
Zebra RFID + Impinj Gen2X Android Sample App User Guide



Zebra RFID + Gen2X: Android SDK Overview

Zebra RFID + Gen2X

ZEBRA GEN2X: ANDROID SDK & SAMPLE APPLICATION

Zebra's Android SDK Now Supports Powerful Gen2X Features!

Protected Mode

Impinj Protected Mode is a feature that enhances the security and privacy of RAIN RFID (UHF) tags by preventing unauthorized tracking or access to tag data. This mode allows tags to be read only by trusted readers that have the correct access credentials.

TagFocus

TagFocus suppresses all previously read tags, allowing readers to focus on capturing data from tags that haven't been read yet.

Tag Quieting

Tag Quieting explicitly mutes selected tags before inventory scans, ensuring they remain silent until reactivated – reducing congestion and improving read performance.

FastID

FastID enables the impinj tags to backscatter their EPC and TID in a single response for inventory.

Inventory Protocol : Gen2X inventory enhanced performance

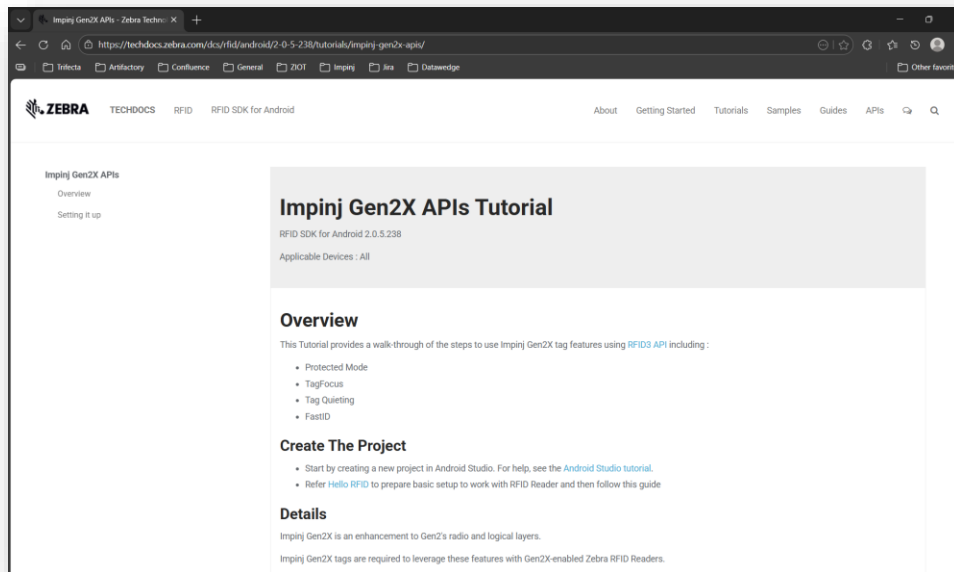
Inventory protocol enables selection of protocol to determine which tags to participate in inventory (e.g., Gen2, Gen2X).

Supported Devices: RFD40, RFD90, EM45 and TC53e-RFID, TC22R

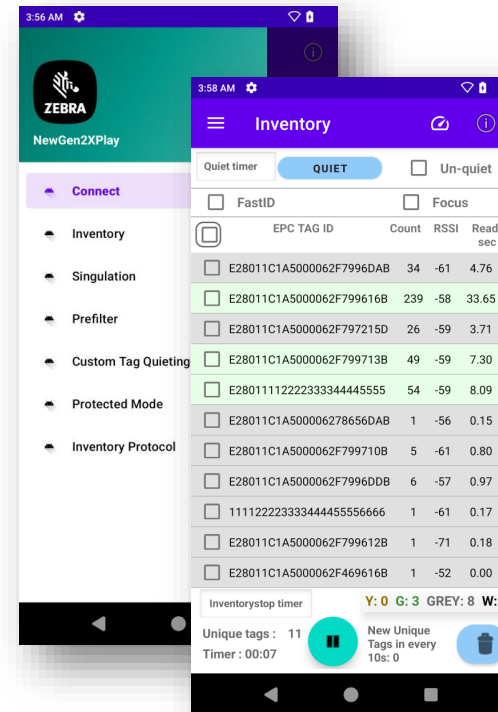
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TechDocs Tutorials



Sample Application + User Guide



And more!

- Gen2X Demo Videos
- Optimizing Gen2X with Zebra RFID Readers: Best Practices and Strategies

NewGen2xPlay Sample App – Getting Started

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What You Need to Know About This Sample App

The NewGen2xPlay sample application is provided solely for demonstration purposes to showcase the features of Impinj Gen2X extensions. The application, source code and accompanying guide are designed to help users explore these features and understand their configuration and functionality.

Please note the following:

- **Demo Purpose:** This sample application is intended as a proof-of-concept tool and should not be used in production environments or as a fully developed solution.
- **Source Code Usage:** The shared source code is provided as a starting point to accelerate the integration of Gen2X features into your existing applications or solutions. It is the user's responsibility to evaluate, customize, and test the code for their specific use cases.
- **Prerequisites:** Ensure you have the required hardware, compatible software, and Gen2X-enabled RFID tags as outlined in the guide before using the sample application.

By using the NewGen2xPlay sample application, you acknowledge and agree to these terms and understand that it is a demonstration tool, not a production-ready application.

[End User License Agreement \(Unrestricted Software\)](#)

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The NewGen2xPlay sample application demonstrates Impinj Gen2X features including Protected Mode, TagFocus, and Tag Quieting.

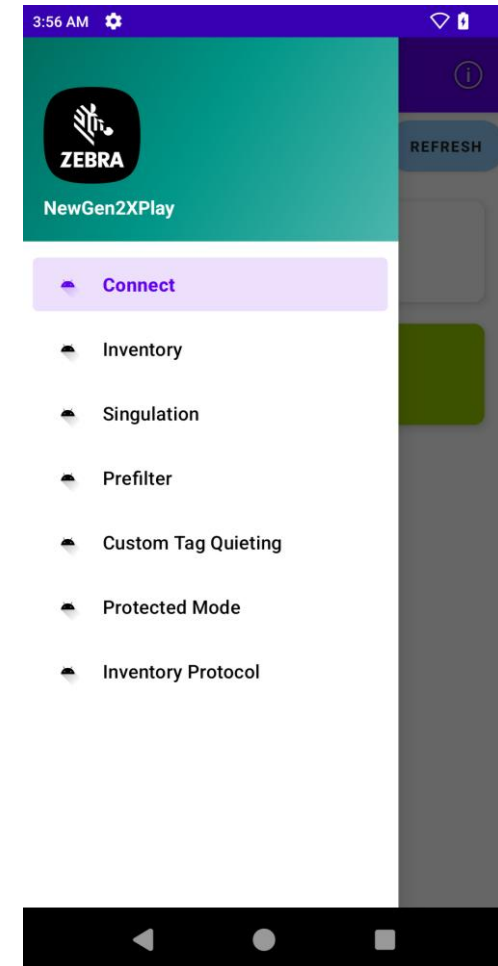
This guide includes:

- Navigation Overview
- General Configuration– (Connect, Inventory, Singulation, Prefilter)
- Gen2X Feature Demo: Tag Focus
- Gen2X Feature Demo: Tag Quieting
- Gen2X Feature Demo: Protected Mode
- Gen2X Feature Demo: Fast ID
- Gen2X enhanced inventory performance

Each feature section includes step-by-step configuration and instructions to demonstrate the feature using the feature-specific screens.

What do I need to use the sample application?

- Mobile Computer w/ Android 10 and later + Zebra RFID Reader (RFD40 or RFD90)
-OR-
Zebra RFID-Enabled Mobile Computer (EM45, TC53e-RFID)
- NewGen2xPlay sample application (download from TechDocs)
- Gen2X-enabled RFID tags (<http://www.impinj.com/Gen2X>)



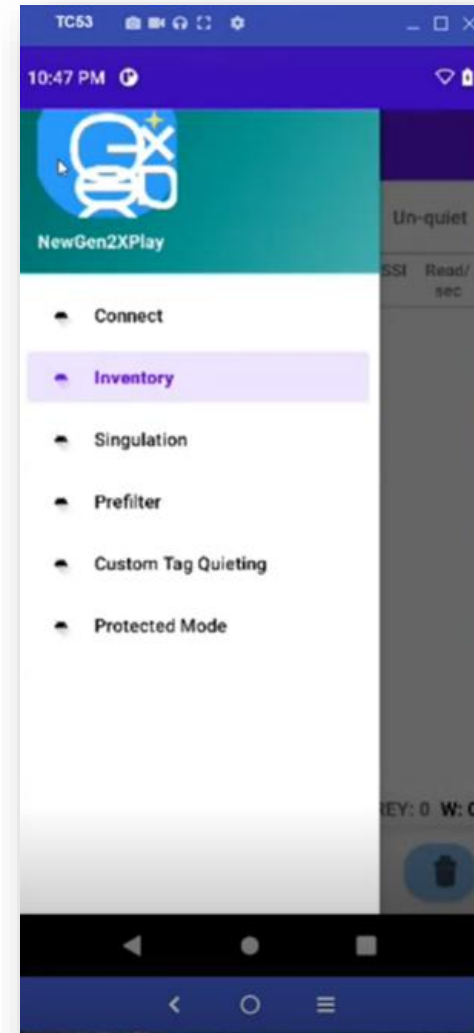
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Navigation

The navigation drawer shows the operations that can be performed using the sample app including:

- **Connect:** Connect to an RFID Reader
- **Inventory :** Read Tags and apply Gen2X features
- **Singulation:** Manage Singulation Settings
- **Prefilter:** Manage Prefilters
- **Custom Tag Quieting:** Manager filters for Tag Quieting
- **Protected Mode:** Enable/Disable Protected Mode

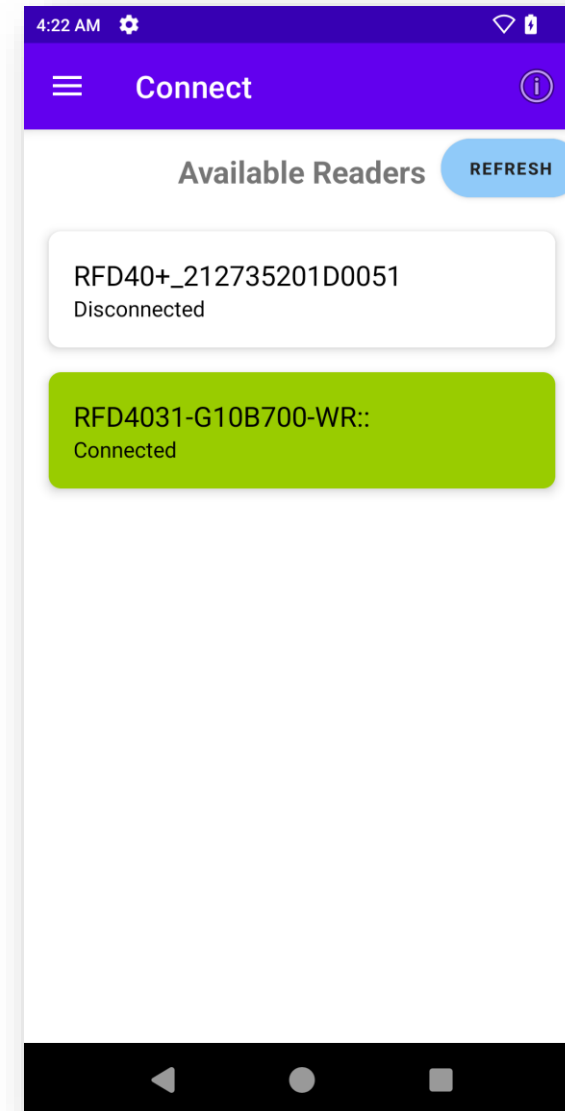


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Connect

- **Connect** displays all the available readers that are ready to connect.
- Click on the reader name to connect to the reader.
- Click Refresh to refresh the list of available readers that are ready to connect.
-  -> icon for app version info.



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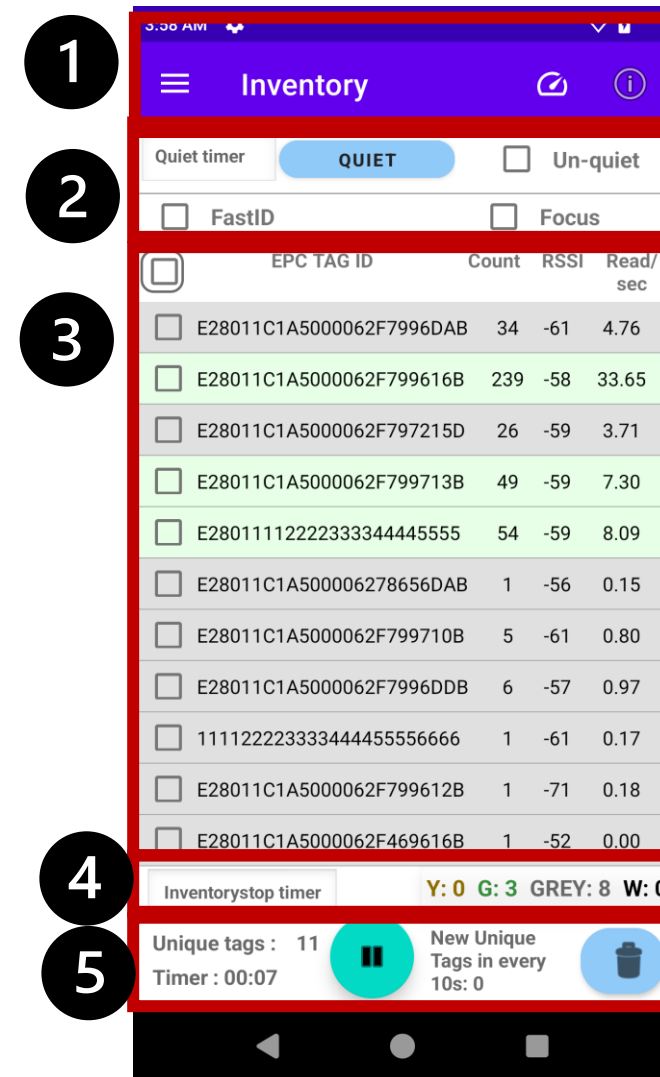
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Inventory

The Inventory screen can be used to read tags and compare behaviors/performance using different configurations and features. This screen can be used both for standard Gen2v2 tag inventory as well as demonstrating and testing Gen2X features. This section describes general features of the screen – please refer to specific feature sections for detailed instructions for each feature.

This screen has 4 areas:

- 1  Icon for total read rate (total read / total time).
- 2 Gen2X Feature Options – enable/disable options, Quiet timer
- 3 Inventory Tag Display – display read tags including count, RSSI and read/sec
- 4 Inventory Summary Bar - inventory stop timer and counts by category
- 5 Unique Tags Bar (including Start/Stop and Clear) – timer, unique tag count and tags/10s



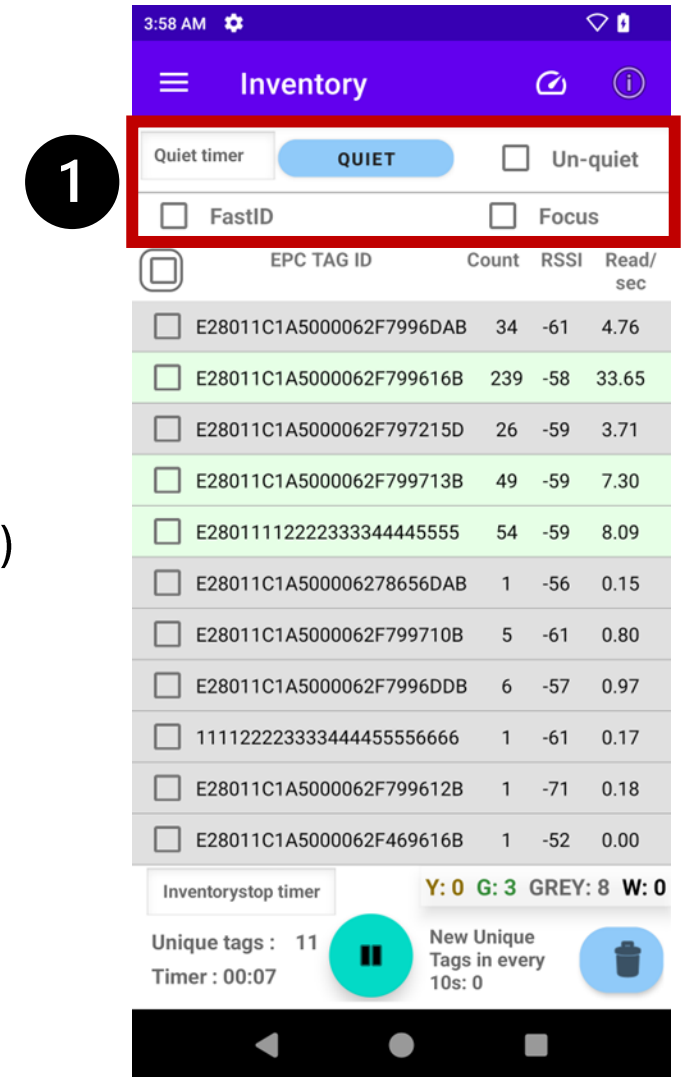
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Inventory

1 Gen2X Feature Options

- Focus – enables TagFocus feature
- Quiet timer – timer for which the quiet filter is applied (default 2s)
- Quiet button – quiets selected tags
- Un-quiet – select to un-quiet inventoried tags
- FastID – enables FastID feature



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Inventory

2 Inventory Tag Display

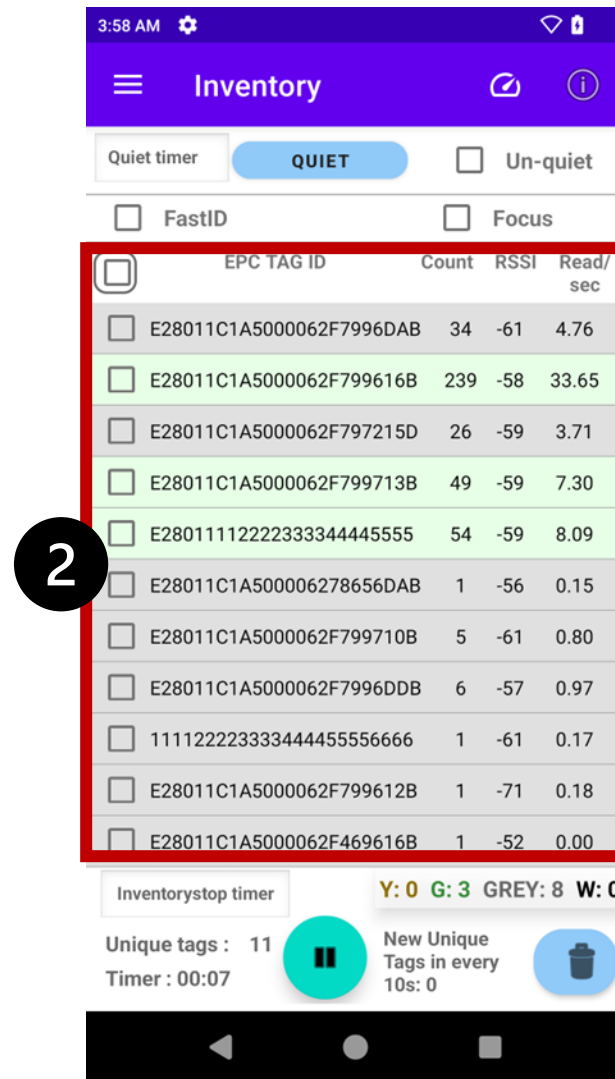
- EPC TAG ID – EPC value read from tag
- Count – Number of times read in this inventory cycle
- RSSI - Received Signal Strength Indicator
- Read/sec – reads per second in this inventory cycle
- Colors

 Green: Tags which have the read / sec greater than the average

 Grey: Tags which have read/sec less than the average

 Yellow: Tags which were quieted

 White: Non quieted tags which are not participating in the current round



☐	EPC TAG ID	Count	RSSI	Read/sec
☐	E28011C1A5000062F7996DAB	34	-61	4.76
☐	E28011C1A5000062F799616B	239	-58	33.65
☐	E28011C1A5000062F797215D	26	-59	3.71
☐	E28011C1A5000062F799713B	49	-59	7.30
☐	E28011112222333344445555	54	-59	8.09
☐	E28011C1A500006278656DAB	1	-56	0.15
☐	E28011C1A5000062F799710B	5	-61	0.80
☐	E28011C1A5000062F7996DDB	6	-57	0.97
☐	111122223333444455556666	1	-61	0.17
☐	E28011C1A5000062F799612B	1	-71	0.18
☐	E28011C1A5000062F469616B	1	-52	0.00

Inventory stop timer Y: 0 G: 3 GREY: 8 W: 0
Unique tags : 11
Timer : 00:07
New Unique Tags in every 10s: 0

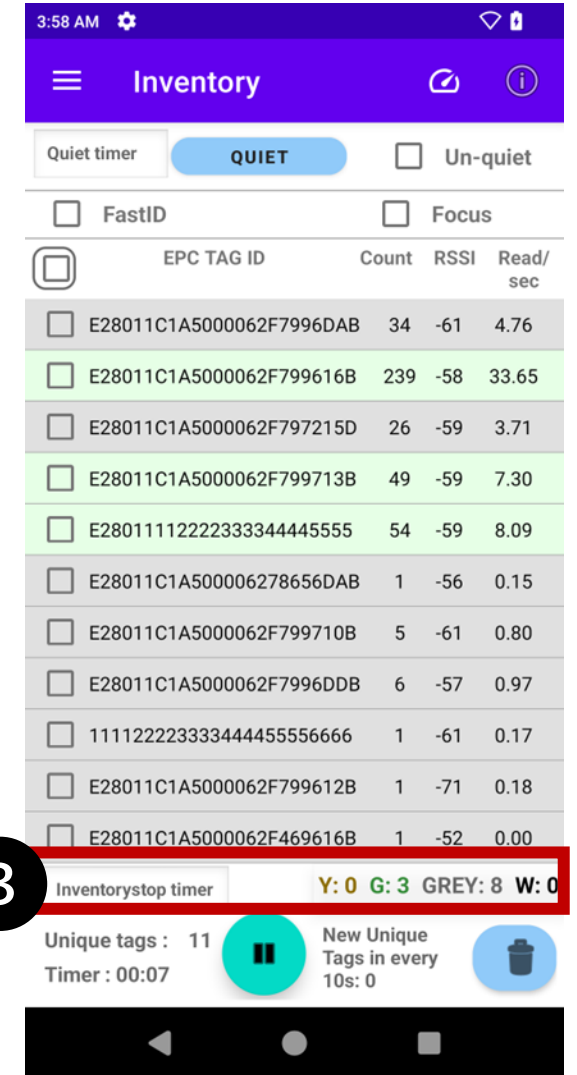
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Inventory

3 Inventory Summary Bar

- **Inventory Stop Timer** – Set a time limit to automatically stop inventory after the specified duration
- **Tag Counts by Category**
 - Y: Yellow
 - G: Green
 - GREY: Grey
 - W: White



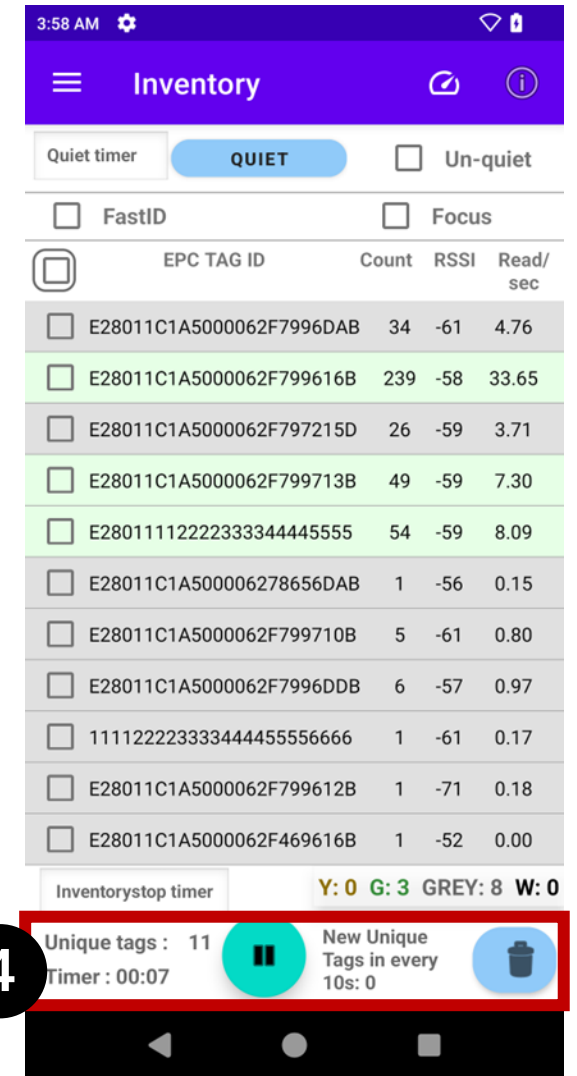
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Inventory

4 Unique Tags Bar

- **Unique Tags Count** - Total number of unique RFID tags read
- **Timer**: Elapsed inventory runtime
- **New Unique Tags in every 10s**: Number of previously unread tags detected within a rolling 10-second interval



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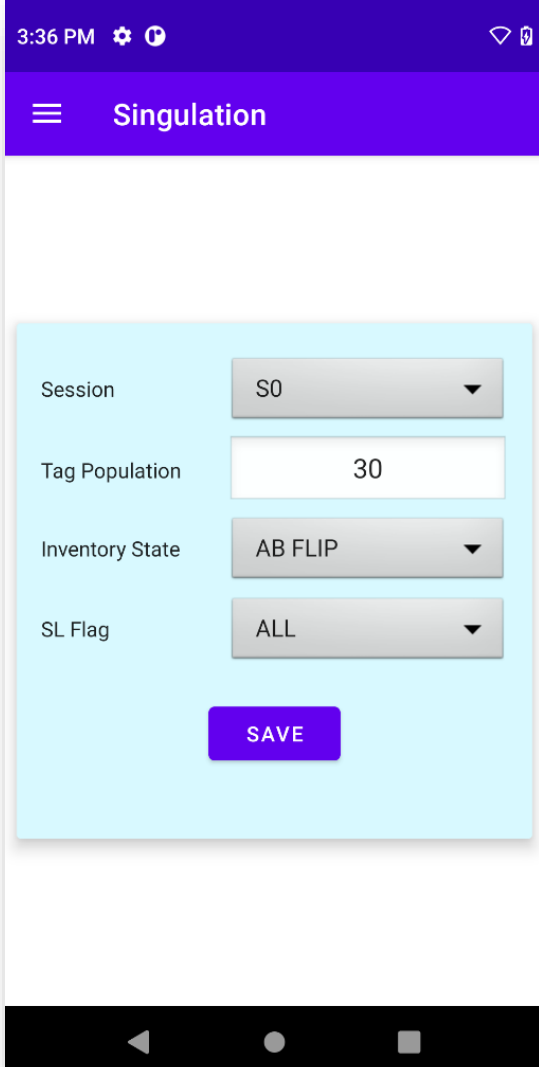
Singulation

This page provides options to customize how RFID tags are filtered and managed during inventory operations.

- Select Session
- Enter Tag Population
- Select Inventory State
- Select SL Flag
- Click the Save button to save Singulation settings

To learn more about singulation, please see:

<https://techdocs.zebra.com/dcs/rfid/android/2-15/tutorials/singulation/>



The screenshot shows the 'Singulation' settings screen. At the top, there is a purple header bar with a hamburger menu icon on the left and the title 'Singulation' on the right. Below the header, the screen has a light blue background. There are four settings: 'Session' with a dropdown menu showing 'S0', 'Tag Population' with a text input field containing '30', 'Inventory State' with a dropdown menu showing 'AB FLIP', and 'SL Flag' with a dropdown menu showing 'ALL'. Each dropdown menu has a small downward arrow icon. Below these settings is a purple 'SAVE' button. At the bottom of the screen, there is a black navigation bar with three icons: a back arrow, a home circle, and a recent apps square.

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Pre-filter

On the prefilter page, the user can save up to 4 prefilters

- To add a prefilter:
 - Select Prefilter Number
 - Select Target, Action, Memory Bank
 - Enter Pointer and Length (the bit numbers of the tag)
 - Click Save
- To modify a prefilter:
 - Prefilters cannot be modified - please delete the prefilter and create a new one.
- To delete a single prefilter (for 1-4 prefilter):
 - Select prefilter
 - Click the Delete button prefilter
- To delete ALL Prefilters (or if >4 prefilters):
 - Click DELETE ALL PREFILTERS to delete all existing prefilters at once (up to 32 prefilters)

The screenshot shows the 'Prefilter' screen of the Zebra Gen2X application. At the top, there's a status bar with the time 3:43 PM and icons for settings, notifications, and connectivity. Below the status bar is a purple header with a hamburger menu icon and the title 'Prefilter'. The main content area has a light blue background and contains several input fields and dropdown menus: 'Tag Pattern' (text input), 'Target' (dropdown menu showing 'SL FLAG'), 'Action' (dropdown menu showing 'INV A NOT INV..'), 'Memory bank' (dropdown menu showing 'EPC'), 'Pointer' (text input), and 'Length' (text input). Below these fields are three buttons: 'SAVE' (purple), 'DELETE' (purple), and 'DELETE ALL PREFILTERS' (purple). At the bottom, there's a black navigation bar with standard Android icons. A note at the bottom of the screen reads: 'Do not modify an existing prefilter; instead, delete it and add a new one.'

Gen2X Feature Demo: TagFocus

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Gen2X Feature Demo: TagFocus

What is TagFocus?

- Tag Focus is a feature designed to enhance RFID tag filtering and focus on specific tags in dense tag environments.

When to use TagFocus?

- TagFocus is most beneficial when the RFID reader is overwhelmed by the number of tags responding simultaneously. This typically occurs when there are several hundreds or thousands of tags in the read field. Below this threshold, the normal session-based reading may already perform adequately without noticeable differences.

How to Demo:

1. Setup Tags for Demo (recommend at least 100 tags)
2. Inventory Without TagFocus
3. Inventory With TagFocus
4. Observe and Compare Results

Expected Results:

- Without TagFocus: Higher count per tag, slower to read ALL tags
- With TagFocus: Lower count per tag, quicker to read ALL tags

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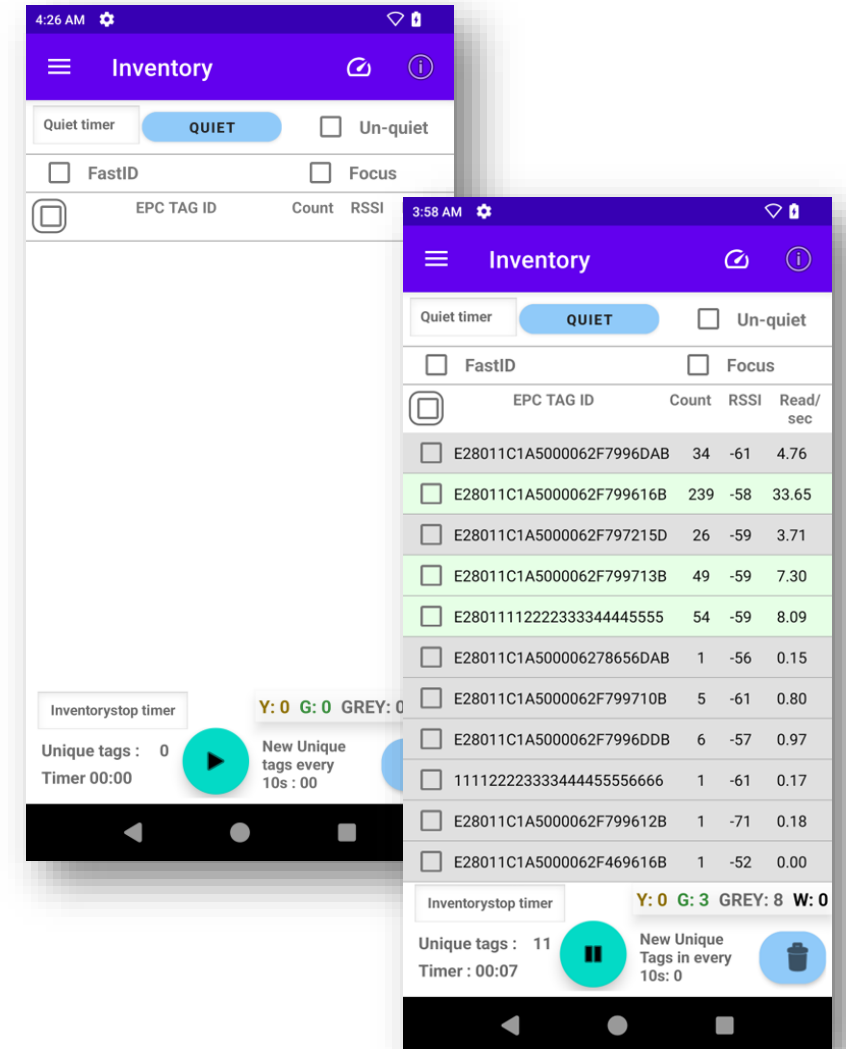
Gen2X Feature Demo: TagFocus

1. Setup Tags for Demo

- Arrange Gen2X-enabled tags in the test area
- Note the total number of tags available

2. Inventory *Without TagFocus*

- Configure using Singulation and/or Prefilters to match your current application (or leave as default)
- Ensure the TagFocus checkbox is NOT checked
- Click the inventory start button
- Read tags for desired period OR until all Unique tags are read
- Click the Stop button and observe:
 - Timer
 - Unique Tags
 - New Unique Tags in every 10s
 - Count per tag (generally expect to see this vary with some tags having very high read/sec and others having very low)



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Gen2X Feature Demo: TagFocus

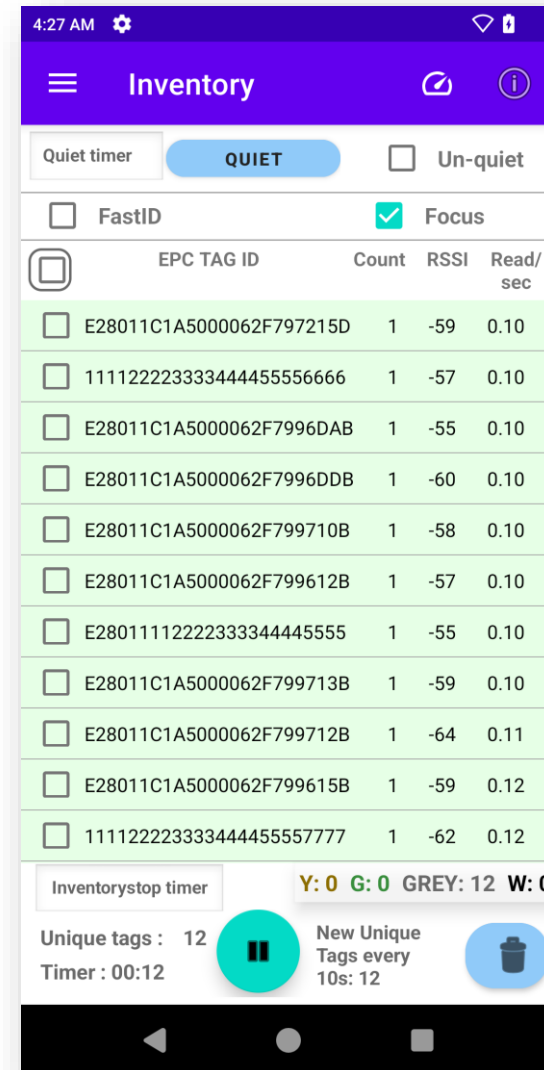
3. Inventory With TagFocus

- Clear the results using the Clear button
- Select the TagFocus checkbox to enable TagFocus (checked)
- Click the inventory start button
- Read tags for desired period OR until all unique tags are read
- Click the Stop button and observe:
 - Timer
 - Unique Tags
 - New Unique Tags in every 10s
 - Count per tag (generally expect to be 1 with some tags reading 2-3x if they do not receive the select command in the first round)

4. Observe and Compare Results

- Was there a difference in the total number of tags read?
- Did TagFocus result in less reads/tag?
- Were all tags read faster with TagFocus enabled?

Note: In low-density tag environments, the benefit of TagFocus may not be perceptible because the reader can already handle the limited number of tags without significant redundancy or delays.



Gen2X Feature Demo: Tag Quieting

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Gen2X Feature Demo: Tag Quieting

What is Tag Quieting?

- Tag Quieting provides a dynamic solution to tag clutter by allowing system integrators to control when tags participate in inventory rounds. Quieting individual tags reduces the total number of tags responding in an inventory round, which results in performance improvements.

When to use Tag Quieting?

- A medium- to large-sized tag population (100+ tags)
- A requirement for multiple tag events involving the same tag(s)
- The presence of a subpopulation of tags that can be identified as strays or meet defined criteria suitable for quieting

How does Tag Quieting differ from TagFocus?

- TagFocus uses a fixed configuration to suppress tags for faster inventory rates, while Tag Quieting provides a more configurable approach (designed to augment an existing solution), allowing users to dynamically control when tags participate in inventory rounds for greater flexibility in managing tag populations.

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Gen2X Feature Demo: Tag Quieting

How to Demo:

This demonstrates the functionality to quiet and unquiet tags. To use Tag Quieting effectively, your application will need to decide which tags to quiet and when – such as after specific reads, location changes, manifest matches, or high RSSI. Quieting can be triggered by inventory rounds, time intervals, new tags, or cycle time limits.

1. Setup Gen2X Enabled Tags (recommend at least 100 tags)
2. Inventory Without Quieted Tags
3. Quiet Selected Tags
4. Un-quiet Tags
5. Observe and Compare Results

Expected Results:

- Without Tag Quieting: Most tags will have multiple reads with some tags having very high read/sec and others having very low reads/sec
- With Tag Quieting: Quieted Tags have no reads after quieting, there may be an increase in counts and read/sec for un-quieted tags

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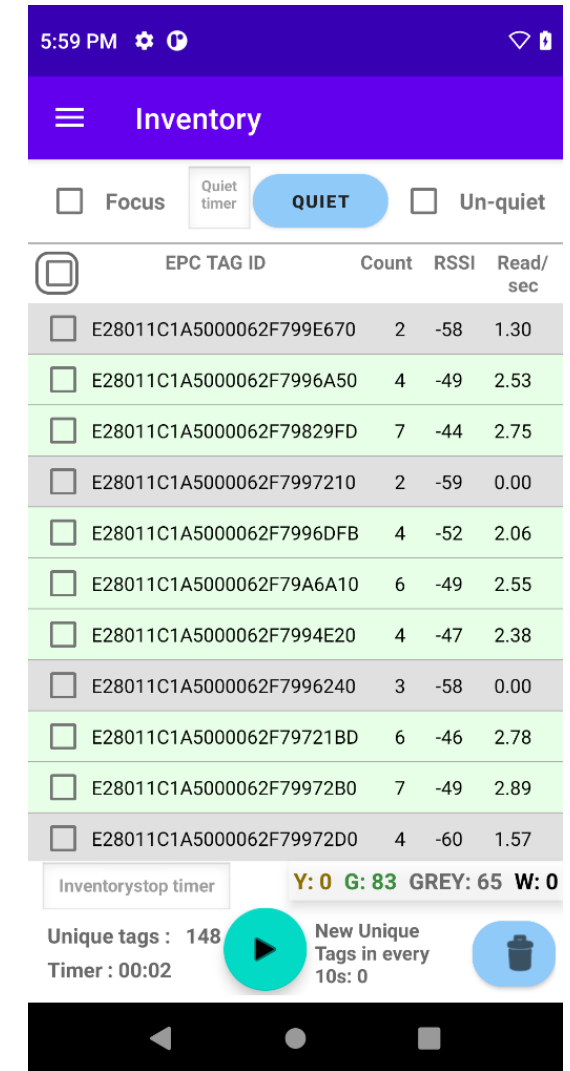
Gen2X Feature Demo: Tag Quieting

1. Setup tags for Demo

- Arrange Gen2X-enabled tags in the test area
- Note the total number of tags available

2. Inventory *Without Quieted Tags*

- Configure using Singulation and/or Prefilters to match your current application (or leave as default)
- Ensure the TagFocus and Un-quiet checkboxes are NOT checked
- Click the inventory start button
- Read tags for desired period OR until all unique tags are read
- Click the Stop button and observe:
 - Timer
 - Unique Tags
 - New Unique Tags in every 10s
 - Count per tag (generally expect to see this vary with some tags having very high read/sec and others having very low)



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Gen2X Feature Demo: Tag Quieting

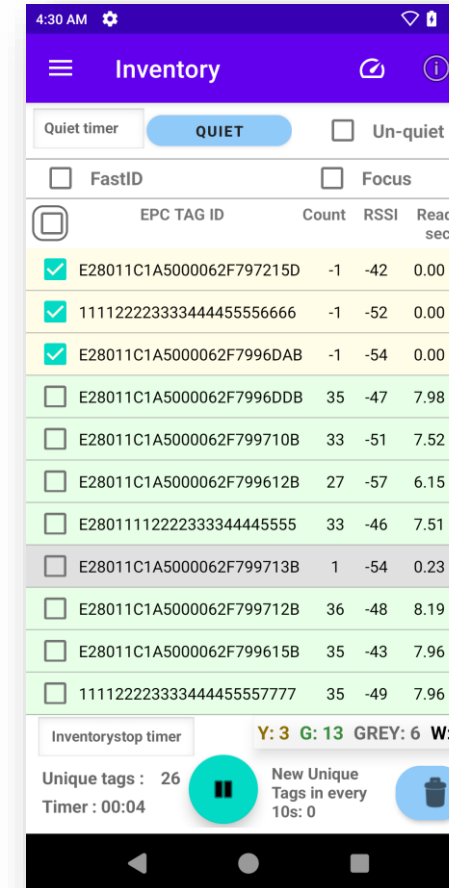
3a. Quiet Selected Tags (up to 31 tags)

- Clear the screen and begin the inventory again (do NOT stop yet)
- Select tags to quiet by checking the box next the EPC Tag ID
- Press the “Quiet” Button to quiet the tags
- Selected tags will be quieted, changed to Yellow and count set to -1 to differentiate from the other tags.

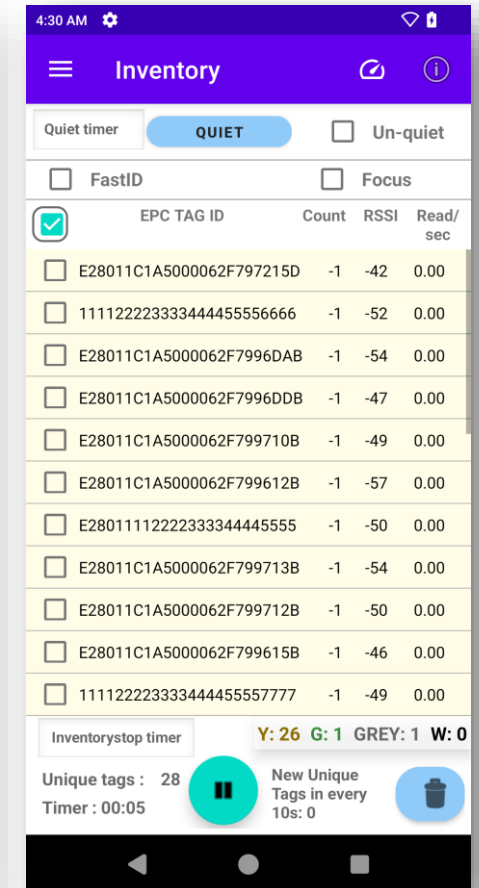
-----OR-----

3b. Quiet All Inventoried Tags

- Clear the screen and begin the inventory again (do NOT stop yet)
- From the inventory screen, check the ‘select all’ box at the top of the tag list
- Press the “Quiet” Button to quiet the tags
 - 31 non-quieted tags are automatically selected every 2 seconds by default, and tag quieting continues until either the Stop button is pressed, or the timer runs out. *Note: The user can also specify a custom timer greater than 2s*



Quiet Selected Tags



Quiet All Tags

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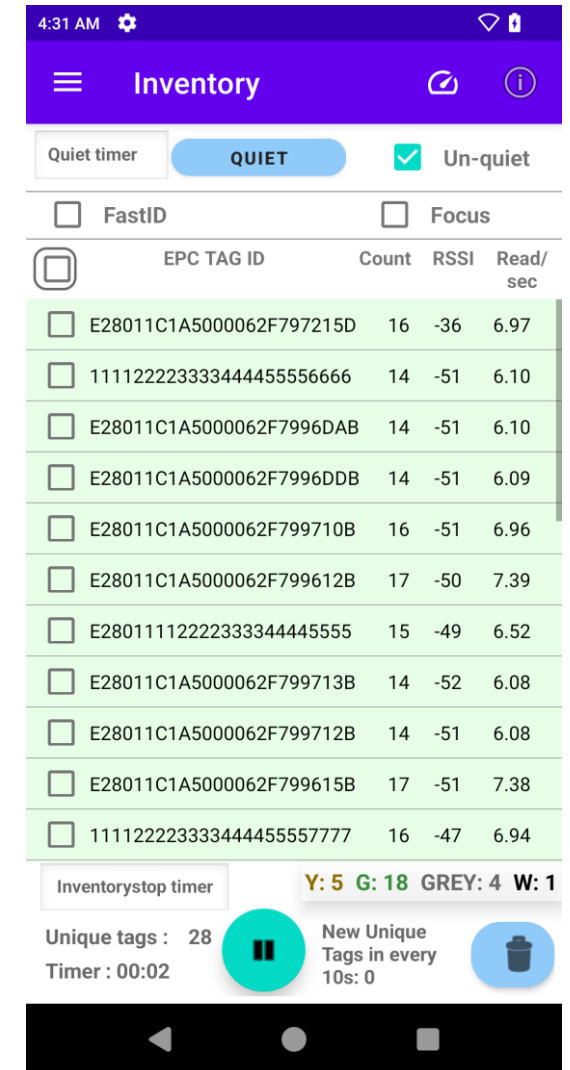
Gen2X Feature Demo: Tag Quieting

4. Un-quiet Tags

- If Inventory is not stopped, press the Stop button
- Select the checkbox
- Select the Un-quiet checkbox to un-quiet tags (checked)
- Click the inventory start button
- All the tags which were quieted will be un-quieted (change from yellow to green/grey)

5. Observe and Compare Results

- Quieted tags are changed to Yellow and count set to -1
- Non-quieted tags will continue to be read and an increase in count and read/sec may be observed.
- Tag Quieting shows the most noticeable difference in environments with **100+ tags**, where controlling interference and focusing on relevant tags improves system performance and reduces redundant data processing. In smaller-scale environments, its impact may be less pronounced.



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Gen2X Feature Demo: Tag Quieting

Custom Tag Quieting

The demo application provides the ability to manage tag quieting filters – this is not required for basic demonstration of Tag Quieting but may be used by advanced users to test configurations.

For more information, please see Zebra TechDocs Tutorials- Impinj Gen2X APIs:
<https://techdocs.zebra.com/dcs/rfid/>



Gen2X Feature Demo: Protected Mode

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Gen2X Feature Demo: Protected Mode

What is Protected Mode?

- Protected Mode is a feature that hides a tag from RFID readers unless the correct 32-bit PIN/Password is provided.
- Protected tags can still be inventoried by readers that supply the correct PIN/Password, and users can toggle the tag's status between protected and unprotected as needed.

When to use Protected Mode?

- Protected Mode is useful for scenarios where controlling access to RFID tag data is critical for security, privacy, or operational efficiency. It is ideal for applications like protecting sensitive data, preventing unauthorized tracking, enhancing privacy, verifying authenticity, securing access control, and streamlining workflows in controlled environments.

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Gen2X Feature Demo: Protected Mode

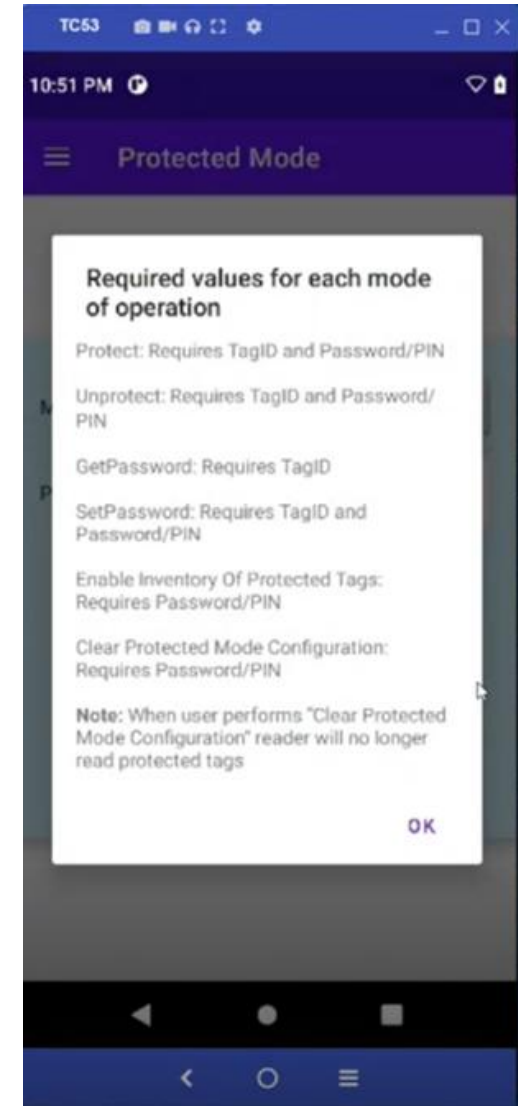
How to Demo:

This demonstrates how to protect tags, verify their invisibility without the PIN/Password, inventory them using the correct PIN/Password, and unprotect them.

1. Setup Gen2X Enabled Tags
2. Inventory Without Protected Tags
3. Protect Selected Tags
4. Inventory w/ Protected Tags Invisible (demonstrates how protected tags are 'invisible' to readers)
5. Inventory w/ Protected Tags Visible (demonstrates how protected tags are visible with the correct PIN/Password)
6. Clear Protected Tag Configuration
7. Unprotect Tags

Expected Results:

- Once tags are protected, they will not be visible to 'standard' inventory rounds
- Protected tags are visible with the correct PIN/Password
- Tags can be protected and unprotected multiple times



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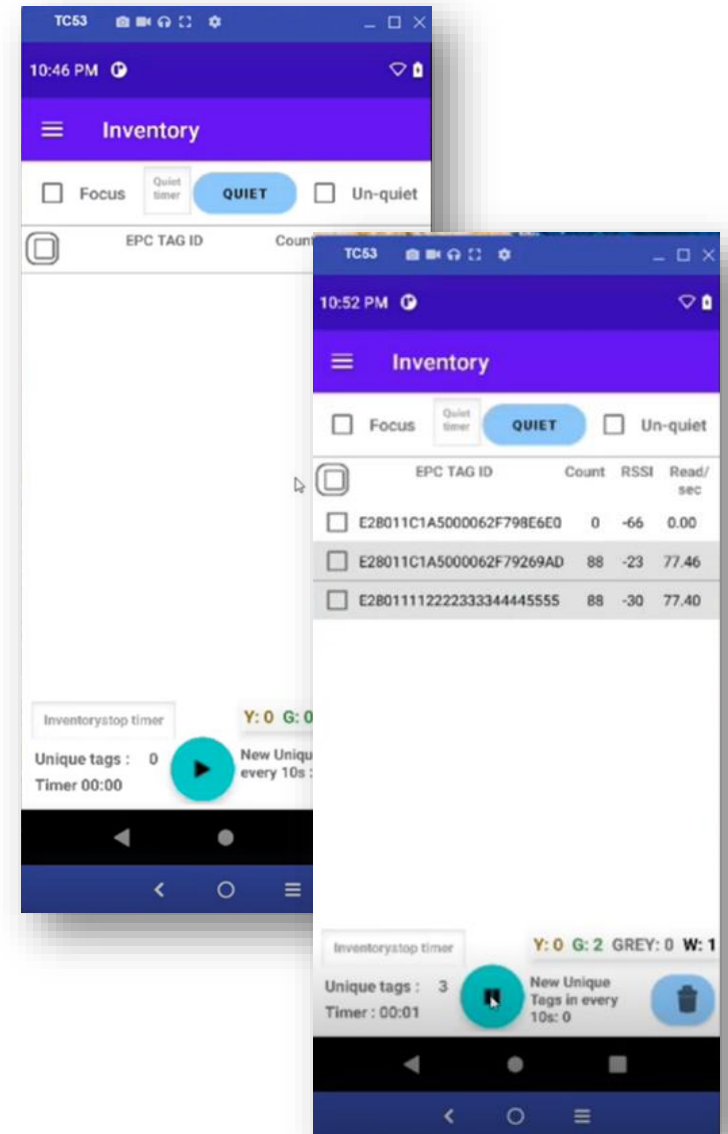
Gen2X Feature Demo: Protected Mode

1. Setup tags for Demo

- Arrange Gen2X-enabled tags in the test area (ensure that none have been previously protected with Protected Mode)

2. Inventory Without Protected Tags

- Configure using Singulation and/or Prefilters to match your current application (or leave as default)
- Ensure the TagFocus, FastID and Un-quiet checkboxes are NOT checked
- Click the inventory start button
- Read tags for desired period OR until all unique tags are read
- Click the Stop button and observe:
 - Unique Tags (all tags in field of view should display)



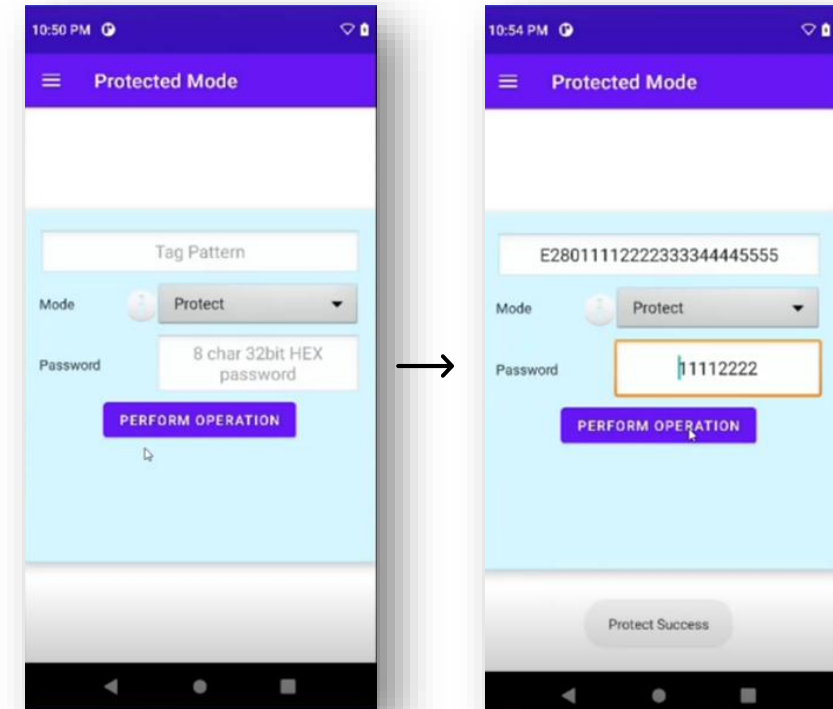
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Gen2X Feature Demo: Protected Mode

3. Protect Selected Tags

- Select the Protected Mode page from the navigation menu
- Enter the EPC Tag Id (the application will auto complete based on previously inventoried tags)
- Select Mode; Protect
- Enter the PIN/Password
- Click Perform Operation
- Protect Success displays to confirm tag is protected



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Gen2X Feature Demo: Protected Mode

4. Inventory With Protected Tags Invisible

This step demonstrates how protected tags are 'invisible' to readers that do not provide the PIN/Password

- Configure using Singulation and/or Prefilters to match your current application (or leave as default)
- Ensure the TagFocus and Un-quiet checkboxes are NOT checked
- Click the inventory start button
- Read tags for desired period OR until all unique tags are read
- Click the Stop button and observe:
 - Unique Tags - only unprotected Tags are inventoried and displayed in the list



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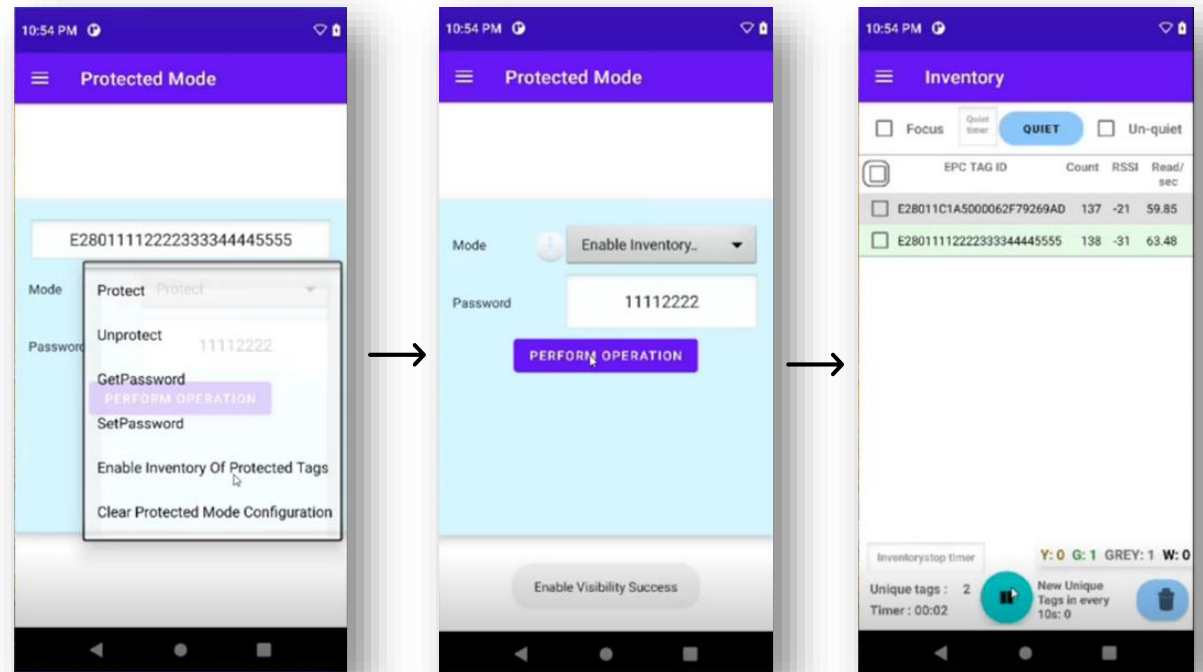
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Gen2X Feature Demo: Protected Mode

5. Inventory *With Protected Tags Visible*

This step demonstrates how protected tags are visible with the correct PIN/Password.

- From the Protected Mode screen, select Enable Inventory of Protected Tags
- Enter the PIN/Password
- Click Perform Operation
- **Enable Visibility Success displays to confirm**
- Return to Inventory Screen
- Clear the Inventory
- Click the inventory start button
- Read tags for desired period OR until all unique tags are read
- Click the Stop button and observe:
 - **Unique Tags - All tags (both protected and unprotected) are inventoried and displayed in the list**



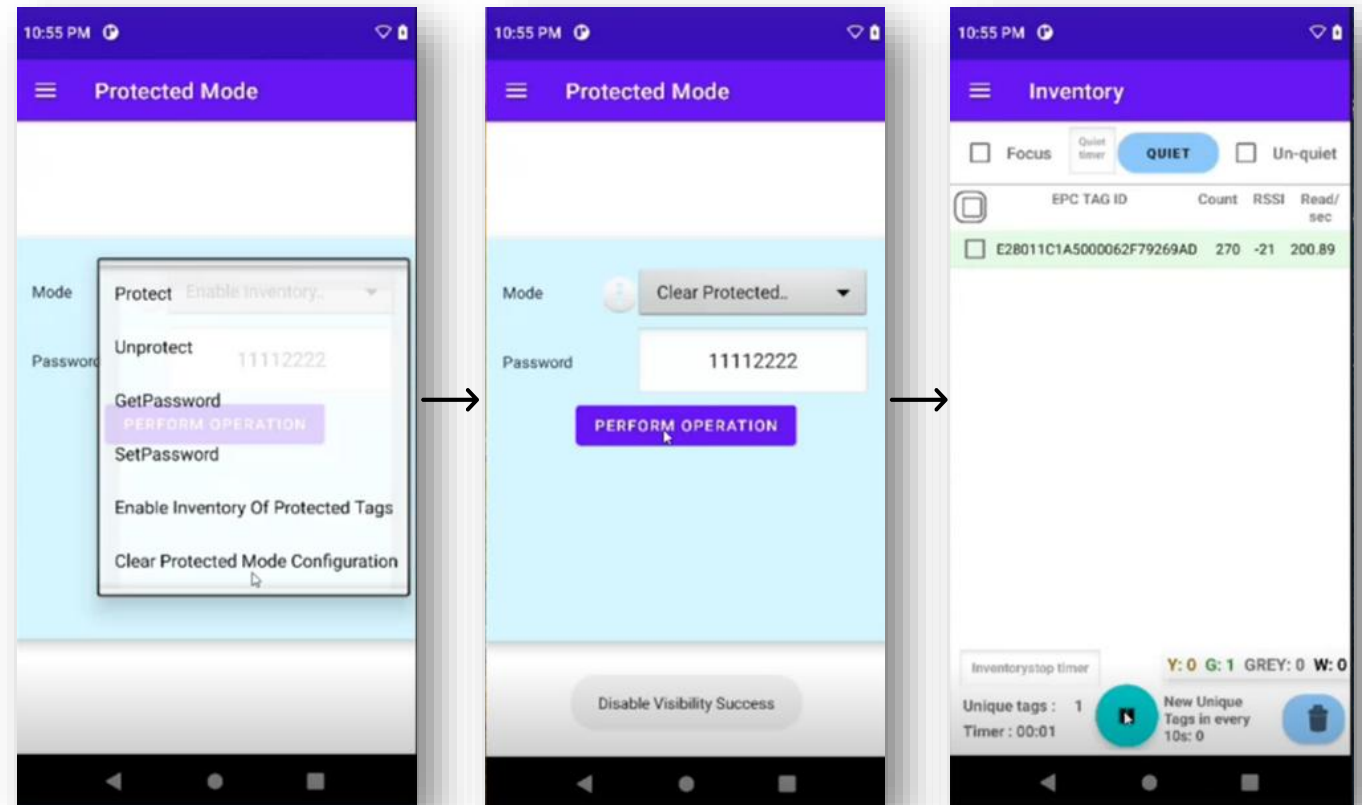
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Gen2X Feature Demo: Protected Mode

6. Clear Protected Mode Configuration

- From the Protected Mode screen, select Clear Protected Mode Configuration
- Enter the PIN/Password
- Click Perform Operation
- **Disable Visibility Success** displays to confirm
- Repeat #4 Inventory With Protected Tags Invisible (only unprotected Tags are inventoried and displayed in the list)



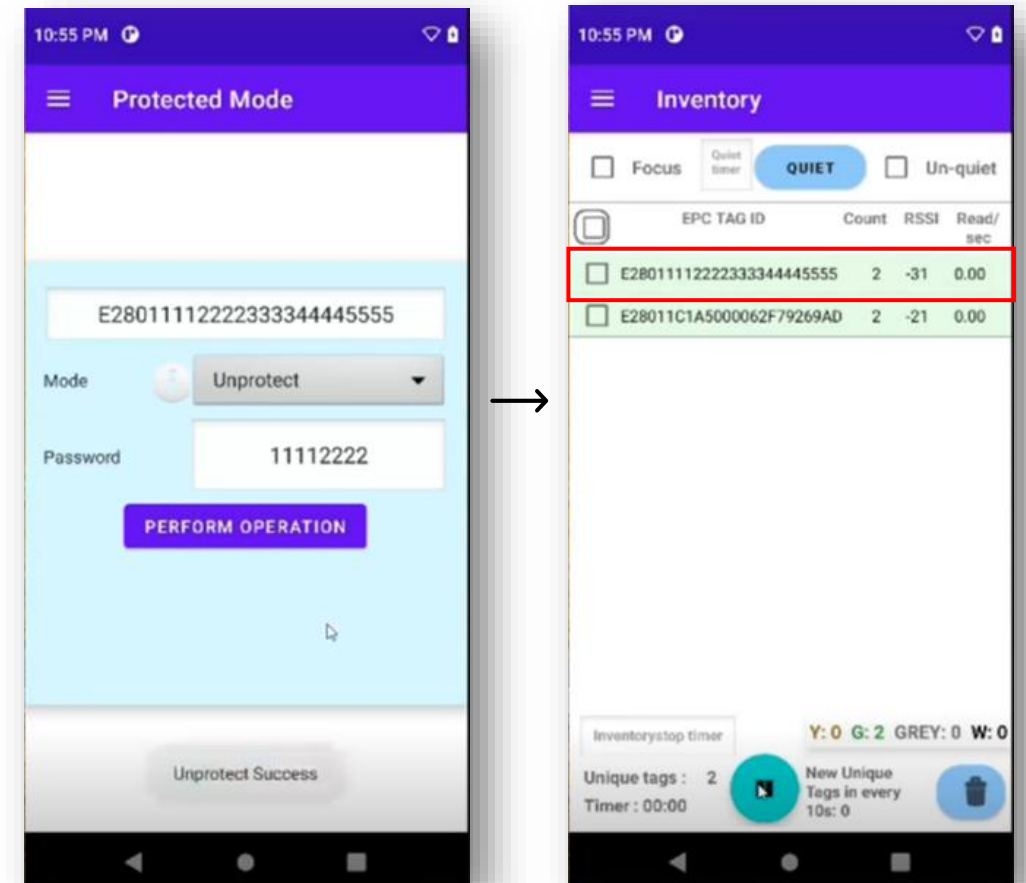
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Gen2X Feature Demo: Protected Mode

7. Unprotect Selected Tags

- From the Protected Mode screen, enter the EPC Tag ID (the application will auto complete based on previously inventoried tags)
- Select Protect Mode; Unprotect
- Enter the PIN/Password
- Click Perform Operation
- **Unprotect Success displays to confirm**
- Repeat #2 Inventory Without Protected Tags (all tags in field of view should display)



Gen2X Feature Demo: FastID

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Gen2X Feature Demo: FastID

What is FastID?

- FastID enables the impinj tags to backscatter their EPC and TID in a single response for inventory.

How to Demo:

1. Setup Tags for Demo
2. Inventory With FastID
3. Observe the Results

Expected Results:

- Without FastID: EPC is backscattered for inventory
- With FastID: EPC+TID is backscattered for inventory

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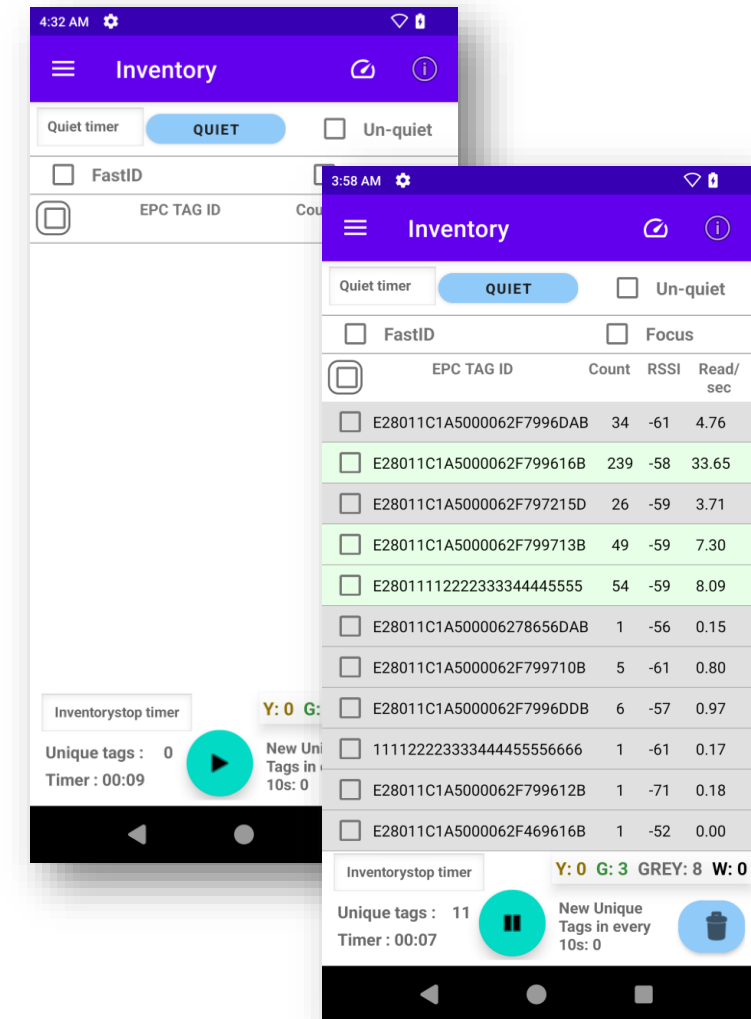
Gen2X Feature Demo: FastID

1. Setup Tags for Demo

- Arrange Gen2X-enabled tags in the test area

2. Inventory Without FastID

- Configure using Singulation and/or Prefilters to match your current application (or leave as default)
- Ensure the FastID checkbox is NOT checked
- Click the inventory start button
- Read tags for desired period OR until all Unique tags are read
- Click the Stop button and observe:
 - Timer
 - Unique Tags
 - New Unique Tags in every 10s
 - Count per tag (generally expect to see this vary with some tags having very high read/sec and others having very low)



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Gen2X Feature Demo: FastID

3. Inventory *With FastID*

- Clear the results using the Clear button
- Select the FastID checkbox to enable FastID (checked)
- Click the inventory start button
- Read tags for desired period OR until all unique tags are read
- Click the Stop button and observe:
 - Timer
 - Unique Tags
 - New Unique Tags in every 10s



Gen2X Feature Demo: Gen2X enhanced inventory performance using Inventory Protocol

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 1. Setup Tags for Demo

Gen2X Feature Demo: Gen2X enhance inventory performance

What is Inventory Protocol mode?

- Inventory protocol enables selection of protocol mode to determine which tags to participate in inventory.
- SDK supports 3 modes for inventory protocol.
 - Gen2 :- Inventory all tags (Gen2 and Gen2X).
 - Gen2X :- Inventory only Gen2X tags.
 - Hybrid :- Inventory all tags with better read rate,

Note : FastID feature is not supported when inventory protocol is set to Gen2X mode .

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Gen2X Feature Demo: Inventory Protocol

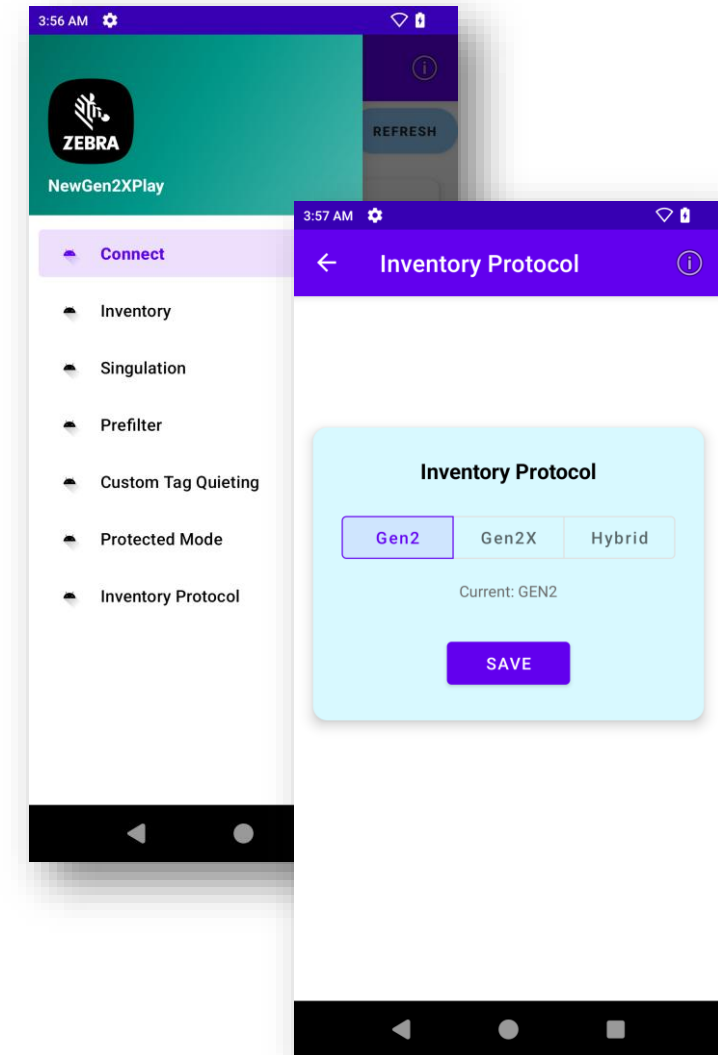
1. Setup Tags for Demo

- Arrange both Gen2 and Gen2X-enabled tags in the test area

2. Inventory Protocol selection

Configure using Singulation and/or Prefilters to match your current application (or leave as default)

- Select the protocol
- Click the save button



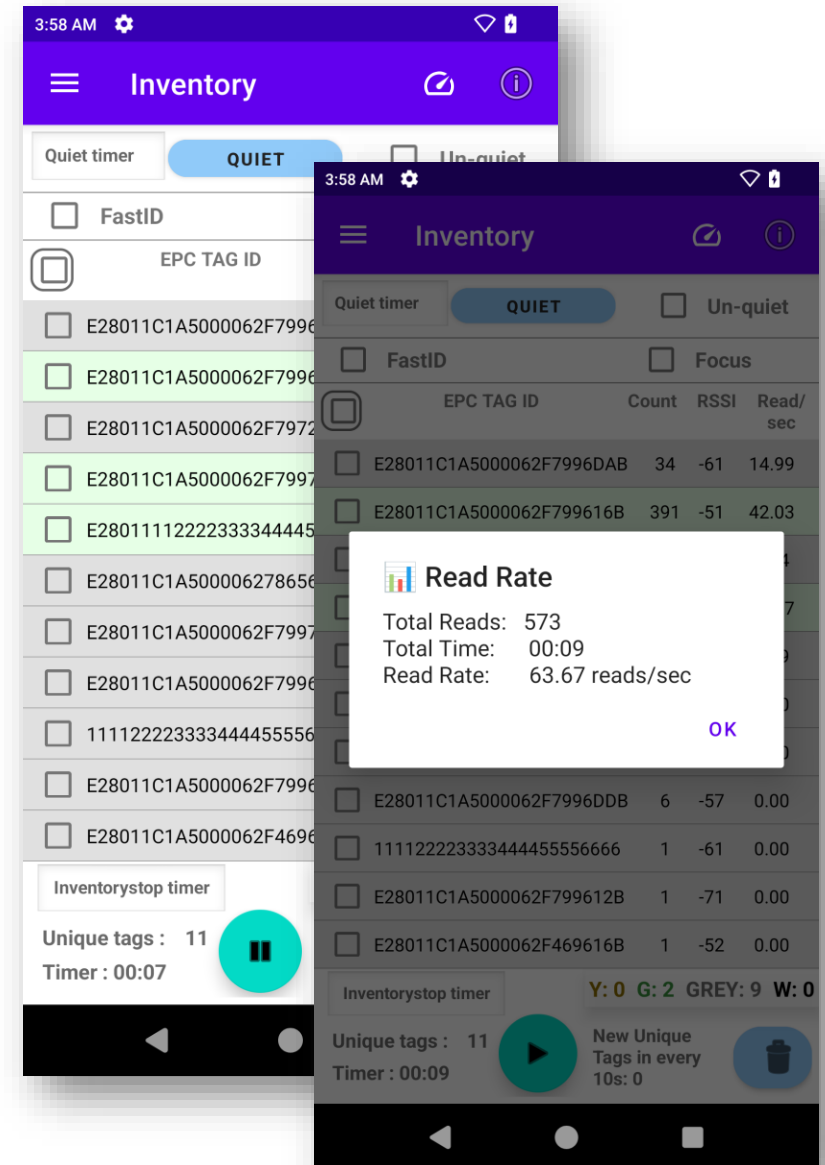
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Gen2X Feature Demo: Inventory protocol

3. Inventory with selected inventory protocol

- Clear the results using the Clear button
- Click the inventory start button
- Read tags for desired period OR until all unique tags are read
- Click the Stop button and observe:
 - Timer
 - Unique Tags
 - New Unique Tags in every 10s.
- Click  and Observe the read rate (total reads / total time) by performing inventory using three different inventory protocol modes.
- TagFocus and Quiet can also be performed using three inventory protocol modes.



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Zebra's "NewGen2XPlay" Sample Application demonstrates key Gen2X features, providing users with powerful tools to optimize RFID performance.

- This sample application enables users to test and compare Gen2X features to standard RFID operations, helping optimize workflows and maximize efficiency.
- Features like **Tag Quieting** and **TagFocus** are particularly valuable for managing large tag populations in high-density environments.
- **Protected Mode** ensures data security and controlled tag visibility, making it ideal for sensitive use cases.

Thank You!

