off; for example cleaning and maintenance personnel

Setting Up Your STREAMbox and Kaco Inverters

This section is intended as a quick guide to setting up Splash Monitoring and assumes your inverter is already connected to the PV panels and grid/batteries, and where necessary programmed according to your requirements. For more details please refer to the Inverter Installation Manual.

Basic Connectivity
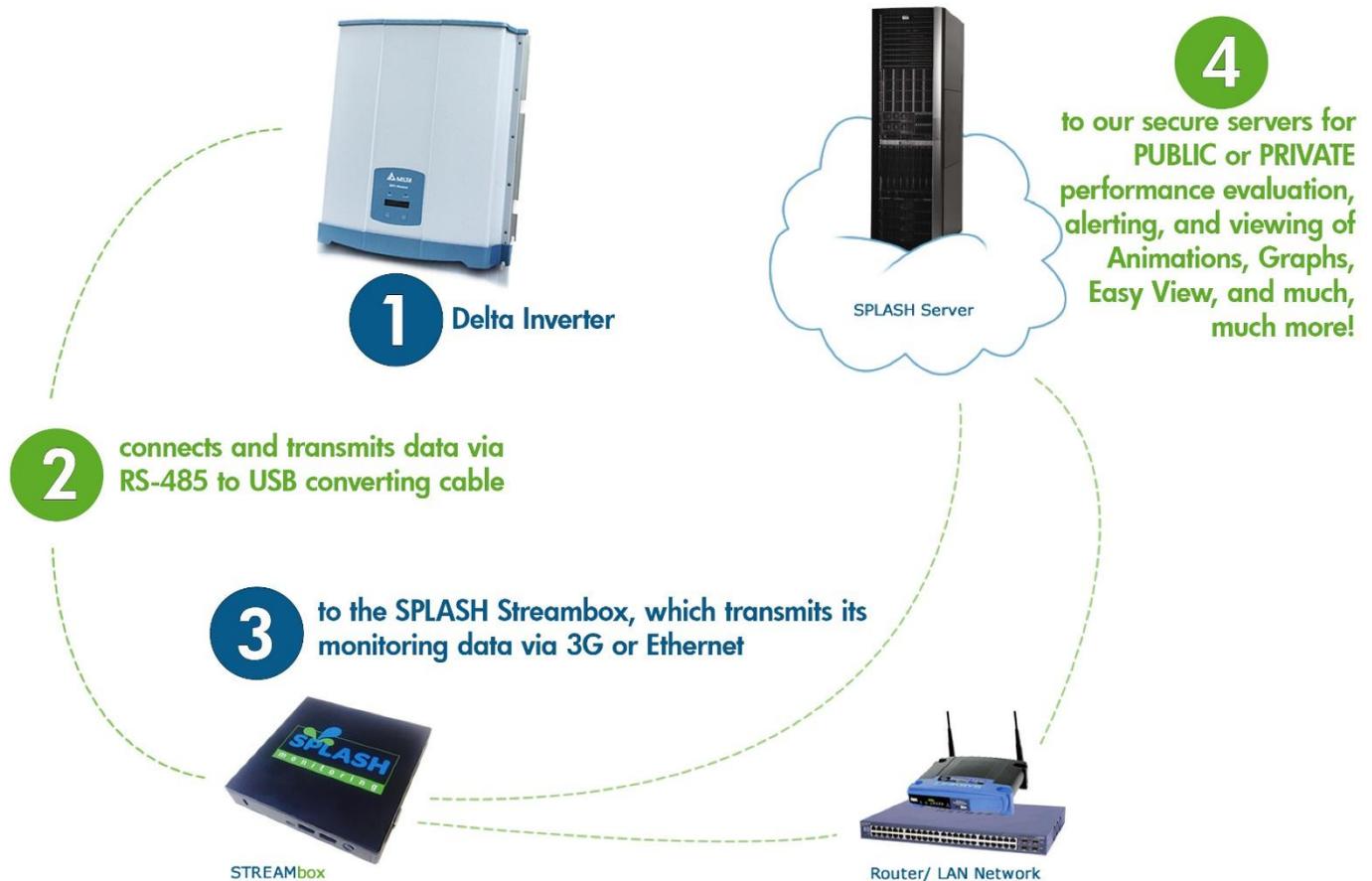
The diagram above shows the connectivity between the various devices. The connections are:
2 – RS485 data bus between the inverter(s) and the STREAMbox.
3 – CAT5 or CAT6 LAN cable between the STREAMbox and your Network Access Device

Network Access Device: This may be a Router, ADSL Modem, Switch or other network device connected to the Internet.

The USB adapter can be located in any of the USB sockets on the STREAMbox. The adapter tails connect to the push-down terminal block on the first inverter. Please see the inverter manual for details on how to connect inverters together if there is more than one.

Please take care when connecting the inverter(s) to the STREAMbox, if the distances are long then twisted pair cable must be used and the pairing is critical. Also the termination at the end of the bus can be critical, however, in practice we have found that on short cable runs in particular, the terminator is not critical, and sometimes impedes the signal. You may have to try both options to get it to work. Please refer to the Inverter User Manual for details.

Setting Up Your STREAMbox

Unless the STREAMbox has already been configured according to your specifications, it will be configured to acquire a DHCP IP address from your router or DHCP server. For most domestic applications this will work without any modification. However, if you do need to change its settings see below for guidance.

Trouble Shooting:

"No Stream Found" on the SM Web site:
This is because the web site hasn't received any data from the STREAMbox.

- Kaco inverters will respond if the AC side is switched on even if there is no DC power from the PV panels, so setting up your STREAMbox for the first time at night is OK, but of course there will be little meaningful data.

- Allow at least 10 minutes after powering up the STREAMbox before starting your diagnostic checks.

- Check the connections between the STREAMbox and your router and ensure you have a solid green light at the top left of the RJ45 socket and a flashing green light at the top right of the socket.

- No solid green light could indicate: the STREAMbox is switched off (check the power light on the front of the STREAMbox); or the router isn't powered up, or the LAN cable isn't connected to the router; or the LAN cable is faulty. To eliminate the LAN cable and router, connect the LAN cable to a known working device like your laptop or PC and if you can get a web session, then the LAN connectivity is OK.

- Check the connection between the STREAMbox and the inverter, making sure the tails on the cable are connected to the correct terminals on the inverter. If you are not using a cable supplied by SPLASH Monitoring, the pin configuration is:

When using the FTDI USB to terminal ends

Streambox USB	FTDI USB To Terminal ends, Cable colour	Kaco Inverter terminations
USB	Yellow	Terminal A (Signal D-)
	Orange	Terminal B (Signal D+)
	Black	Terminal G (Signal Gnd)**

*** signal ground is not available on many models, in which isolate the black core.

When using the USB D9 RS485 adapter with terminal ends

Streambox USB	CAT5 or equivalent UTP cable **To Terminal Ends Cable colour**	Kaco Inverter terminations
D9 Female # 1	Orange	Terminal A (Signal D-)
D9 Female # 2	White / Orange	Terminal B (Signal D+)
D9 Female # 3	Blue	Terminal G (Signal Gnd)***

*** signal ground is not available on many models, in which case isolate the blue core.

- Try power cycling the STREAMbox – switch it off, wait 5 sec, switch it back on.

- Try logging on to the STREAMbox: enter "splash" in your web browser's address line, or if your STREAMbox has a fixed IP address, enter that into your web browser. For instructions on how to use the STREAMbox's 'Web Information Page' go to http://www.splashmonitoring.com/assets/SM-STREAMbox-Web-Information-Page.html

- The most common issue we encounter is the site's network firewall not allowing outbound traffic. This is rarely an issue with domestic routers, but very common in managed commercial networks. Unless you have someone you can ask (like a network administrator) a good way to detect this issue is to log onto the STREAMbox and run a 'Healthcheck' report. This will give you lots of information including whether the STREAMbox can 'see' the internet.

- The STREAMbox is not able to work with a proxy server. If you have a proxy server you will need to make special arrangements with your network administrator to have the STREAMbox circumnavigate it by issuing a fixed IP address with appropriate privileges.

- Generally there must only be on 'master' device on an RS422/RS485 bus. The STREAMbox is a master device and as such can be the only one attached to your inverters, so make sure you don't have another data logging device attached to the RS422/RS485 bus. It will very likely work intermittently, but the data flow will be unreliable and possibly corrupt if there are multiple master devices attached.

Kaco Values:

Status Codes:

Status	Explanation	Comments
0	Inverter has just switched on	Only after the first startup in the morning
1	Waiting for start the self-test to complete	Powador changes to grid-feeding operation.
2	Waiting for shut-down	Insufficient generator voltage and generator power. Condition that precedes the night time shutdown.
3	Constant voltage regulator	Short-term grid-feeding at constant generator voltage at the start of the grid-feeding process (80% of the measured no-load voltage).
4	MPP- tracker, permanent	At times of low insolation the MPP tracking movement tracker is used for grid feeding.
5	MPP- tracker, without tracking	At times of high insolation the movement patented MPP tracker is used to ensure maximum grid-feeding capacity.
6	Wait mode before grid feeding.	The inverter waits until the generator tests the grid and the solar voltage is higher than the switch on threshold (410V), then starts the grid-feeding process after approximately 3 minutes.
7	Wait mode before self-test.	The inverter waits until the generator tests for grid and solar voltage is higher than the switch on threshold (410V), then starts the self-test of the relays after approximately 3 minutes.
8	Self-testing relays	Test the grid relays prior to starting the grid-feeding process.
10	Overtemperature shut-down	If the inverter is overheated (heat sink temperature >80°C) due to continuous overload and lacking air circulation, the inverter will shut down. Cause: solar generator too large; ambient temperature too high; Inverter defective.
11	Power limitation	Protective function of the inverter, e.g. if excessive generator power is delivered or the heat sink of the device exceeds 75°C.
12	Overload shut-down	Protective function of the inverter, e.g. if excessive generator power is delivered.
13	Overvoltage shut-down	Protective function of the inverter, e.g. if the grid voltage L1 is too high.
14	Grid failure	3-phase Protective function of the inverter, monitoring, e.g. if one of the three grid phases has failed or the voltage is out of tolerance.
15	Transition to night shut-down	Inverter goes to sleep.
18	Shut-down of RCD module	Fault - current is too high.
19	Insufficient insulation resistance	Insufficient insulation resistance from PV-/PV+ to PE.
3	Measuring error	Current and voltage measurements in the inverter are not plausible.
31	RCD module error	An error occurred in the RCD module.
32	Self-test error	An error occurred when testing the grid isolation relay.
33	DC grid-feeding error	Excessive amount of DC grid-feeding power.
34	Communication error	An error occurred in the internal data transmission.
-999	Inverter not responding	No response was received from the inverter. If this persists check the inverter is alive and the cable between the STREAMbox and inverter is intact.

Model Numbers:

Because the STREAMbox can currently transmit only numbers we have had to code the model numbers so that the number before the decimal point represents the Kaco model number, which usually represents the power rating, followed by the numerical model type after the decimal point . The numerical code is derived from the following table:

0 = xi,	1 = k1,	2 = k2,	3 = k3,	4 = su,	5 = I,
6 = IS,	7 = DE,	8 = x8k,	9 = x10k,	11 = x11k,	12 = IN,
13 = TL,	14 = TR,	15 = kTR,	16 = kTL,	17 = u	18 = UM
19 = kH2,	21 = kH4,	22 = kH6,	23 = kH4P		

For example a Powador 2002 International (Type code 2002I) would show up as "2002.5" the "5" representing the "I" as depicted in the above table.