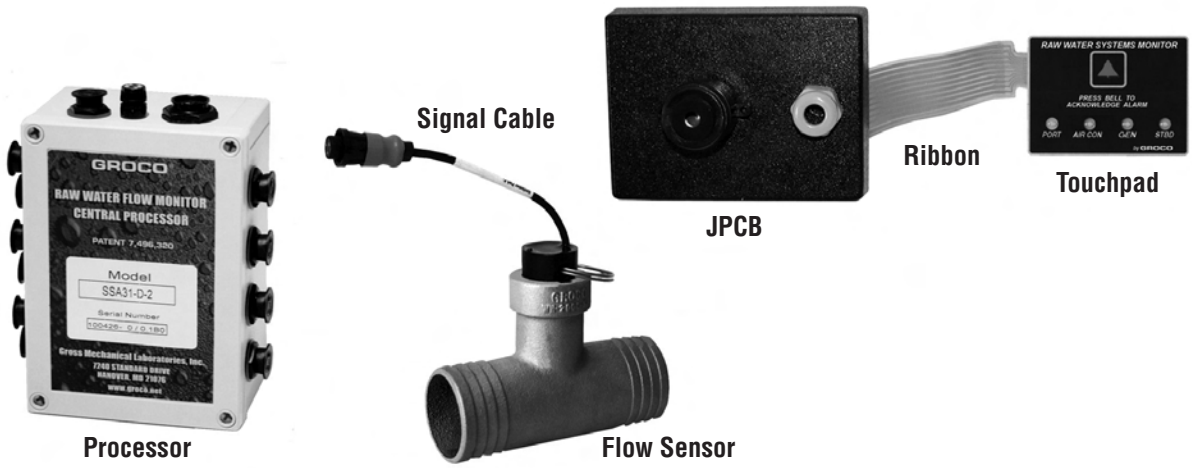
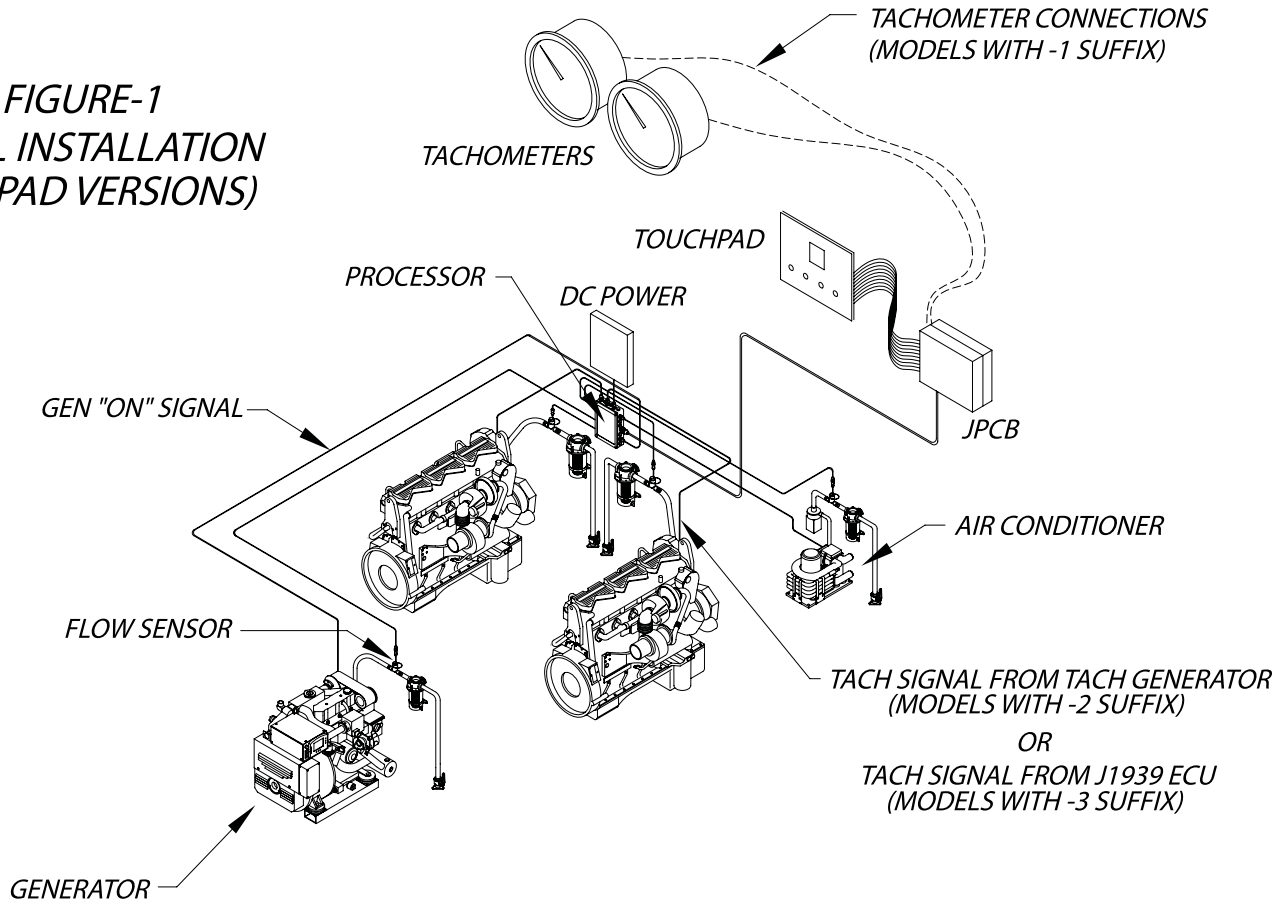


The Concept: **GROCO®** SSA-4 continuously monitors raw water flow to as many as four devices (engines, generators, air conditioners, refrigeration, R/O systems, pumps, etc). Through calibration the patented process considers unique individual plumbing and flow parameters, and learns "normal" flow for each connected device. Audible and visual alerts are provided within 7 seconds of a dangerous reduction of raw water flow to any of the devices.

Components: An SSA system includes these components (Refer to Figure-1):

- *Processor
- *Flow sensors, sized for each plumbing system
- *Flow signal cables (blue)
- *Power cable (red)
- *Touchpad
- *JPCB enclosure and helm data cable (black)
- *"On" Signal cables:
  - Switched AC (yellow)
  - Switched DC (green)
  - Engine Speed (orange)

FIGURE-1
TYPICAL INSTALLATION
(TOUCHPAD VERSIONS)



Processor Installation: Install the Processor in the engine room above the highest bilge water level. The enclosure is water resistant, but is not water tight; water damage to the processor is not covered by the warranty. Secure the Processor to a smooth and flat surface with the hook & loop tape provided. Optionally, the Processor can be mounted with #8 screws through the four corner holes in the enclosure, accessible with cover removed. Install the Processor with the fuse holder and power connections facing up.

The Processor enclosure is labeled to identify correct cable connections, and some locations may not be used. Protect unused locations with the dust caps provided.

Flow Sensors Installation: Bronze flow sensor housings should be installed with their pull-ring facing down.

Each sensor is sized to fit the hose ID of the connected plumbing system. Insert the bronze barbs fully into the hose and double-clamp each side. For best results install the housing with at least 12" (more of possible) of straight plumbing before and after the sensor to assure maximum "quiet" water. Paddlewheel assemblies are interchangeable. Install the paddlewheel assembly into the bronze housing so its directional arrow (on top opposite the cable exit) points in the direction of flow.

Cables: Two cable connections to the Processor are required from each device (flow and "on"). Cables are color-coded and their connector pins allow connection to any same-color connector on the Processor. There are multiple same-color bulkhead connectors on the enclosure, so be sure to connect each cable to the Processor location that matches the device you are connecting. Refer to Fig. 2 schematic. Verify color match and align the index pin before pushing the connector halves together - do not force. Screw the cable nut onto the bulkhead connector 1/4 turn until it locks into place. Excess cable length may be coiled or may be removed from the end without the connector. Before cutting off excess cable length, verify adequate length for routing and securing cables.

Note: Connecting a blue GEN flow cable to the AIRCON flow location will not cause damage, but will result in calibration errors, improper system operation and the incorrect display of alerts.

Labels are provided to mark each "on" signal cable to identify the device (Gen, Aircon, etc.) to which it is connected. Apply the identification label to the cable at the end that connects to the Processor.

Flow Signal Cables: See Figure-2 and connect to Processor Jack 1 through 4. Flow signal cables are marked BLUE. Connect one end to the flow sensor and run the cable to the Processor. Extension flow cables are available in 30-ft lengths (#11-1028-30).

"On" Signal Cables: There are three types of "on" signals: Switched DC, Switched AC, and Engine. The signal type is determined by the device you are connecting.

CONNECTING 'ON' SIGNAL CABLES FROM GENERATORS AND CIRCULATOR PUMPS

See Figure-2 and connect to Processor Jack 10 or 11. Generators and circulator pumps are constant speed devices that provide a switched DC "on" signal. Cables are marked GREEN.

A generator "on" signal comes from a normally open switched source such as a fuel pump or oil pressure sender – the switch closes when the generator is operating, notifying the Processor that the generator is "on".

A DC powered circulator pump "on" signal comes from the pump's power switch or breaker. The Processor detects that the device is operating when the normally open switch becomes closed.

CONNECTING 'ON' SIGNAL CABLES FROM AIR CONDITIONERS, R/O SYSTEMS, OR REFRIGERATION SYSTEMS

See Figure-2 and connect to Processor Jack 8 or 9. Air Conditioners, refrigeration pumps, and R/O systems are constant speed devices that provide a switched AC signal; their cables are marked YELLOW. The Processor detects that the device is operating when its control circuit turns the pump motor on. DO NOT obtain the Air Conditioner "on" signal from the circuit breaker that provides power to the device - False Alerts will result. Consult system manufacturer's schematics.

CONNECTING 'ON' SIGNAL CABLES FROM ENGINES

For engines the "on" signal is a tachometer input that provides engine speed data to the Processor.

Engine Speed Signals for SSA models with suffix "1":
A tachometer signal is obtained directly from a helm-mounted tachometer. Make the connection with yellow (port) and violet (starboard) wires provided. Run wires from the tachometer (+) terminal through the compression fitting on JPCB, and to J2 locations 7 and 8 (see Figure-2).

Engine Speed Signals for SSA models with suffix "2":
See Figure-2 and connect the orange cable to Processor Jack 12 or 13 (use Jack 12 only if there is a 2nd engine). A tach signal is obtained from the tach signal generator on each engine. Cut off the 3-pin Deutsch™ connector and connect black and blue wires to the tach signal generator. Connection points are polarity sensitive - improper tach operation may result if polarity is incorrect.

Engine Speed Signals for SSA models with suffix "3":
See Figure-2 and connect the orange cable to Processor Jack 12 or 13 (use Jack 12 only if there is a 2nd engine). A tach signal is obtained from a J1939 connection. Tach signal cables are terminated with a 3-pin Deutsch™ connector. Consult the engine electrical schematic to identify the J1939 connector, usually a large 70-pin (approximately) connector that terminates at the Engine Control Unit (ECU) for each engine. On each ECU there is commonly an unused jack (marked CAN hi and CAN low) to which the tach signal cable can be connected. If this connection requires a 2-pin, 4-pin or 6-pin connector, an adaptor may be ordered from GROCO:

3-pin to 2-pin = 11-1033-02
3-pin to 4-pin = 11-1033-04
3-pin to 6-pin = 11-1033-06

Touchpad Installation: When choosing a location for the touchpad, consider the following:

- *The touchpad is water resistant, but not waterproof. Choose a location that is protected against direct exposure to water.
- *LED's on the touchpad will be more visible if installation is not in direct sunlight.
- *The vessel operator will need access to the touchpad for calibration and to acknowledge an alert.
- *12" ribbon extensions are available (#11-0023-12).
- *The touchpad should be located at the helm station that is most often used during vessel operation.

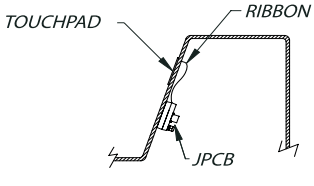
First, determine how you will route the touchpad ribbon. Trial-fit the touchpad before peeling off the adhesive backing. Then, peel off half the backing paper, insert the ribbon through the slot (1/4" X 1-1/4"), align the touchpad carefully and press lightly against the chosen surface. Last, peel off the other half of the backing paper and press the touchpad firmly into place.

The photo shows one possible installation where the touchpad ribbon runs through an existing hole behind the autopilot control.

CAUTION: Be careful not to crease or pinch the ribbon.

CAUTION: Carefully align the male tab on the ribbon with the female slot on the pcb. You will hear a "click" when the two are properly connected.

JPCB Enclosure Installation: JPCB is the black box with the touchpad and 50-foot cable attached. Connections are made at the factory for system testing and do not have to be broken if you can run the large connector at the end of the cable to the Processor (1-1/4" hole required).



SECTIONAL VIEW OF TYPICAL HELM STATION

If you cannot route the large connector to the Processor you must route the cable from the processor to JPCB. Open JPCB enclosure and cut all wires about 1/2" from the terminal block leaving the wires connected and the colors visible. This will aid with re-connection of the wires. Connect the large connector to the Processor, and run the cable to JPCB. Figure-2 Schematic shows proper wire connections.

The touchpad communciates with and/is connected to JPCB through a flat ribbon. If you open JPCB enclosure to complete the installation you may have to disconnect the ribbon from the circuit board. Press the ribbon release from the black connector at the end of the ribbon and gently pull the connector (do not pull the ribbon). When reassembling, gently push the connector halves together until they lock - you will hear a click.

CAUTION: The pins inside the connector halves are delicate and can easily be bent.

When replacing JPCB enclosure cover, place the ribbon in the notch between top and bottom enclosure halves. Use the hook & loop tape provided to attach JPCB to a flat smooth surface behind the instrument panel.

If you want to display SSA information at more than one location, order an additional station kit for each location. The suffix number defines the touchpad.

JPCB-31

JPCB-41

Power Connection: See Figure 2 and connect DC power to Processor Jack 7. SSA will operate with any input voltage from 12VDC to 32VDC. The Processor is protected by the 2-amp fuse on the enclosure. The cable marked red is for DC power. Connect the wire end (red +, black -) to the DC Main buss to assure uninterrupted DC power. When power is applied the processor will conduct a self-test, and the touchpad will rapidly cycle three times through its LEDs. When all "on" signal cables and flow signal cables are connected you are ready to calibrate.

Operation

Definitions:

* Grace Period – The first 30-seconds of operation of any connected device is considered the "Grace Period" during which pumps prime, purge air, and achieve stabilized flow.
* Horn – In the context of these instructions the term "horn" is used to mean the high-pitch audible alarm mounted on the JPCB enclosure. We are not referring to the vessel's main horn.
* Alert – During operation (not during calibration or the grace period) a flashing LED and simultaneous horn
* Alert Acknowledge – When an alert is indicated, pressing the acknowledge (red bell) button will silence the horn; the LED status will change from flashing to steady.
* Alert Clear – After an alert occurs, if flow returns to "normal" the alert LED will clear.
* Auto-clear – An alert that clears itself (ie: a plastic bag covers the air conditioner inlet, and then floats away). Audible and visual alerts will be displayed, and will automatically cease 5 seconds after the flow restriction clears.

Notes:

* SSA will continuously monitor flow rate to connected and calibrated devices and alert you visually and audibly if flow to any device is significantly reduced.
* Under normal operating conditions, no alerts will be displayed
* Each 60-seconds a brief LED flash will occur for each device that is running.
* SSA will "self-clear" (audible and visual alerts will turn off) if a temporary flow reduction occurs, and then clears itself.
* During the Grace Period, or until stable flow is achieved, the display of a solid LED is normal.

Sensitivity Adjustments:

Near the center of the Processor PCB is a set of dipswitches. Switches 1 and 2 adjust system sensitivity. Factory settings provide mid-range sensitivity to flow reduction. We suggest that you operate with the factory setting for a period of time before making sensitivity adjustments. Switch settings may be changed to increase or decrease tolerance.

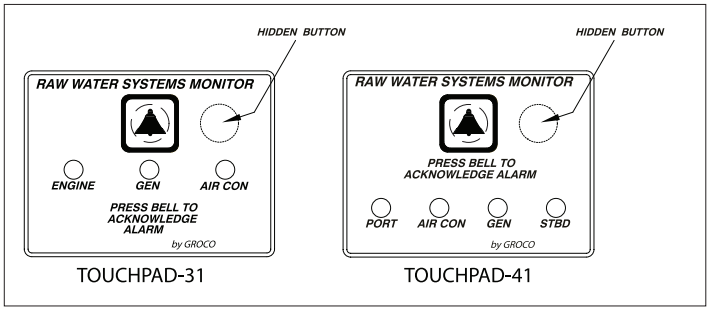
Switch-1	Switch-2	Restriction Tolerance
OFF	OFF	Low (alert will trigger sooner)
OFF	ON	Mid-range (factory setting)
ON	OFF	High
ON	ON	Very high (not recommended)

*Switch-3 is factory-set to "off". DO NOT alter Switch-3.
*Switch-4 is factory-set to "off". DO NOT alter Switch-4.

Calibration Overview: Calibration teaches the Processor the unique plumbing and flow characteristics of each connected device, and enables SSA to distinguish between normal and below normal flow over the full range of operating conditions.

Air conditioners, generators, circulator pumps, refrigeration pumps, and R/O systems operate at a constant speed, so one calibration flow rate is required. Propulsion engines operate at variable speed, determined by throttle setting, so calibration is required at multiple throttle settings.

Calibration takes place at the helm (or at any location if multiple stations are installed) and can be conducted by one person, but we suggest calibrating with two persons - one to operate the vessel and one to perform the calibration.



TOUCHPAD-31 TOUCHPAD-41

The touchpad has two buttons – an "acknowledge" (bell) button and a hidden button located next to the bell button. Lightly pass your finger over the hidden button location to detect a slight bump. Both buttons will be used during calibration.

You may calibrate constant speed devices (generators, air conditioners and pumps) while at berth, but engines must be calibrated in open water where full throttle operation is safe.

Calibration notes:

*Before calibrating any device check these maintenance items that will affect flow rate:

-The raw water strainer filter basket is clean

-Pumps impellers have no broken or missing blades

-The seacock is fully open and clear

-Plumbing connections are tight and free of leaks

-There are no hose kinks

*Calibration mode will automatically end if no buttons are pressed for five minutes. You will not lose calibrations already successfully completed.

*If a calibration attempt is not successful you will hear 2 short beeps and the corresponding LED will return to a solid light. Refer to the Troubleshooting Section.

TO CALIBRATE CONSTANT SPEED DEVICES:

1. Turn on the pump, air conditioner or generator and observe that raw water flow is present.
2. To enter calibration mode – press and hold both buttons for 3 seconds. All LEDs will flash 3 times to confirm Calibration Mode. Release both buttons. A solid LED identifies which device is offered for calibration. If this is not the device you want to calibrate press the hidden button to advance to other devices. When the device you want to calibrate is indicated by a solid LED press the bell button to accept this device; the LED will flash at a one second interval.
3. To calibrate the device - press the bell button. Rapid beeping indicates that the Processor is collecting data. When data collection is complete the LED will automatically advance to the next device.
4. When the device you want to calibrate is indicated by a solid LED press the bell button to accept this device; the LED will flash at a one second interval.
5. Repeat step 3 for each constant speed device.
6. To exit calibration mode - press and hold both buttons for 3 seconds. All LEDs will blink three times, the horn will beep simultaneously, and the LED's will cycle to indicate that the calibration mode has been exited.

TO CALIBRATE ENGINES:

Engine Calibration Note: Engines with 3/4" to 1-1/2" plumbing will collect flow data quickly (in about 2 seconds). Engines with 2" and larger plumbing may take up to 10 seconds to collect flow data.

The data collection process is indicated by rapid beeping. Do not change throttle setting or make touchpad selections during data collection.

1. Run the engine(s) at idle speed and confirm that water flow is present. Proceed to open water (you will have to operate at idle speed and at full throttle to complete the calibration process for each engine).
2. To enter calibration mode - press and hold both buttons. All LEDs will flash 3 times to confirm Calibration Mode. Release both buttons. A solid LED identifies which device is offered for calibration. If this is not the engine you want to calibrate, press the hidden button to advance to the next engine. Press the bell button to accept the engine for calibration.
3. To calibrate this engine at idle speed - press the bell button again; rapid beeping indicates the collection of flow data. When beeping stops, idle speed data collection is complete.
4. The LED flashing rate will increase – accelerate to full throttle WHEN SAFE TO DO SO. After the vessel has reached plane and is running at stable speed wait 15-seconds to allow raw water flow to stabilize.
5. To calibrate this engine at full throttle press the bell button – rapid beeping indicates the collection of flow data. When beeping stops, data collection at full throttle for this engine is complete; the LED will automatically advance to the next device.
6. Repeat steps 3, 4 and 5 for each engine.
7. To exit calibration mode - press and hold both buttons. All LEDs will blink three times, the horn will beep simultaneously, and the LED's will cycle to indicate that the calibration mode has been exited.

Maintenance

Marine growth and debris will impede paddlewheel operation and may trigger false alerts. Clean all flow sensor paddlewheels monthly. First, close the seacock.

The sensor can be removed by grasping the pull-ring and turning it 90-degrees counter-clockwise – then pull straight out. Lubricate the O-Rings (GROCO #2-120) with silicon or Teflon® based grease. DO NOT use petroleum based grease.

TROUBLESHOOTING

INDICATION	PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
During calibration, 2 beeps, then solid LED	Calibration not successful	There is no flow	Check pump, strainer seacock, and hoses
		Cables in wrong jack	Check Figure-2
Audible Alert and Blinking LED during operation	Flow reduction	Debris on sensor	Clean Sensor
		Clogged Strainer	Clean Strainer
		Damaged Pump Impeller	Replace Impeller
		Failed Pump Motor	Replace Motor
		Partially Closed Seacock	Open Seacock
		Kinked Hose	Replace Hose
Alerts flashing and beeping		SSA not calibrated	Calibrate system
No LED flash when consumer is on	No power	Blown fuse	Replace fuse
		Power cord disconnected	Connect power cord
No self-test routine	No power	Blown fuse	Replace fuse
		Power cord disconnected	Connect power cord