INTRODUCTION OF A NOVEL CHLORINE GENERATOR
IN GHANA, UGANDA, AND ETHIOPIA HEALTH SYSTEMS

Learning brief: Building capacity of health staff across the health system in operation and maintenance of the Aqua Research STREAM™ Disinfectant Generator

July 2025


Photo: Thomas Mugunya

Aqua Research STREAM device operator observing the device while it produces hypochlorite disinfectant.

Background

The Aqua Research STREAM™ Disinfectant Generator is an on-site electrolytic chlorine generator designed specifically for low-resource settings. It produces a consistent flow of 0.5 percent (5,000 milligrams per liter) chlorine solution using salt, water, and electricity. The chlorine solution can be used to disinfect surfaces and medical equipment, supporting infection prevention and control (IPC) practices and preventing the spread of health care–associated infections (HAIs).

HAIs pose a significant threat globally, disproportionately affecting vulnerable populations such as mothers and newborns in low- and middle-income countries. In Ethiopia, a systematic review indicated a pooled HAI prevalence of 16.96 percent.[1] Sepsis, a consequence of these infections, contributed to over 33 percent of neonatal deaths[2] and 14.68 percent of maternal deaths.[3] Similarly, Ghana faces a substantial burden, with inpatient HAI rates averaging 8.2 percent,[4] with sepsis contributing to maternal and neonatal mortality. Uganda also experiences a high HAI burden, estimated at 28 percent of patients, further exacerbating maternal (10 percent)[5] and newborn (18 percent)[6] deaths linked to sepsis. Most of these reported HAIs are preventable.

This document is part of the STREAM learning brief series and focuses on training and capacity-building approaches for health staff to support the national adoption and scale-up of the Aqua Research STREAM™ Disinfectant Generator (STREAM) across national health care systems. This brief reflects key lessons learned from the implementation of STREAM in Ethiopia, Ghana, and Uganda. It serves as a guide for national and subnational health staff seeking to effectively implement and use the STREAM device to strengthen infection prevention and control practices. By equipping health care workers with the knowledge and skills necessary to operate and maintain the STREAM, facilities can increase its long-term impact and sustainability.

[1] Alemu AY, Endalamaw A, Belay DM, Mekonen DK, Birhan BM, Bayih WA. Healthcare-associated infection and its determinants in Ethiopia: a systematic review and meta-analysis. *PLOS One*. 2020;15(10):e0241073. https://doi.org/10.1371/journal.pone.0241073

[2] Ali MM, Kwatra G, Mengistu M, et al. Trends of neonatal sepsis and its etiology at Hawassa, Ethiopia: a five year retrospective cross-sectional study. *BMC Pediatrics*. 2025;25(1):152. doi:10.1186/s12887-025-05515-w

[3] Mekonnen W, Gebremariam A. Causes of maternal death in Ethiopia between 1990 and 2016: systematic review with meta-analysis. *Ethiopian Journal of Health Development*. 2018;32(4). https://www.ajol.info/index.php/ejhd/article/view/182583

[4] Labi AK, Obeng-Nkrumah N, Owusu E, et al. Multi-centre point-prevalence survey of hospital-acquired infections in Ghana. *Journal of Hospital Infection*. 2019;101(1):60–68. https://doi.org/10.1016/j.jhin.2018.04.019

[5] Countdown to 2030 Uganda. The Countdown profiles: A tool for action. Accessed July 21, 2025. https://data.unicef.org/countdown-2030/country/Uganda/1/

[6] United Nations Children's Fund (UNICEF). *Maternal and Newborn Health Disparities Uganda*. UNICEF; 2015. https://data.unicef.org/wp-content/uploads/country_profiles/Uganda/country%20profile_UGA.pdf

One factor contributing to these high infection rates is the inconsistent availability of chlorine, which is recommended for IPC.

The introduction of the STREAM into health care facilities in Ethiopia, Ghana, and Uganda can strengthen IPC practices in district facilities and health centers that have access to water and electricity by improving the availability of chlorine for these practices.[7] However, as with any health intervention[8] its introduction should not be a standalone solution. Through a systems-based approach[9] that addresses activities related to installation, operation, maintenance, and long-term sustainability, along with a comprehensive IPC training program and capacity, the introduction, adoption, and scale of the STREAM can greatly contribute to improved public health outcomes. This approach provides health care workers and biomedical engineers with the necessary tools and skills to implement water, sanitation, and hygiene (WASH) practices, contributing to a reduction in HAIs and improved public health.

Installation and operation

Strategic site preparation

Site preparation for STREAM device installation involves selecting appropriate health facilities that meet multiple criteria. The following should be considered: history of chlorine stockouts and variable or insufficient chlorine stock volumes (evidenced by documented records or verbal feedback from staff), average chlorine demand volumes of 400 to 800 liters of 0.5 milligrams per liter per month (to ensure sufficient chlorine coverage), access to on-site water and energy sources (mains or solar), and commitment by health administration and staff to use STREAM chlorine supply. Districts with high IPC and WASH service gaps identified through national surveys should be prioritized.

Within health facilities, selecting an appropriate location for the STREAM device should be based on several criteria: access to a reliable electricity source, proximity to a water source, presence of a wet area to manage spillage, and a central, secure location—especially near critical wards such as labor units, operating theaters, and other areas relying heavily on chlorine for disinfection. In short, health facility administrators and in-charge nurses should identify suitable, central, secure locations within the facility for STREAM placement.

Training recommendations

Trainers should provide two main trainings during installation: (1) a centralized training for district technicians/equipment managers/clinical engineers focusing on STREAM device maintenance, repair, troubleshooting, and technical support; and (2) on-site training for STREAM operators and chlorine users at each health facility on how to operate the device, monitor and record chlorine output, and clean, maintain, and troubleshoot the STREAM. Trainers should also ensure that operator manuals (see Operation and Maintenance Manual), troubleshooting guides (see Troubleshooting and Operator Flowchart), consumables, and monitoring forms are provided at each site. Additionally, trainers should conduct IPC mentorships in conjunction with the ministry of health and provide supportive supervision to reinforce correct cleaning procedures and integration of STREAM chlorine use. Where knowledge and skill level gaps are present, a facility-based refresher training on IPC is recommended.

Staff and stakeholder roles

STREAM installation requires the involvement of several key stakeholders, each with clearly defined roles and responsibilities:

Trainers/implementers. Lead the overall installation process and conduct operator trainings on device use, monitoring, cleaning, maintenance, and troubleshooting; provide consumables and monitoring forms; offer technical support both remotely and in person; and coordinate with district technicians and health facility staff. During our studies, PATH staff co-led trainings with Ministry of Health officials in Uganda, Ghana, and Ethiopia and collected data during monitoring visits.

Ministries of health. Collaborate with trainers in planning and executing installations; lead IPC mentorships and supportive supervision during monitoring visits; participate in training sessions; provide guidance and feedback throughout implementation; and support long-term integration and ownership of STREAM operational needs.

Health facility administrators and in-charge nurses. Identify appropriate locations for STREAM devices within facilities based on criteria such as electricity and water access; select primary device operators; ensure commitment and adherence of health staff to using STREAM chlorine; and support ongoing use and integration into IPC practices.

STREAM operators and chlorine users. Attend trainings on operating, monitoring, maintaining, and troubleshooting the STREAM device; generate chlorine daily; complete monitoring forms; and communicate any issues to STREAM device technicians.

Biomedical engineers and technicians. Attend centralized training on STREAM operation, maintenance, repair, and troubleshooting; provide technical support to health facilities either remotely or through site visits; set up a WhatsApp group for sharing knowledge and resolving issues alongside implementers, the ministry of health, and Aqua Research representatives; and liaise with in-country

[7] Drolet A, Mugumya T, Hsu S, et al. Performance and acceptability of the STREAM Disinfectant Generator for infection prevention and control practices in primary health care facilities in Uganda. *Antimicrobial Resistance and Infection Control*. 2024;13(1):77. https://doi.org/10.1186/s13756-024-01433-1

[8] Diaconu K, Chen Y-F, Cummins C, Jimenez Moyao G, Manaseki-Holland S, Lilford R. Methods for medical device and equipment procurement and prioritization within low- and middle-income countries: findings of a systematic literature review. *Globalization and Health*. 2017;13(1):59. https://doi.org/10.1186/s12992-017-0280-2

[9] United Nations UN Water. SDG 6 Global Acceleration Framework. Accessed July 7, 2025. https://www.unwater.org/our-work/sdg-6-global-acceleration-framework

STREAM distributors and Aqua Research to address technical support needs and provide spare parts.

Aqua Research. Provide technical guidance and support as needed, especially for complex repairs or device analysis, and name of contact for troubleshooting.

In our three implementation countries (Ethiopia, Ghana, and Uganda), PATH worked with the ministries of health and facility staff to finalize device placement across regions and within health facilities, installed one or two STREAM units depending on chlorine demand, and ensured sites were ready for operation. PATH and ministry of health counterparts also conducted operator trainings, provided consumables and monitoring forms, and established workflows for chlorine production and use. Facility staff committed to using STREAM chlorine and maintaining backup chlorine stocks. Coordination with technicians for ongoing maintenance support was also arranged.

Case studies: Installation approaches in Ghana and Uganda health facilities

In Uganda, site preparation included selecting health facilities—general hospitals and health center IVs—that aligned with the STREAM's chlorine production capacity and demand levels, as recommended by Uganda's National Advisory Committee on Medical Equipment. Facilities had to have documented commercial chlorine stock records showing at least one stockout period of 24 hours or more in the past year, reflecting local supply challenges. The selection also prioritized districts and facilities with preexisting WASH support structures identified through national surveys (e.g., UNICEF/Ministry of Water and Environment WASH survey) indicating low environmental cleanliness scores and high IPC needs. Additionally, installation planning involved coordination with Uganda's Ministry of Health Clinical Services Department and district health management teams to ensure alignment with national IPC guidelines and integration into existing health system workflows. Commitment from local hospital administrators and staff was emphasized to address contextual operational realities and promote sustained use within Uganda's public health system.

Similarly in Ghana, health facility selection was done after a validation visit to several identified facilities. The validation conducted in collaboration with national and regional Ghana Health Service leadership focused on selecting facilities based on their chlorine consumption records, existing IPC structures and their effectiveness, suitability of their infrastructure, and past record of commitment of facility management to integrate new initiatives and innovations into their operations. Above all, facilities were selected based on their need for consistent chlorine supply for their IPC practices.

Installation considerations: Human resources and health facility infrastructure

The introduction of the STREAM device has introduced new human resource demands, with users reporting increased workload due to device operation, troubleshooting, frequent cleaning, and the management of chlorine production timelines, potentially increasing staff burden. To proactively address these issues, it is important to train multiple primary users at each health facility, and some facilities design rosters for primary users so there is always someone available to operate the device. This includes involving all relevant health staff to raise awareness about the STREAM and the advantages of its chlorine, talking about and promoting proper chlorine dilution practices, and highlighting common issues with commercial chlorine quality to encourage the use of STREAM chlorine. Additionally, generating facility-level demand by engaging hospital administrators, in-charge nurses, and chlorine users helps integrate STREAM chlorine as the primary disinfectant, ensuring consistent production and use aligned with IPC goals.

Local conditions should be carefully considered prior to the installation process. These include:

Water quality. High calcium and magnesium contents in local water sources can cause technical problems, such as rapid scaling and leaks in reaction chambers. Therefore, STREAM deployments should include water hardness testing and may need to incorporate pretreatment solutions, such as reverse osmosis systems, to address mineral content. For facilities with high calcium content, rainwater is recommended as the best source of water.

Power stability. Unstable electricity can lead to power surges. While the STREAM includes a 10,000-volt surge protector, additional protection should be integrated into installation sites, and implementers should prioritize access to more reliable power sources or consider backup power options at the facility, such as solar power systems.

Transportation. Difficulties in delivering the STREAM device and its consumables (e.g., salt, vinegar) and replacement parts to remote health facilities due to poor road infrastructure, long distances, and potential logistical delays can hinder installation, maintenance, and continuous operation. Leveraging local markets and in-country STREAM technical staff for consumables and spare parts offers effective options for continued STREAM use.

Integration with infection prevention and control

Ministry of health officials and district IPC focal persons should concurrently conduct on-site IPC mentorships and supportive supervision at both intervention and control facilities during monitoring visits. These mentorships and the supportive supervision should focus on addressing identified IPC gaps and include practical demonstrations of standard cleaning procedures using chlorine disinfectants as well as on-the-job coaching. Trainers should emphasize the use of STREAM-generated chlorine as the primary disinfectant in these trainings, ensuring that health workers understand both the operation of the device and proper disinfection practices. This approach helps to reinforce correct chlorine use, improve adherence to IPC guidelines, and support sustainable improvements in health care facility hygiene.

The following examples highlight governmental efforts and collaborative initiatives in Ethiopia, Ghana, and Uganda to improve IPC and WASH services in support of the STREAM.

An assessment covering the eight World Health Organization IPC core components found significant gaps in IPC education and training levels among Ugandan health staff and in supervision, monitoring, and auditing of IPC practices, along with inadequate HAI surveillance systems.[10,11] To address this, the Ugandan government has made substantial commitments to improving IPC and WASH services in health facilities across the country. Examples include the development and release of the *Uganda National Infection Prevention and Control Guidelines 2013*; efforts to strengthen IPC education, training, supervision, monitoring, and auditing practices among health staff; and initiatives to improve HAI surveillance systems and training programs connected to their health services aimed at reducing infectious diseases.

The Ghana Health Service and other agencies of the Ministry of Health have made significant efforts to improve the quality of WASH services, including IPC training.[4,12] The Ghana Health Service's recent 2024 to 2028 national strategy provides updated guidelines to boost IPC capabilities, monitoring, and the tracking of HAIs nationwide.[13] Furthermore, the National Healthcare Quality Strategy from 2017 to 2021 highlights the importance of consistently having IPC resources, equipment, and necessary WASH infrastructure in health care settings.[14,15] The national IPC/WASH Taskforce, established in 2016, has been crucial in making professional training and skills development for health workers standard practice.

However, challenges persist; a review of IPC preparedness in 56 Ghanaian health facilities revealed considerable shortcomings, including a lack of clear IPC goals, inadequate funding, inconsistent required training, and limited availability of vital IPC supplies.[16]

The Ethiopia Ministry of Health recognizes the importance IPC plays in preventing HAIs, as evidenced by its national infection control policy.[17] The Ethiopian government, through the Ministry of Health, Addis Ababa City Administration Health Bureau, and Amhara Regional Health Bureau, plays a collaborative role in strengthening IPC efforts. They partner with organizations like PATH and Millennium Water Alliance to introduce and assess on-site chlorine generation technology (e.g., STREAM) in health care facilities. The government is involved in providing IPC training facilitated by Ministry of Health experts, supporting project implementation in selected health centers and woredas, and contributing personnel for training workshops. Their engagement aligns with national WASH strategies and IPC guidelines aimed at improving health care quality and patient safety across the country.

Within these programs, PATH and the ministries of health have integrated the STREAM using capacity-building approaches to support the effective use and maintenance of the STREAM. According to the staff member in charge of the maternity ward at Masindi General Hospital in Uganda, "The cases of sepsis at postnatal ward has greatly reduced because we now pour out the chlorine once it changes color since we have enough chlorine, unlike before when we only disinfect a few areas because we have very limited volume of Jik [chlorine]."

Maintenance and repair

The biomedical engineer (or the designated technical point of contact for maintenance) should be present during the STREAM training sessions. This role involves being the technical expert responsible for the maintenance and troubleshooting of the STREAM, ensuring its proper operation and addressing any technical issues that arise with the device.

Regional biomedical engineers should already be familiar with common mechanical and user errors, diagnostic procedures, and repairs so that they can build local technical capacity for ongoing support or receive their own training. If a device cannot be fixed on-site, backup units stored at the regional level can be deployed. Malfunctioning devices may be sent back to the manufacturer for further analysis. This minimizes downtime and ensures continuous chlorine production while building sustainable maintenance capacity locally.

For instance, in Uganda, local technicians addressed technical challenges with the STREAM devices, such as repairing leaking reaction chambers resulting from calcium scaling and pressure buildup and reinforcing poorly soldered circuit board connections with more durable replacement parts. To illustrate further, technicians in Uganda specifically replaced reaction chambers to resolve leaks, added an outer titanium plate to the cathode housing to prevent warping and subsequent leaks, upgraded circuit board socket connectors for enhanced robustness, and improved the power supply to the control box connector to a higher-rated version to prevent overheating.

Similarly, during evaluations in Ghana, local technicians successfully resolved various issues with the STREAM

[10] Uganda Ministry of Health. *National Infection Prevention and Control Survey Report*. Uganda Ministry of Health; 2019.

[11] Opollo MS, Otim TC, Kizito W, et al. Infection prevention and control at Lira University Hospital, Uganda: more needs to be done. *Tropical Medicine and Infectious Disease*. 2021;6(2):69. https://doi.org/10.3390/tropicalmed6020069

[12] Sunkwa-Mills G, Senah K, Breinholdt M, Aberese-Ak M, Tersbøl BP. A qualitative study of infection prevention and control practices in the maternal units of two Ghanaian hospitals. *Antimicrobial Resistance and Infection Control*. 2023;12(1):125. https://doi.org/10.1186/s13756-023-01330-z

[13] Ghana Ministry of Health. MOH launches National Infection Prevention and Control Strategy. Accessed March 17, 2025. https://www.moh.gov.gh/moh-launches-national-infection-prevention-and-control-strategy/

[14] Ghana Ministry of Health. *Ghana National Healthcare Quality Strategy (2017-2021)*. Ghana Ministry of Health; 2016. https://www.moh.gov.gh/wp-content/uploads/2017/06/National20Quality20Strategy20Ghana.pdf

[15] World Health Organization (WHO). *Report on the Burden of Endemic Health Care-Associated Infection Worldwide*. WHO; 2011. https://apps.who.int/iris/handle/10665/80135

[16] Oppong TB, Amponsem-Boateng C, Kyere EKD, et al. Infection prevention and control preparedness level and associated determinants in 56 acute healthcare facilities in Ghana. *Infection and Drug Resistance*. 2020;13:4263–4271. https://doi.org/10.2147/IDR.S273851

[17] Ethiopia Ministry of Health. *National Infection Prevention and Control Policy*. Ethiopia Ministry of Health; 2021. http://repository.iphce.org/bitstream/handle/123456789/1701/1_National_Infection_Prevention_and_Control_Policy_Final_Version.pdf?sequence=1&isAllowed=y

devices. Their interventions included replacing a malfunctioning controller board plagued by loose circuit connections, substituting two power supplies likely damaged by sustained high voltage despite surge protection, repairing circuit boards affected by connection problems or overheating by replacing components such as a diode and stepper board, and resolving a leaking reaction cell due to calcium scale accumulation. These repairs, involving component replacements, directly informed manufacturer enhancements such as the implementation of more secure cable connections.

Sustained use

A comprehensive socialization strategy is needed to ensure national, regional, and district staff effectively support the STREAM long term. For example, in Uganda, PATH and the Ministry of Health Clinical Services Department held meetings with district health management teams in all target districts to ensure broad awareness among relevant district staff such as technicians and IPC focal persons. Health facility administrators were provided with detailed information sheets explaining the study. Trainings for operators, chlorine users, and maintenance technicians emphasized not only technical skills but also the benefits and integration of STREAM chlorine into existing IPC practices. Ongoing communication through WhatsApp groups facilitated knowledge sharing and troubleshooting among technicians and stakeholders. These efforts helped encourage ownership, ease adoption, and support sustained use within Uganda's public health system.

In Ghana, sustained use of the STREAM has been achieved by strong collaboration between leaders of the Ghana Health Service at the national, regional, district, and health facility levels at all stages of the piloting process, including planning and executing the installation, training, and monitoring exercises. This has enabled them to take ownership of the device and ensure its sustained use. Where active monitoring has been completed, lines of communication have been established for PATH support and for procurement of consumables and parts from Aqua Research representatives in Ghana, ensuring that technical challenges are resolved in the shortest possible time.

Furthermore, establishing collaborations with parts distributors for the STREAM may involve formalizing supply agreements with Aqua Research and its regional partners or directly contacting Aqua Research to identify local authorized distributors that stock and supply replacement components.

Overall lessons learned from implementation sites

Prioritize engagement in tailored training sessions. PATH found that for effective STREAM trainings, participant engagement is important. Trainings should:

- Actively involve participants through a hands-on experiential approach where device users practice each step—from setting up the brine solution to operating and cleaning the device—to ensure they gain practical experience.
- Use varied formats that include reading and explaining steps, followed by participant practice and group review to reinforce learning.
- Ensure training content is directly relevant to each participant's specific role and context. For example, hospital administrators should identify primary users from medical store staff or cleaners, and instructions on daily chlorine production and monitoring could be tailored to health care wards such as surgery theaters and maternity units.

Emphasize real-world applications, including preparing precise brine solutions, troubleshooting common errors indicated by LED lights, and performing regular cleaning cycles to prevent scale buildup (see our best practices manual).

Pair installation and trainings with IPC refresher training for health impact. PATH has also learned that pairing the installation and training on the use of the STREAM with IPC refresher trainings goes a long way toward improving skills for device use and impacts on IPC practices. With the introduction of the STREAM, there is renewed enthusiasm for IPC, and these refresher trainings provide an opportunity to leverage this enthusiasm to build on the existing knowledge, skills, and capacity of health care staff in this regard. Key outcomes that PATH has observed are the formation or reinstatement of IPC focal persons and teams, renewed commitment of facility management to provide other needed logistics to improve IPC practices, and development of action plans and roadmaps for sustainable use of the STREAM and ensuring its full benefits are realized in improving IPC practices. Prior to conducting these refresher trainings, each facility undergoes an assessment to identify key challenges in IPC. The refresher trainings are primarily designed to focus on and address these challenges.

Resources

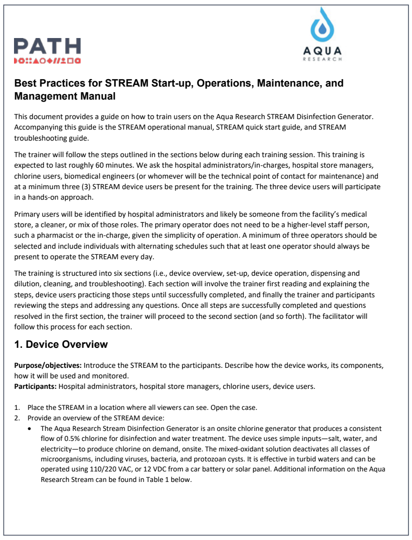
The following section provides a collection of essential resources designed to support the effective use, maintenance, and troubleshooting of the STREAM. These materials are tailored for a variety of users, including health care workers, biomedical engineers, and technicians.

Best Practices for STREAM Start-up, Operations, Maintenance, and Management Manual

Intended for hospital administrators, device users, chlorine users, and biomedical engineers responsible for operating and maintaining the STREAM, this document provides a comprehensive 60-minute training guide covering device overview, setup, start-up, shutdown/storage, cleaning, dilution, and troubleshooting. It details the device's components and function, the preparation of brine solution, power options, tubing assembly, error identification, cleaning cycles to prevent scale buildup, proper dilution for various uses, and step-by-step troubleshooting procedures. The guide emphasizes hands-on practice with at least three operators to ensure continuous daily use and includes monitoring and supply management protocols during the study period.

English: https://aquaresearch.com/wp-content/uploads/2025/07/1_Training-manual-checklist_EN.pdf

Portuguese: https://aquaresearch.com/wp-content/uploads/2025/07/2_Training-manual-checklist_PT.pdf



PATH

AQUA RESEARCH

Best Practices for STREAM Start-up, Operations, Maintenance, and Management Manual

This document provides a guide on how to train users on the Aqua Research STREAM Disinfection Generator. Accompanying this guide is the STREAM operational manual, STREAM quick start guide, and STREAM troubleshooting guide.

The trainer will follow the steps outlined in the sections below during each training session. This training is expected to last roughly 60 minutes. We ask the hospital administrators/in-charges, hospital store managers, chlorine users, biomedical engineers (or whomever will be the technical point of contact for maintenance) and at a minimum three (3) STREAM device users be present for the training. The three device users will participate in a hands-on approach.

Primary users will be identified by hospital administrators and likely be someone from the facility's medical store, a cleaner, or mix of those roles. The primary operator does not need to be a higher-level staff person, such a pharmacist or the in-charge, given the simplicity of operation. A minimum of three operators should be selected and include individuals with alternating schedules such that at least one operator should always be present to operate the STREAM every day.

The training is structured into six sections (i.e., device overview, set-up, device operation, dispensing and dilution, cleaning, and troubleshooting). Each section will involve the trainer first reading and explaining the steps, device users practicing those steps until successfully completed, and finally the trainer and participants reviewing the steps and addressing any questions. Once all steps are successfully completed and questions resolved in the first section, the trainer will proceed to the second section (and so forth). The facilitator will follow this process for each section.

1. Device Overview

Purpose/objectives: Introduce the STREAM to the participants. Describe how the device works, its components, how it will be used and monitored.
Participants: Hospital administrators, hospital store managers, chlorine users, device users.

1. Place the STREAM in a location where all viewers can see. Open the case.
2. Provide an overview of the STREAM device:
   - The Aqua Research Stream Disinfection Generator is an onsite chlorine generator that produces a consistent flow of 0.5% chlorine for disinfection and water treatment. The device uses simple inputs—salt, water, and electricity—to produce chlorine on demand, onsite. The mixed-oxidant solution deactivates all classes of microorganisms, including viruses, bacteria, and protozoan cysts. It is effective in turbid waters and can be operated using 110/220 VAC, or 12 VDC from a car battery or solar panel. Additional information on the Aqua Research Stream can be found in Table 1 below.

Quick Start Guide

Primarily intended for health care workers who frequently use the STREAM, this one-page guide provides step-by-step instructions for preparing and operating the device. It covers preparing the brine solution, setting up and starting the device, shutdown and storage, dilution, cleaning, and troubleshooting common problems. As it outlines the most common day-to-day tasks, it should be laminated and kept near the device for quick reference. More detailed information can be found in the operation and maintenance manual.

English: https://aquaresearch.com/wp-content/uploads/2025/07/3_Quick-start-guide_EN.pdf

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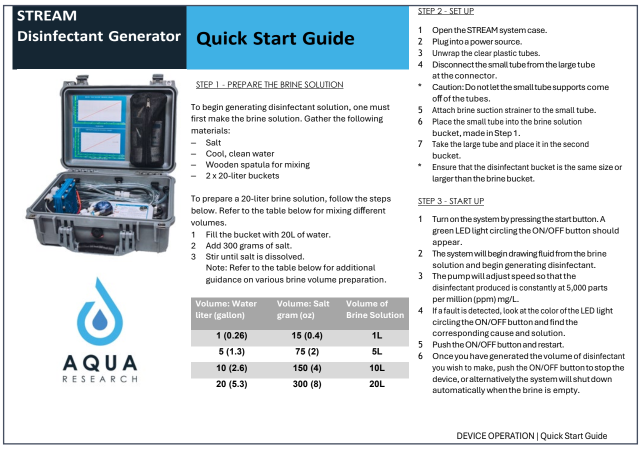
Portuguese: https://aquaresearch.com/wp-content/uploads/2025/07/5_Quick-Start-Guide_PT.pdf



STREAM Disinfectant Generator

Quick Start Guide

STEP 1 - PREPARE THE BRINE SOLUTION

To begin generating disinfectant solution, one must first make the brine solution. Gather the following materials:
- Salt
- Cool, clean water
- Wooden spatula for mixing
- 2 x 20-liter buckets

To prepare a 20-liter brine solution, follow the steps below. Refer to the table below for mixing different volumes.
1. Fill the bucket with 20L of water.
2. Add 300 grams of salt.
3. Stir until salt is dissolved.
   Note: Refer to the table below for additional guidance on various brine volume preparation.

Volume: Water liter (gallon)	Volume: Salt gram (oz)	Volume of Brine Solution
1 (0.26)	15 (0.4)	1L
5 (1.3)	75 (2)	5L
10 (2.6)	150 (4)	10L
20 (5.3)	300 (8)	20L

STEP 2 - SET UP

1. Open the STREAM system case.
2. Plug into a power source.
3. Unwrap the clear plastic tubes.
4. Disconnect the small tube from the large tube at the connector.
* Caution: Do not let the small tube supports come off of the tubes.
5. Attach brine suction strainer to the small tube.
6. Place the small tube into the brine solution bucket, made in Step 1.
7. Take the large tube and place it in the second bucket.
* Ensure that the disinfectant bucket is the same size or larger than the brine bucket.

STEP 3 - START UP

1. Turn on the system by pressing the start button. A green LED light circling the ON/OFF button should appear.
2. The system will begin drawing fluid from the brine solution and begin generating disinfectant.
3. The pump will adjust speed so that the disinfectant produced is constantly at 5,000 parts per million (ppm) mg/L.
4. If a fault is detected, look at the color of the LED light circling the ON/OFF button and find the corresponding cause and solution.
5. Push the ON/OFF button and restart.
6. Once you have generated the volume of disinfectant you wish to make, push the ON/OFF button to stop the device, or alternatively the system will shut down automatically when the brine is empty.

DEVICE OPERATION | Quick Start Guide

STREAM Disinfectant Generator Operation and Maintenance Manual

Intended for health care workers and users tasked with installing, operating, maintaining, or troubleshooting the STREAM, this manual provides detailed operation and maintenance instructions. It is provided with each device purchased, and it includes specifications, safety warnings, regulatory compliance information, system component descriptions, installation guidelines, start-up procedures, maintenance protocols, troubleshooting steps, and storage recommendations.

English: https://aquaresearch.com/wp-content/uploads/2025/07/6_STREAM-OM-MANUAL-AR-SMALL-VERSION-REV-K-070925_EN.pdf

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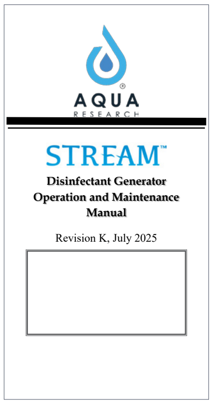

AQUA RESEARCH

STREAM™

Disinfectant Generator Operation and Maintenance Manual

Revision K, July 2025

Troubleshooting and Operator Flowchart

This flowchart is designed to help troubleshoot common error codes generated by the STREAM system, providing troubleshooting steps based on LED color indicators and problem symptoms. It identifies potential causes, including power supply issues, brine salt concentration problems, clogged tubing or cells, ruptured discs, overheating, pump malfunctions, moisture leaks, low chlorine production, and calcium carbonate fouling. For each issue, the guide provides specific mitigation. More detailed guidance can be found in the STREAM operation and maintenance manual.

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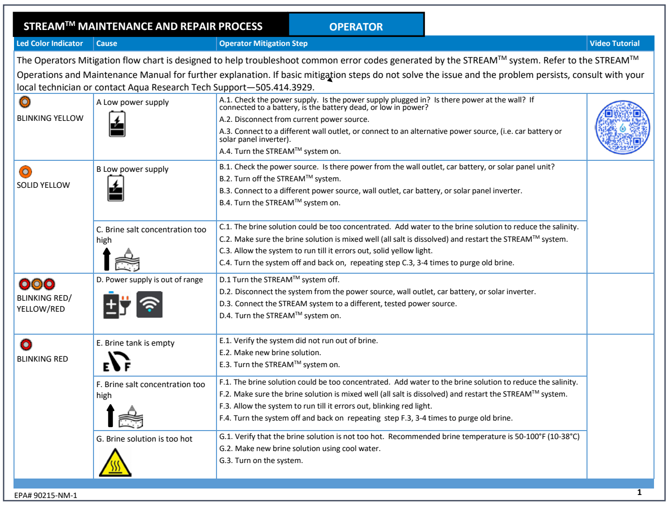

STREAM™ MAINTENANCE AND REPAIR PROCESS — OPERATOR

Led Color Indicator	Cause	Operator Mitigation Step	Video Tutorial
The Operators Mitigation flow chart is designed to help troubleshoot common error codes generated by the STREAM™ system. Refer to the STREAM™ Operations and Maintenance Manual for further explanation. If basic mitigation steps do not solve the issue and the problem persists, consult with your local technician or contact Aqua Research Tech Support—505.414.3929.			
BLINKING YELLOW	A Low power supply	A.1. Check the power supply. Is the power supply plugged in? Is there power at the wall? If connected to a battery, is the battery dead, or low in power? A.2. Disconnect from current power source. A.3. Connect to a different wall outlet, or connect to an alternative power source, (i.e. car battery or solar panel inverter). A.4. Turn the STREAM™ system on.	
SOLID YELLOW	B Low power supply	B.1. Check the power source. Is there power from the wall outlet, car battery, or solar panel unit? B.2. Turn off the STREAM™ system. B.3. Connect to a different power source, wall outlet, car battery, or solar panel inverter. B.4. Turn the STREAM™ system on.	
	C. Brine salt concentration too high	C.1. The brine solution could be too concentrated. Add water to the brine solution to reduce the salinity. C.2. Make sure the brine solution is mixed well (all salt is dissolved) and restart the STREAM™ system. C.3. Allow the system to run till it errors out, solid yellow light. C.4. Turn the system off and back on, repeating step C.3, 3-4 times to purge old brine.	
BLINKING RED/ YELLOW/RED	D. Power supply is out of range	D.1 Turn the STREAM™ system off. D.2. Disconnect the system from the power source, wall outlet, car battery, or solar inverter. D.3. Connect the STREAM system to a different, tested power source. D.4. Turn the STREAM™ system on.	
BLINKING RED	E. Brine tank is empty	E.1. Verify the system did not run out of brine. E.2. Make new brine solution. E.3. Turn the STREAM™ system on.	
	F. Brine salt concentration too high	F.1. The brine solution could be too concentrated. Add water to the brine solution to reduce the salinity. F.2. Make sure the brine solution is mixed well (all salt is dissolved) and restart the STREAM™ system. F.3. Allow the system to run till it errors out, blinking red light. F.4. Turn the system off and back on repeating step F.3, 3-4 times to purge old brine.	
	G. Brine solution is too hot	G.1. Verify that the brine solution is not too hot. Recommended brine temperature is 50-100°F (10-38°C) G.2. Make new brine solution using cool water. G.3. Turn on the system.	

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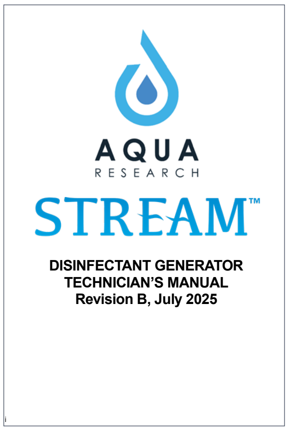
STREAM Disinfectant Generator Technician's Manual

Intended for biomedical officers and other technicians who service the STREAM, this guide offers in-depth instructions for troubleshooting and repair tasks. It covers device components, required tools, and procedures such as addressing scale formation, diagnosing voltage and current errors, resolving pump issues, and responding to low chlorine production.

English: https://aquaresearch.com/wp-content/uploads/2025/07/10_STREAM-TECHNICIANS-MANUAL-REV-B-071025_EN.pdf

Amharic: https://aquaresearch.com/wp-content/uploads/2025/07/11_STREAM-TECHNICIANS-MANUAL-REV-A-050823_AMH.pdf

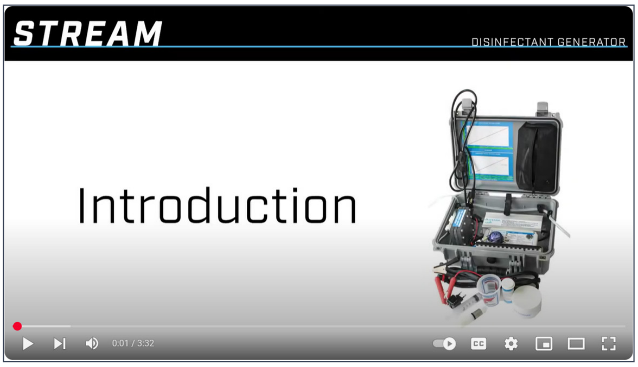


STREAM video series

This series of short videos provides an introduction to the STREAM, instructions for making the brine solution, and guidance on system start-up.

Introduction to the STREAM

English: https://youtu.be/R3Mv1QurNCw

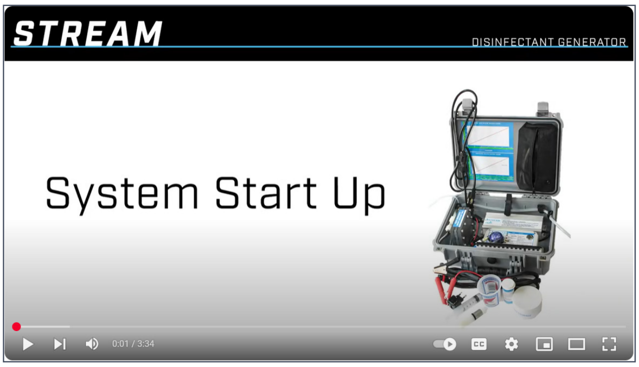


How to make the brine solution

English: https://www.youtube.com/watch?v=2nYX7K4SFlk

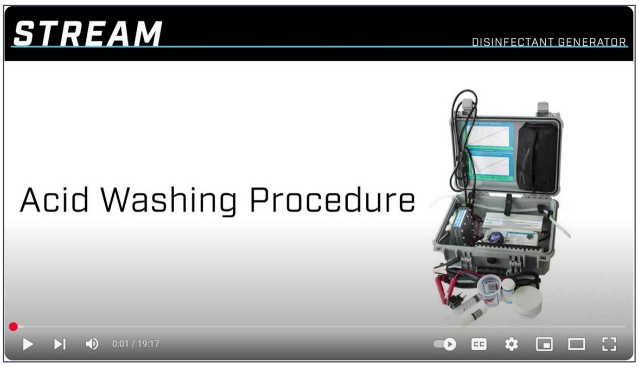
How to start up the STREAM system

English: https://www.youtube.com/watch?v=JD8EGak6NQo



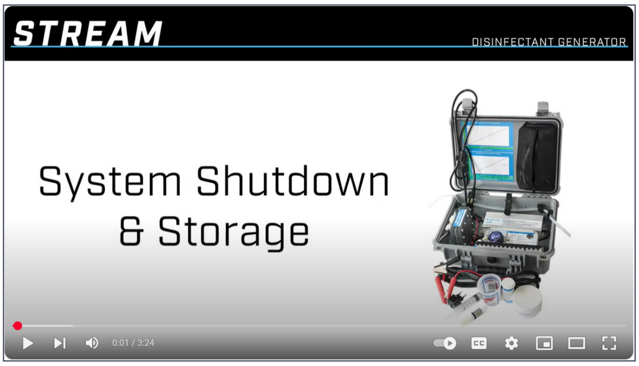
How to clean the STREAM using various acids such as vinegar or diluted muriatic acid

English: https://www.youtube.com/watch?v=Y_7ICrPHor8



How to shut down and store the STREAM

English: https://www.youtube.com/watch?v=IPxDBvWYenc



WASH FIT

Used by more than 70 countries, WASH FIT (the Water and Sanitation for Health Facility Improvement Tool) is a free digital tool developed by the World Health Organization and UNICEF to provide practical steps to help health care facilities improve and maintain their WASH services. Aimed at primary and secondary health facilities in low- and middle-income countries, the tool covers topics related to water, sanitation, hand hygiene, environmental cleaning, health care waste management, energy, and building and facility management.

English: https://www.washinhcf.org/wash-fit/

WASH FIT   Home   Example   My Data

Indicators   Team List   Team Meetings   Hazards

Water

	Indicator	Meets Target +++	Partially Meets Target ++	Does Not Meet Target +	Assessment 2016-12-14	Assessment 2017-02-08	Notes
1.1	Improved water supply piped into facility or on premises	Improved water supply within facility and available	Improved water supply on premises (outside of facility building) and available	No improved water source within facility grounds, or improved supply in place but not available			
1.2	Water services available at all times and of sufficient quantity	Water services available every day and of sufficient quantity	Water services available more than 5 days per week or every day but not sufficient quantity	Water services available fewer than 5 days per week	++	+++	Water has improved
1.3	Drinking water station available	A reliable drinking water station is present at all times and locations and accessible to all	A reliable drinking water station is present sometimes, or only in some places or not available for all users	A reliable drinking water station is not available	++	++	
1.4	Drinking water safe storage	Yes, drinking water is safely stored with cover and tap	All available drinking water points are safely stored	Drinking water points are not safely stored or no drinking water available	+++	+++	
1.6	All end points connected to functioning water supply	Yes, all end points are connected to an available and functioning water supply	More than half of all endpoints are connected to an available and functioning water supply	No, less than half of all endpoints are connected to an available and functioning water supply	+++	+++	
1.7	Water services available throughout the year	Yes, water services are available throughout the year	Water services have shortages for 1–2 months	Water services have shortages for 3 months or more	+	++	Dry season is hard
1.8	Water storage is sufficient	Yes, water storage is sufficient to meet the needs of the facility for 2 days	Water storage to meets more than 75% of the needs of the facility for 2 days	Water storage to meets less than 75% of the needs of the facility for 2 days	+	+++	
1.9	Water treatment meets WHO standards	Yes, water is treated with a proven technology that meets WHO performance standards	Water is treated but not regularly with a proven technology that meets WHO performance standards	Water is not treated with a proven technology that meets WHO performance standards	+++	+++	
1.10	Drinking water has chlorine residual	Yes, drinking water has appropriate chlorine residual or 0 E.Coli/100 ml and is not turbid	Drinking water has chlorine residual exists, but is <0.2mg/l	Drinking Water is not treated/do not know residual/do not have capacity to test residual/no drinking water available	+	+++	

For more information

Contact: Adam Drolet, PATH Product Manager, adrolet@path.org.

This project directly contributes to the Sustainable Development Goals 3 and 6, as well as global WASH in health care facility targets.

6 CLEAN WATER AND SANITATION

Ensure availability and sustainable management of water and sanitation for all

3 GOOD HEALTH AND WELL-BEING

Ensure healthy lives and promote well-being for all at all ages

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Hilton CONRAD N. HILTON FOUNDATION

PATH

PATH is a global nonprofit dedicated to achieving health equity. With more than 40 years of experience forging multisector partnerships, and with expertise in science, economics, technology, advocacy, and dozens of other specialties, PATH develops and scales up innovative solutions to the world's most pressing health challenges.

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