TERRA UNIVERSAL.COM
Critical Environment Solutions



Installation and Operating Guide *Document No. 1788-61*

Universal™ Filter Replacement Alarm System with PLC

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Safety Notice

A thorough familiarity with all operating guidelines is essential to safe operation of the product. Failure to observe safety precautions could result in poor performance, damage to the system, or serious bodily injury or death.

⚠ CAUTION

Cautions are used when failure to observe instructions could result in significant damage to equipment.

⚠ WARNING

Warnings are used when failure to observe instructions or precautions could result in injury or death.

1.0 Introduction

This manual provides installation and operating information for the Terra Universal Universal™ Filter Replacement Alarm System with PLC. Keep this document in a safe place for future reference. Please read this manual in its entirety before operating the unit.

This guide covers hardware overview, PLC touchscreen navigation, pressure set point configuration, email alert setup, and alarm management.

2.0 Description

The Universal™ Filter Replacement Alarm System with PLC is a filter replacement alarm system designed to monitor HEPA and ULPA filter differential pressure within Fan Filter Units (FFUs). The unit features a fully integrated PLC with a color touchscreen display, providing real-time pressure readings and full system status at a glance.

When filter backpressure reaches the configured set point, the unit triggers an audible buzzer, illuminates the TUI logo, and sends an automated email alert to configured recipient addresses. This allows facility teams to respond to clogged filters promptly, avoiding costly downtime and preventing electrical or fire hazards caused by overworked FFU motors pushing against overloaded filters.

One alarm unit connects to one FFU via the challenge port and monitors all filters within that FFU. The control box is typically mounted above the cleanroom control panel.

Key Features

- Integrated PLC with color touchscreen displaying live pressure readings and system status
- Real-time differential pressure display in inches water column (" WC)
- User-configurable alarm set point (factory default: 1.00" WC; adjustable 0.5"–2" WC)
- Audible buzzer alarm with manual bypass switch
- Automated email notifications to up to two addresses when filter replacement is needed
- TUI logo flashes when HEPA or ULPA filter replacement is required
- Stainless steel enclosure — ISO Grade 5 certified design
- Powers from cleanroom PDM or standard 120V outlet

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System Features Overview

Feature	Description
PLC Touchscreen	Full-color touchscreen displays live pressure, set point value, progress bar, and email notification status.
Email Notifications	Sends automatic email alerts to up to two recipients when the filter reaches the set point.
Email Status Indicator	On-screen color indicator: green = notifications enabled and ready; red = disabled or triggered.
LAN & E-mail Setup	Dedicated screen for entering SMTP server, credentials, network settings, and recipient addresses.
Test E-mail Function	Built-in test screen to verify email delivery configuration before relying on the system.
Buzzer Bypass Switch	Toggle switch silences the audible alarm without disabling visual alerts or email notifications.

3.0 Specifications

Specification	Value
Terra Part #	2625-54C-SS
Manufactured By	Terra Universal, Inc.
Electrical Specifications	120 V, 50/60 Hz
Certified ISO Grade Design	ISO 5
Unit of Measure	EA
Enclosure Material	Stainless Steel
Alarm Set Point (Factory Default)	1.00" WC (adjustable 0.5"–2.0" WC)
Display	Integrated PLC color touchscreen
Email Recipients	Up to 2 addresses (Maintenance + Management)
Pressure Unit	Inches Water Column (" WC)
Dimensions, Product	5" W × 8.1" D × 5" H
Weight, Product	3 lb
Dimensions, Shipping	10" W × 12" D × 10" H
Weight, Shipping	5 lb
Package Type	Palletized
Warranty	1 year parts, 90 days labor

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4.0 Hardware Overview

The Filter Replacement Alarm System with PLC consists of a brushed stainless steel enclosure housing a PLC controller with integrated color touchscreen, a pressure sensor to display differential pressure, and a buzzer bypass toggle switch. The clear tubing connects the unit to the FFU challenge port to sample differential pressure.



Figure 1: Filter Replacement Alarm System with PLC — Front View

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Figure 2: Unit installed at cleanroom entry

4.1 External Components

Component	Description
TUI LED Logo	Flashes when the HEPA or ULPA filter needs replacement.
PLC Touchscreen	Color display showing real-time pressure, set point, email status, and all configuration screens.
Buzzer Bypass Switch	Toggle switch to silence the audible alarm without disabling visual indicators or email notifications.
Pressure Port (Orange)	Quick-connect port on top of the enclosure. Connect the supplied clear tubing here.
Clear Tubing	Connects the alarm unit to the FFU challenge port to sample differential pressure.
Power Cable	Plugs into cleanroom PDM or standard 120V outlet.

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> ⚠ **CAUTION**
> Ensure the clear pressure tubing is fully seated in the quick-connect port before powering the unit.
> Do not kink or pinch the tubing — a blocked tube will prevent accurate pressure readings.
> Connect the tube to the FFU challenge port only. Connecting to the wrong port may damage the pressure sensor.

5.0 PLC Touchscreen Interface

The integrated PLC touchscreen is the primary interface for this alarm system. All system status, pressure readings, and email configuration are accessible directly from the screen. The display is touch-operated — tap the on-screen buttons to navigate and make changes.

5.1 Home Screen

The Home screen is displayed at startup and during normal monitoring operation. It shows all critical information at a glance.



Figure 3: Home screen — normal monitoring state

Home Screen Elements

Element	Description
FILTER ALARM (header)	Screen title banner. Background turns red and reads "CHANGE FILTER" when the alarm threshold is reached.
Pressure Bar	Horizontal progress bar showing current pressure relative to the set point. Fills red when set point is reached.
SET POINT / Value	Lower-left box shows the configured alarm set point (default: 1.00). Tap to change the value.
Live Pressure Reading	Large number showing current differential pressure in inches water column (" WC).

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Email Status (top-right)	Color indicator square: green = email notifications enabled and ready; red = disabled or triggered.
LAN & E-mail (bottom-right)	Button to navigate to the LAN & E-mail Setup configuration screen.

5.2 Alarm State — Change Filter Screen

When differential pressure reaches or exceeds the set point, the screen transitions to the alarm state. The header changes to "CHANGE FILTER" with a red background, the pressure bar fills red, the audible buzzer activates, and an email notification is sent (if enabled).



Figure 4: Alarm state — CHANGE FILTER triggered at 1.55" WC

6.0 Configuring the Alarm Set Point

The alarm set point defines the differential pressure threshold at which the buzzer activates, the screen changes to the alarm state, and an email notification is sent. The factory default is 1.00" WC. The set point is adjustable from 0.5" to 2.0" WC.

> **NOTE**
> The set point is typically configured to approximately twice the initial filter backpressure at the time of installation (commonly 0.5" WC for new filters), indicating the filter is fully loaded.
> Consult your facility manager or filter manufacturer specifications before changing the set point.

6.1 Changing the Set Point

To adjust the alarm set point:

1. On the Home screen, tap the SET POINT box in the lower-left corner of the display.
2. A numeric entry field will appear on screen.
3. Enter the desired value using the on-screen keypad (e.g., 1.50 for 1.5" WC).
4. Confirm the entry. The new set point takes effect immediately and is shown on the Home screen.

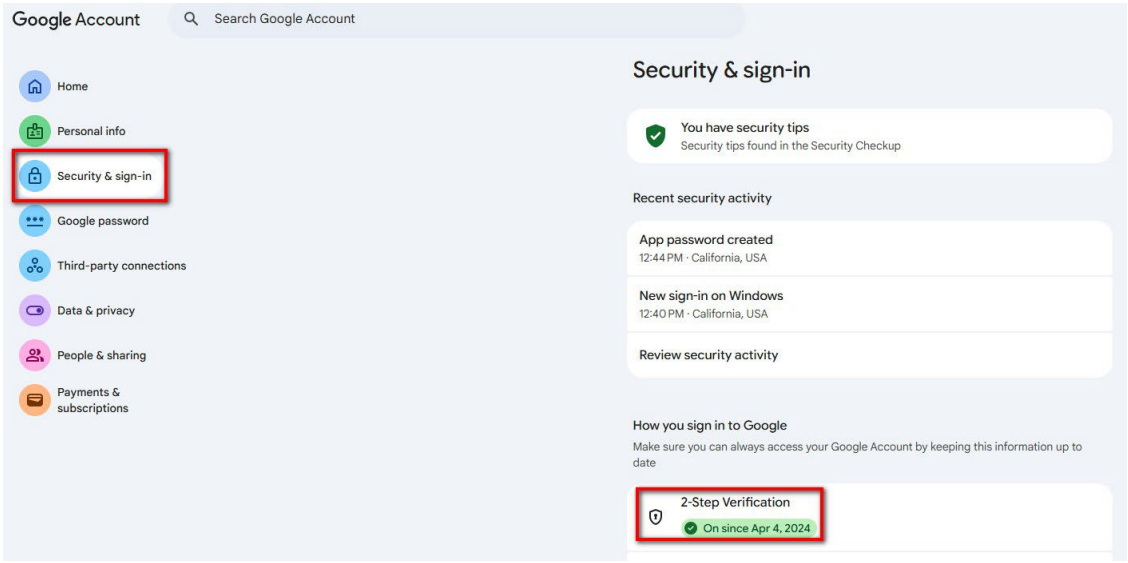
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> ⚠ **CAUTION**
> Setting the alarm threshold too low may cause false alarms during normal filter loading.
> Setting the threshold too high may allow filters to become severely overloaded, risking motor damage.

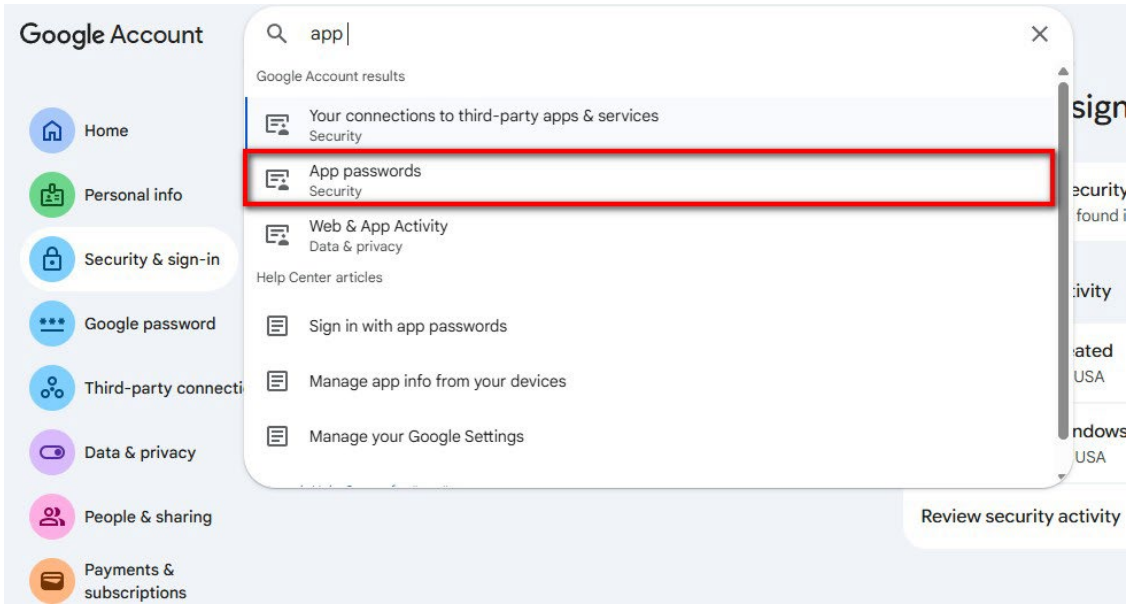
7.0 PLC Filter Email Setup

1. To receive email notifications to be notified when the filter needs to be replaced, a gmail account for your system must first be made.

2. Once the gmail account is made, select “Manage your Google Account” and set up 2-Step Verification.

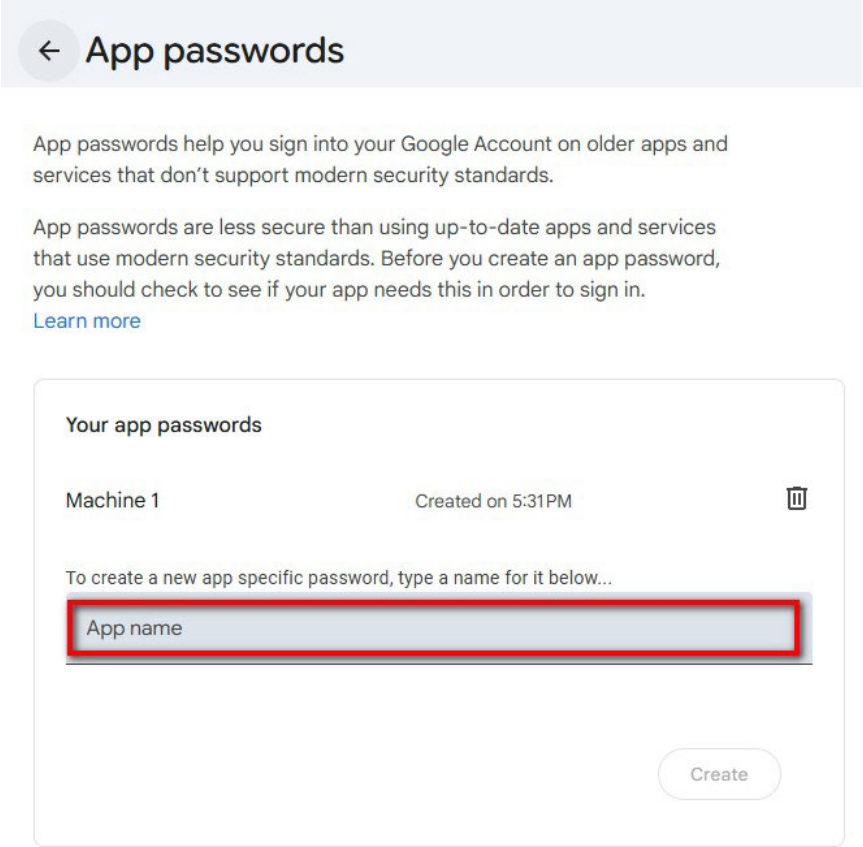


3. Search “app” in the search bar and select App passwords.

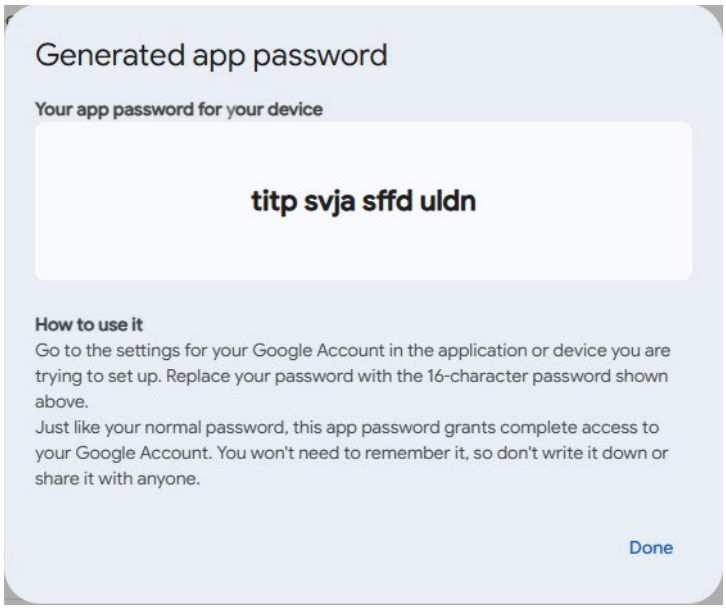


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4. Provide a name of your system to the app for it to generate the password.



5. Save the generated pass word to enter into the PLC because it cannot be retrieved again when the window is closed.



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6. Plug in a ethernet cable in the LAN port on the back of the PLC.



7. With the system on, select LAN & E-mail on the PLC screen.



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8. The client must identify their system's IP address, Net Mask, and Gateway address and enter them on the LAN portion of the screen. If a firewall is enabled for the entered IP address, it may block the email from being sent. Enter 8.8.8.8 for the DNS address and 587 for the SMTP Port # as shown in the picture below. The server is smtp.gmail.com and enter the generated password from step 5 into the SMTP password.



9. Select E-mail Address Setup and enter the email created in Step 1 in Machine E-mail Address and enter in emails of the people to receive the notification in Maintenance and Management.



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10. Select E-mail Test and test if the email notification works by sending it to another email.

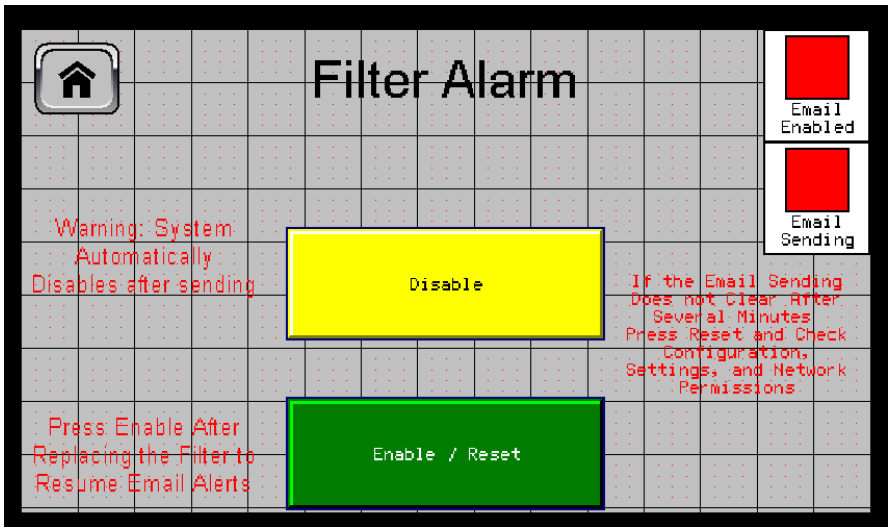


11. If some time has passed and the email still hasn't been received, check for any error on the E-mail Status page. Errors will be indicated with a red circle.



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12. When a filter needs to be replaced and an email has been sent, the screen below will appear on the PLC. Select Enable/Reset to enable the email alert again after the filer has been replaced. A green box will appear on the top left to show email notifications are enabled.



8.0 Audible Alarm (Buzzer)

The Filter Replacement Alarm System with PLC includes an internal buzzer that activates when differential pressure reaches the configured set point. The buzzer is programmed inside the PLC and does not require any additional configuration.

8.1 Silencing the Buzzer

The buzzer can be silenced using the Buzzer Bypass toggle switch located on the top-right of the enclosure. Engaging the bypass silences the audible alarm without affecting:

- The visual alarm on the PLC screen (CHANGE FILTER state remains active)
- Email notifications (the alert email is sent at the moment the set point is reached)
- The flashing TUI logo indicator

> **NOTE**
> Silencing the buzzer does not reset the alarm. The unit continues to display the alarm state until the filter is replaced and the system is reset via "Enable / Reset" on the Filter Alarm screen.

9.0 Installation

9.1 Mounting

The control box is typically mounted above the cleanroom control panel, at or near the cleanroom entry. The unit can be wall-mounted using the keyhole slots on the rear of the enclosure with standard screws.

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1. Select a mounting location with clear visibility of the PLC screen and within cable reach of the FFU challenge port.
2. Install wall anchors and screws at the spacing to match the keyhole slots on the rear of the enclosure.
3. Hang the unit on the screws and verify it is secure.

> ⚠ **CAUTION**
> Ensure the mounting surface can support the weight of the unit (3 lb / 1.4 kg).
> Mount the unit away from sources of excessive heat, moisture, or vibration.

9.2 Pressure Tubing Connection

1. Locate the orange quick-connect port on the top of the unit.
2. Insert the clear pressure tubing fully into the quick-connect port until it seats securely.
3. Route the tubing to the FFU challenge port. Avoid kinks, sharp bends, or pinch points.
4. Connect the other end of the tubing to the FFU challenge port.

> ⚠ **CAUTION**
> Ensure the tubing is not pinched, kinked, or blocked — this will prevent accurate pressure readings and may cause false alarms or missed alerts.
> Connect ONLY to the FFU challenge port. Incorrect connections may damage the pressure sensor.

9.3 Power Connection

The unit draws power from the cleanroom PDM or can be connected to a standard 120V outlet. If connecting to a standard outlet, a power outlet cord adapter must be ordered separately.

1. Plug the power cable into the cleanroom PDM port or a standard 120V outlet.
2. The PLC display will illuminate and the Home screen will load within a few seconds.
3. Verify the pressure reading updates in real time.

9.4 LAN Connection

For email notification functionality, connect the unit to the facility LAN using a standard Ethernet cable (not included). Then complete the LAN & E-mail Setup as described in Section 7.

10.0 Normal Operation

Once installed and configured, the Filter Replacement Alarm System with PLC operates automatically. No daily user interaction is required during normal filter monitoring.

10.1 Monitoring State

During normal operation, the Home screen displays the live differential pressure reading in inches water column. As the filter gradually loads with particulates over time, backpressure builds and the progress bar on the screen fills accordingly.

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> **NOTE**
> The PLC touchscreen displays real-time differential pressure readings. If the screen is off, pressure cannot be read from the unit.

10.2 Filter Replacement Workflow

When the set point is reached and the alarm triggers:

1. The PLC screen displays "CHANGE FILTER" with a red background.
2. The audible buzzer activates (can be silenced with the Buzzer Bypass switch).
3. The TUI logo flashes.
4. An email notification is sent to configured recipients (if email is enabled).
5. The Email Status indicator turns red after the notification is sent.

After receiving the alert and replacing the filter:

1. Silence the buzzer if desired using the Buzzer Bypass switch.
2. Replace the HEPA or ULPA filter in the FFU according to your facility's filter replacement procedure.
3. Navigate to the Filter Alarm screen on the PLC and tap "Enable / Reset" to re-arm email notifications.
4. Confirm the Home screen returns to the normal monitoring state and the Email Status indicator turns green.

11.0 Troubleshooting

Symptom	Possible Cause	Recommended Action
No display on PLC screen	Unit not powered	Check power cable connection to PDM or outlet.
Pressure reading does not respond	Tubing disconnected or kinked	Inspect tubing connections at both the unit and the FFU challenge port. Straighten any kinks.
Alarm triggers at low pressure	Set point too low	Increase the set point value by tapping the SET POINT field on the Home screen.
Email not received after alarm	SMTP settings incorrect or network not connected	Verify LAN settings and SMTP credentials. Run a test email from the Test E-mail screen.
"Email Sending" status stuck	Network issue or SMTP rejection	Check network connectivity and firewall rules. Tap Reset on the Filter Alarm screen, then reconfigure SMTP settings.

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Buzzer will not silence	Bypass switch not engaged	Toggle the Buzzer Bypass switch on the top of the enclosure to the bypass position.
Email notifications do not resume after filter change	Email not re-enabled after filter replacement	Navigate to the Filter Alarm screen and tap "Enable / Reset" to re-arm email notifications.

12.0 Warranty

This product carries a warranty of 1 year on parts and 90 days on labor from the date of shipment. This warranty covers defects in materials and workmanship under normal use and service conditions.

This warranty does not cover damage resulting from misuse, unauthorized modification, improper installation, or operation outside of the specified electrical ratings. Terra Universal's liability under this warranty is limited to repair or replacement of the defective unit at Terra Universal's discretion.

For warranty service, technical support, or replacement parts, contact Terra Universal:

- Phone: (714) 578-6000
- Email: sales@terrauniversal.com
- Web: TerraUniversal.com
- Address: 800 S. Raymond Ave., Fullerton, CA 92831

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