



## Pressure Monitoring 101





# Introductions

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# Timeline of LEC, inc.

Increased focus on providing communication and data acquisition solutions with a wider geographic footprint

Launched LEC's first IIoT platform: iQ Web Scada

Celebrates 30 years of moving industry forward

Launched iQ Pulse for AMI



2008



2015



2019



2021

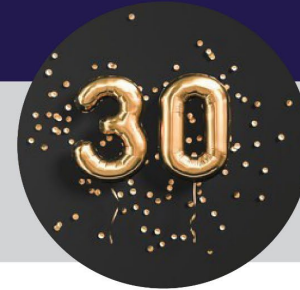
1989



2009



2018



2020



LEC began as a controls, automation and systems integration-based engineering firm providing plant floor application services through machine OEMS

Registered as professional engineering firm

iQ2 launched and received multiple awards

LEC continues delivering disruptive innovation with the introduction of Gen-Set: Smart remote control & monitoring for industrial emergency generators



# Since 2021...?



Self-Powered Pressure Monitoring Solution



Self-Powered Pump Monitoring Solution



Streamlined RTU Platform for efficient deployment and flexible monitoring options





# Pressure Monitoring 101

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# Why Monitor Pressure?

## OBVIOUS

- Recurring problems in specific locations
- Frequent “leaks” and difficulty locating
- Not enough manpower
- Safety of personnel

## NOT-SO-OBVIOUS

- Budget prioritization for maintenance and additions
- Public perception and confidence
- Need for short-term and long-term data analytics



# The Solution

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# The Solution



## Pressure Monitoring Cellular Endpoint...What's that?



- Low power, battery operated
- Mobile App – Bluetooth with cellular connectivity
- Monitor pressure readings
- Cellular alarm notifications
- Data Collection

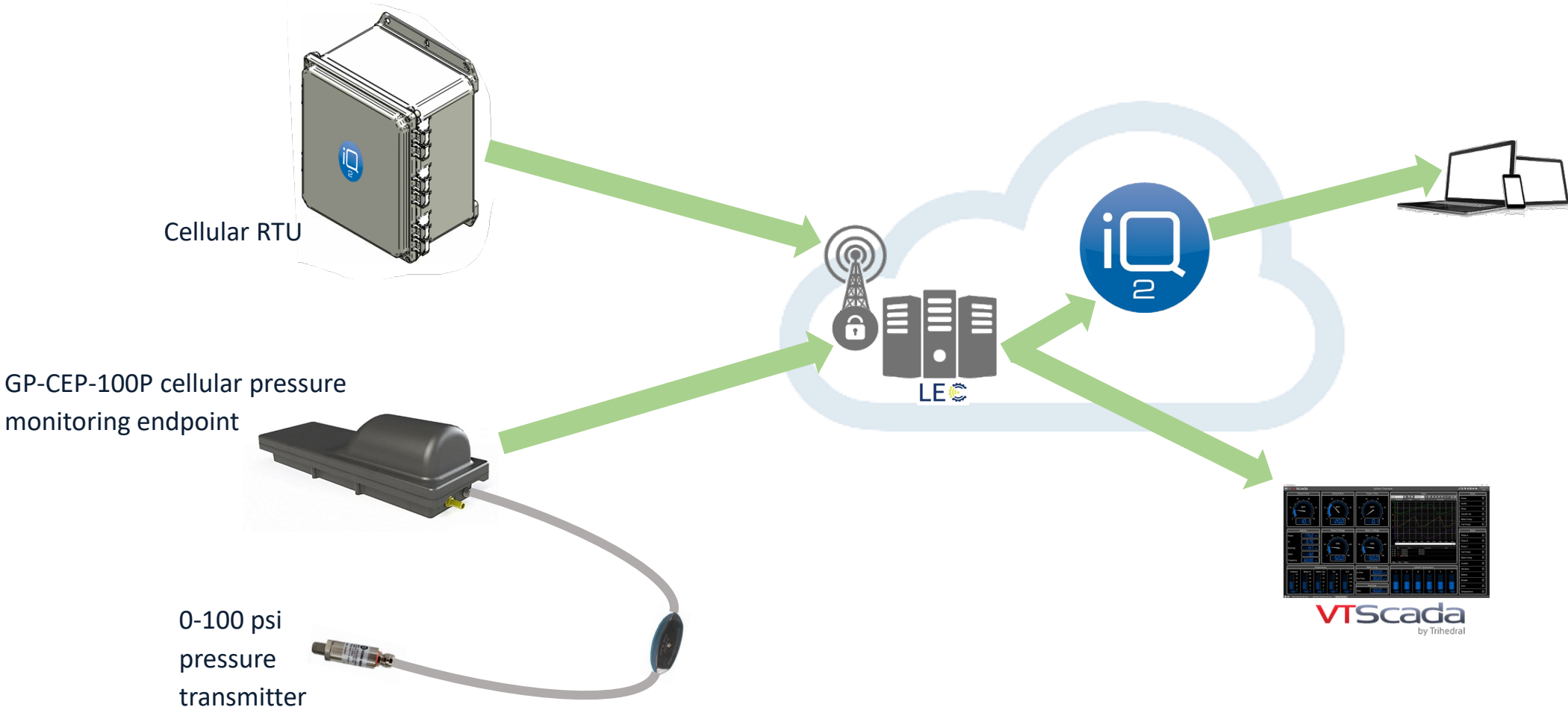
0-100 psi pressure transmitter



# The Solution



## System Overview



# The Solution



## Mobile Device

9:24

JH Pressure - 035.000.000.226

ONLINE ●

Status: null

SN: 587202560

LEC

Endpoint Testing - IQ2 & IQ Pulse

RSSI: -67 dB

IP: null

JH Pressure - 035.000.000.226

Leaflet | © Esri, I-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community

NO ACTIVE ALARMS

iq2.lecinc.com

9:24

JH Pressure - 035.000.000.226

TOGGLE INPUTS

WIDGET ORDERING ACTIVE

### INPUT TAG LIST (drag and drop to reorder)

Pressure Reading	135.69
LTE Signal	-93 dBm
Signal Quality	-13
Battery Voltage	3.645 Vdc

iq2.lecinc.com

9:25

TAG TREND: PRESSURE READING: JUSTIN HOGUE

← GO BACK

Pressure Reading

iq2.lecinc.com

## PC

ENABLING IIoT

### System Pressure Monitoring ONLINE DEVICE MAP

NORMAL WARNING ALARM

Leaflet | © Esri, I-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community



# Economics

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System-wide pressure monitoring is historically expensive, but in 2024 it doesn't have to be.

For implementation you should think in terms of AMI solution deployment, except this is integrated into your operational SCADA.



# Deployment

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# Deployment



## What does installation require?

Location in need of monitoring

A short list of hand tools, depending on install method

Fitting with ¼" NPT female threads

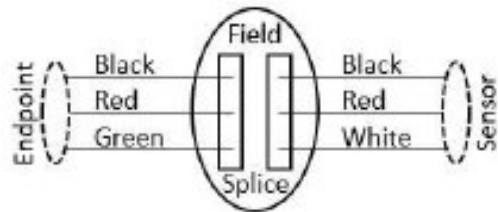




# Deployment

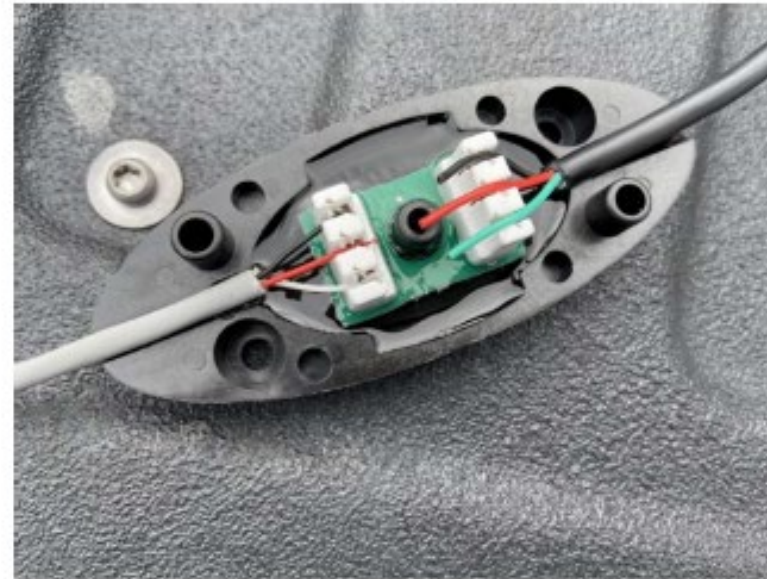


## GP-CEP-100P Field Wiring Diagram



Tools required for signal wire splicing:

1. Impact Punchdown Tool  
(reference Klein Tools part# VDV427-300 or equivalent)
2. Phillips Head Screwdriver





# Deployment



Permanent

Temporary





# Deployment

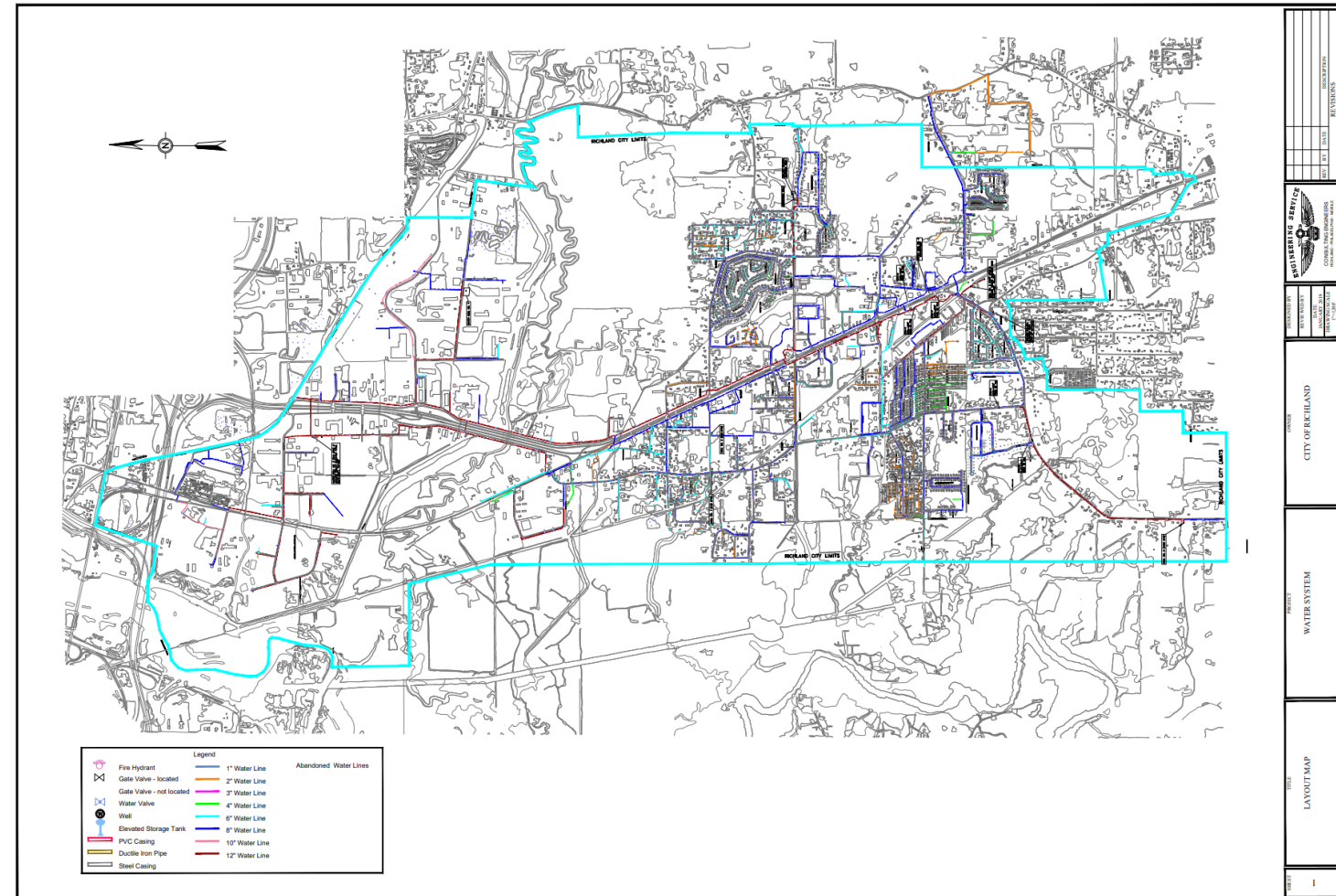


## Strategic Location

Location, location, location

What locations are “strategic” will vary from system to system

Many factors influence where pressure endpoints should be installed





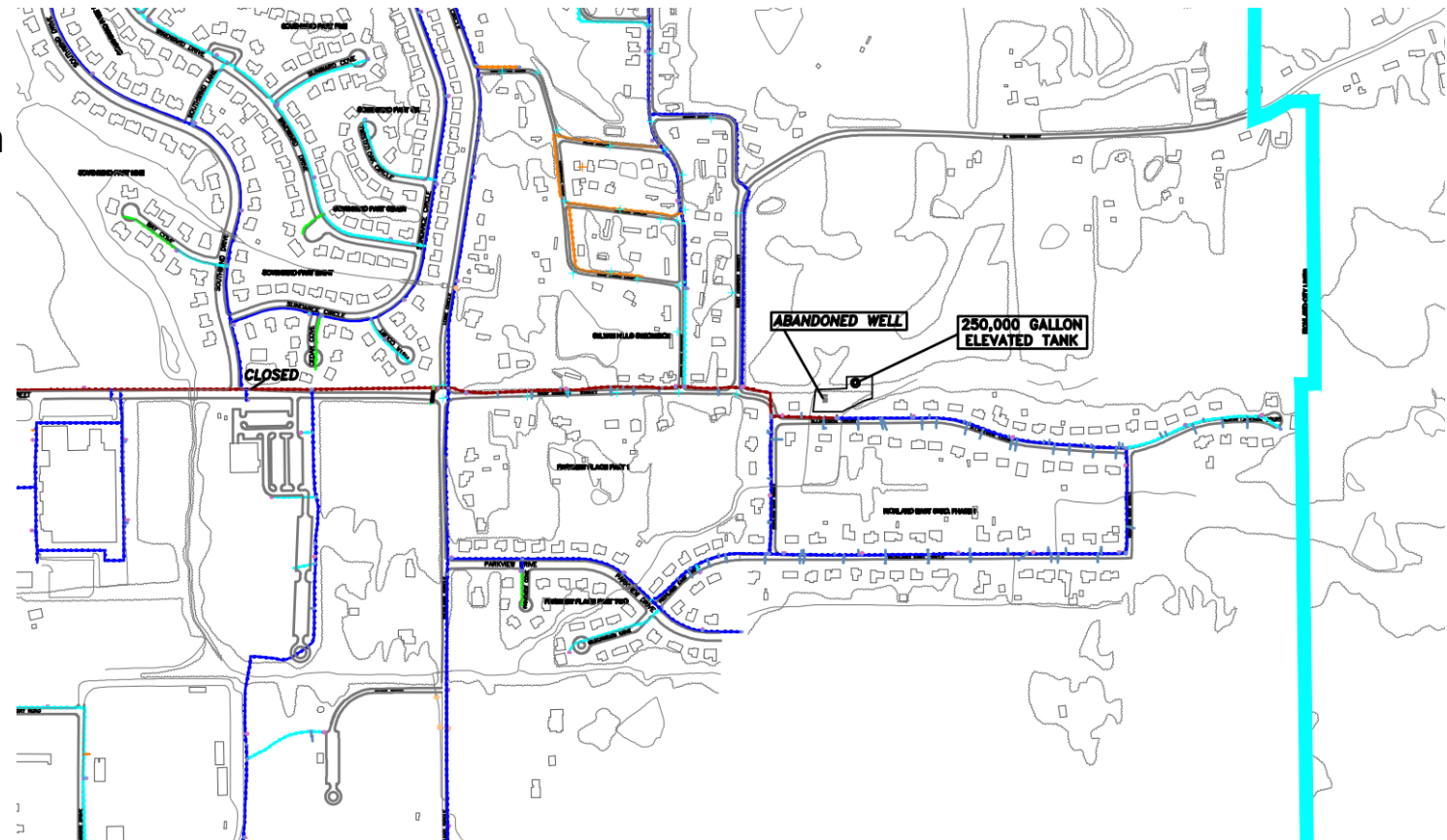
# Deployment



## Strategic Location

Consider installations based on system layout

Consider loops, elevation changes, dead-ends, well locations, tank locations, significant valves



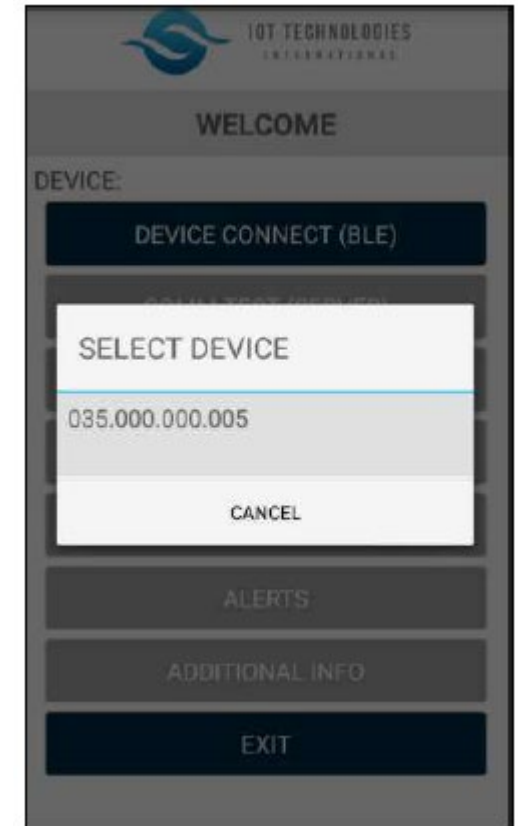
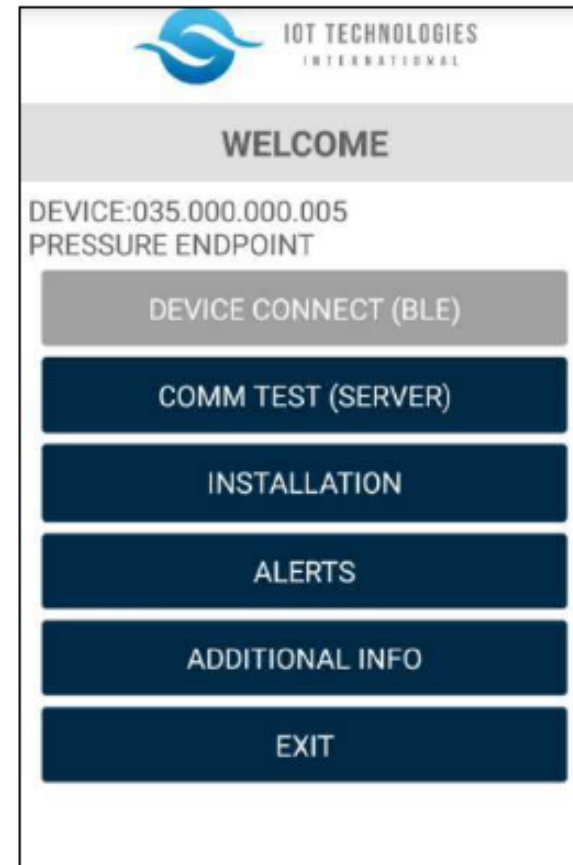
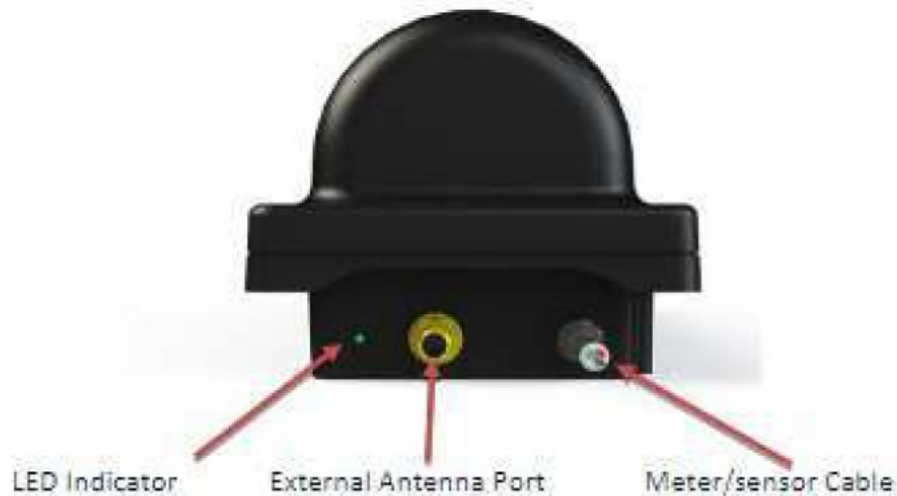




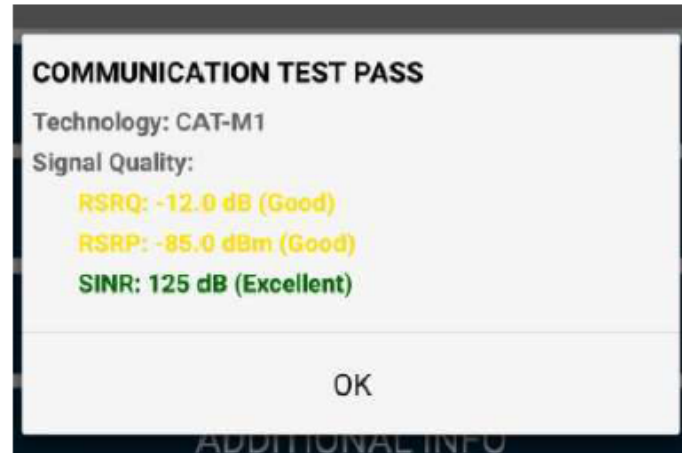
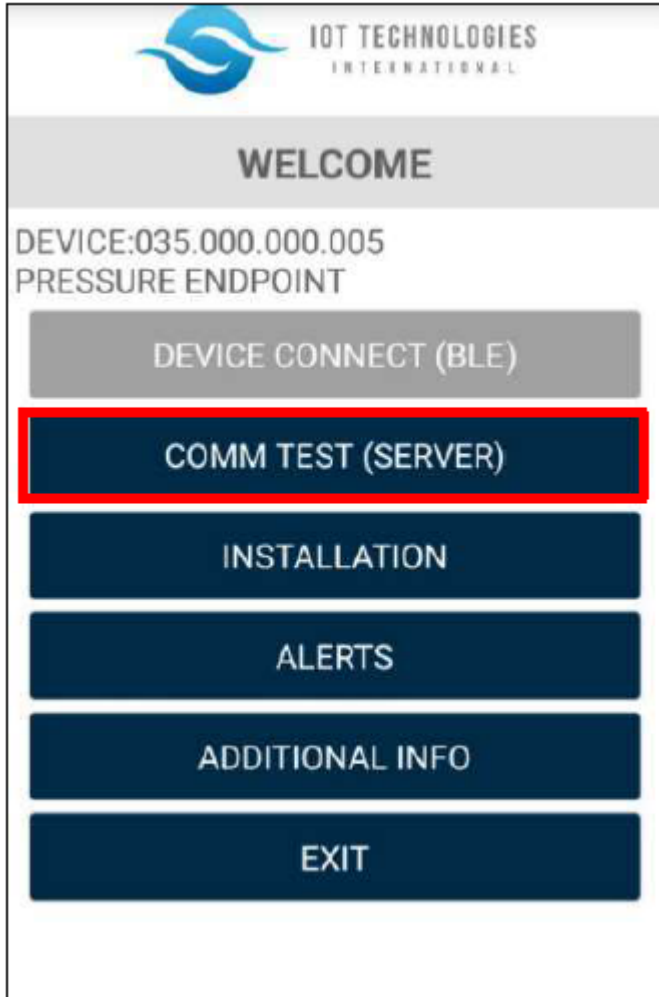
# Activating Communication



Initiate activation with a magnet  
Green light will illuminate  
Open “Device Connect” in the app  
Green light flickers and SN appears



# Activating Communication



Press "OK" to return to the Main Menu.

RSRP:  
Excellent (Green)  $\geq -80$  dBm  
Good (Yellow) -80 dBm to -90 dBm  
Medium (Orange) -90 dBm to -100 dBm  
Cell Edge (Red)  $\leq -100$  dBm

RSRQ:  
Excellent (Green)  $\geq -10$   
Good (Yellow) -10 dB to -15 dB  
Medium (Orange) -15 dB to -20 dB  
Cell Edge (Red)  $\leq -20$  dB



# Setup and Tuning



Normal data flow is to check pressure every 5 minutes, upload readings on 15-minute intervals every 4 hours

14:23 01:20 4G 82%

IOT TECHNOLOGIES INTERNATIONAL

### INSTALLATION

INSTALLER NAME:

INSTALLATION DATE :05/30/2023 11:35:02

INSTALLATION LOCATION:  
Latitude: 38.773586  
Longitude: -90.560638  
Accuracy 9.935046

LOCATION DESCRIPTION:

CLUSTER: 003.000.001.002

SERVER: gencep.lecinc.com:5043

TIMEZONE: America/Chicago **UPDATE**

APN: automationcontrolsia02.com.attz **UPDATE**

LTE MODE: CatM Preferred **UPDATE**

ANTENNA: INTERNAL **UPDATE**

UPDATE SERVER INTERVAL: 4 HOURS **UPDATE**

METER READING: 15 MINUTES **UPDATE**

**ACTIVATE**

Setpoints for High High, High, Low and Low Low

14:25 02:45 4G 82%

IOT TECHNOLOGIES INTERNATIONAL

### ALERTS

UNDER PRESSURE 1 OK

#### ALERT CONFIGURATION

UNDER PRESSURE 1 (PSI)  
  ENABLE

UNDER PRESSURE 2 (PSI)  
  ENABLE

OVER PRESSURE 1 (PSI)  
  ENABLE

OVER PRESSURE 2 (PSI)  
  ENABLE

Cancel OK

### CONFIGURATION

REFRESH

OK

# Setup and Tuning



**ALERT CONFIGURATION**

UNDER PRESSURE 1 (PSI)  
15.0  ENABLE

UNDER PRESSURE 2 (PSI)  
43.0  ENABLE

OVER PRESSURE 1 (PSI)  
95.0  ENABLE

OVER PRESSURE 2 (PSI)  
58.0  ENABLE

Cancel OK

## ALERT CONFIGURATION

- Regular readings – 15 minutes
- Threshold exceeded
- 60 second follow up reading
- Alarm signal to iQ2
- 3 Minute Delay
- Notification to end user

# Setup and Tuning



INPUT TAG LIST (drag and drop to reorder)	
Pressure	80.88 psi

## Final steps to initial configuration:

- Set device name
- Set GPS Coordinates
- Upload install photo

## Recent Enhancement to iQ2

DEVICE INFORMATION	
USE MOBILE DEVICE GPS	
DEVICE NAME	White House UD - 035.000.001.037
GPS LATITUDE	36.4746243
GPS LONGITUDE	-86.4676106
UPLOAD PHOTO	Choose File No file chosen



The background features a network diagram with white lines connecting various icons (gears, signal towers, people, etc.) over a blue globe. A large white rectangular box with a thin black border is centered on the page.

# Installed Solution

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# Installed Solution

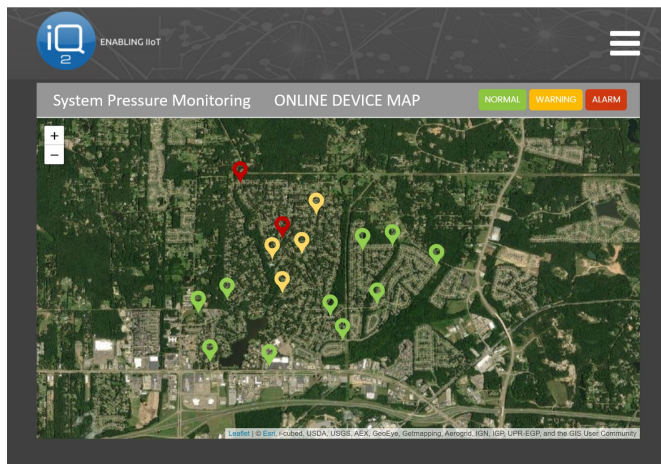


- Constant Monitoring
- Alerting and alarming
- Remote viewing for field and maintenance staff
- Short-term data analytics
- Data logging

- Control room visibility
- Long-term data storage and analytics (historian)
- Custom reporting



**VTScada**  
by Trihedral



**ArcGIS**  
ESRI

- Flexible Data Acquisition
- Advanced Modeling/Analysis
- Digital Twinning



# Focused Example: JXN Water



- Phase 1A: 15 Units to Start - Initially temporary install
- Phase 1B: 10 additional temporary units added
- Phase 2: 25 additional permanent units
- Additional RTU's for wells and tanks currently being deployed
- City gaining visibility on where they have pressure, finding problem valves and identifying leaks
- Engineering is developing hydraulic models to develop master plan to improve the system





# Focused Example: JXN Water



Drinking Water Distribution: operational efficiency and an engineering gold mine:

- Constant monitoring and real time alerting
- Data for proving and calibrating existing hydraulic models
- Historian data via control room applications such as VT Scada
- Dynamic hydraulic modeling
- Digital twins



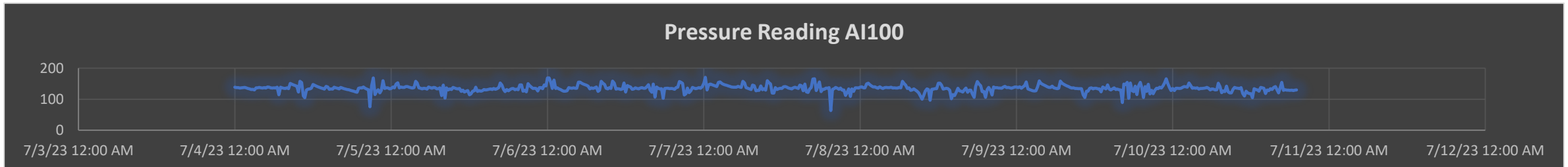
Remote Users



Control Room



Planning and Consulting



# Summary

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# Summary



## What's the trend in terms of results?

Direct relationship between pressure and savings

Boil water notices...entire system suspect

Prioritize maintenance spend based on system performance

Prioritize upgrades and additions based on actual system performance

Solid system = safe drinking water delivered + public confidence





## Contact Information



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