The SBE 38 Signal

November 2026

The official newsletter of the El Paso chapter of the Society of Broadcast Engineers



The latest from the SBE

Upcoming Webinars: From AI Experimentation to Reliable Broadcast Engineering Workflows
Hosted by: ***Gleb Tsipursky, Ph.D.***

Broadcast engineers are increasingly experimenting with AI for documentation, troubleshooting, planning, and other technical workflows, but reliable adoption requires more than access to the tools. This webinar shows how engineers and technical leaders can use AI productively while preserving engineering judgment, reliability, and professional standards.
More info here



CHAPTER NOTES

The minutes from our last meeting at El Rincon De Cortez

SAGE RELEASES 96-02

The mandatory update and all you need to know

THE CLOVIS SOUND

A look back at Norman Petty and how the Clovis Sound got Buddy Holly Started

White Papers Attached

Pressure under Control:

Maintaining Dielectric Integrity in High-Power RF Systems

Special Thanks to Noe Rodriguez-Jimenez

Chapter Notes

The last chapter meeting was held October 14th at El Rincon De Cortez

Total Attendance: 6

Meeting Called to Order: 12:00 PM

Secretary's Report: No Report

Treasury Report: **No Report**

Certification Report: Glenn Leffler is in the process of receiving study guides for certification and should have by 10/31

Membership Report: No Report

Frequency Coordination Report: Coordination was requested for UTEP/Oregon State game Sept 26th

Scholarship Report: No Report

Website Report: No current Issues

EAS Report: New Mexico State EAS not coming in due to instreaming issues

Program Committee Report: No Report

New Business: Gates Air visiting Entravision and KRWG facilities 10/17 + 10/18

MEETING ADJOURNED: AT 12:30 PM.

Certification Window:

The next exams offered in **February 2027** have an application deadline of **January 4th**. Reach out to Megan Clappe, mclappe@sbe.org for details or visit the SBE Certification Page for details

Sage Offers Rev 96-02 Just in time for NPT November 19th

From Nick Langan, Radio World Staff



Here's an important note for stations that update their Sage Alerting Systems Digital ENDEC 3644 with the firmware we told you about yesterday: Once you install the required update, you must also go back and update the FCC's ETRS Form One.

As we reported, Sage Alerting Systems released a mandatory firmware that patches compromised eMudhra root certificates.

That means for any station who installs the update, it must amend their ETRS Form One submission to ensure the commission's records reflect the encoder-decoder software version in use on the nationwide Emergency Alert System test date of Nov. 17.

The free firmware update, designated version 96-2 (also designated 96-02), is required for U.S. users running Rev96 or Rev96-1.

Although the annual deadline to submit initial ETRS Form One filings was Oct. 30, the online portal remains open for modifications.

"EAS participants that update their EAS equipment's software or replace their equipment after filing an ETRS form must update their ETRS Form One filing to reflect the equipment and software version that they will use the day of the nationwide test," the FCC Public Safety and Homeland Security Bureau stated in a public notice this week.

Filers can amend previously submitted forms by logging into ETRS, selecting the "My Filings" menu option and clicking on the existing record for that authorization. Step-by-step instructions on updating entries are detailed on page 14 of the commission's ETRS frequently asked questions document.

Our Next Chapter Meeting:

Thur November 12th time TBA

Online via Zoom

We hope you logon for a few moments!

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Norman Petty: Buddy Holly and the Clovis Sound

(source: Wikipedia)

Petty was born in the small town of Clovis, New Mexico.[3] He began playing piano at a young age. While in high school, he regularly performed on a 15-minute show on a local radio station. After his graduation in 1945, he was drafted into the United States Air Force. When he returned, he married his high-school sweetheart Violet Ann Brady on June 20, 1948. The couple lived briefly in Dallas, Texas, where Petty worked as a part-time engineer at Jim Beck Studio.[2] Eventually, they moved back to their hometown of Clovis.

Petty and his wife, Vi, founded the Norman Petty Trio, with guitarist Jack Vaughn. Due to the local success of their independent debut release of "Mood Indigo", they landed a recording contract with RCA Records and sold half a million copies of the recording, and were voted Most Promising Instrumental Group of 1954 by Cashbox magazine. In 1957, their song "Almost Paradise" hit number 18, and Petty won his first BMI writers' award. The song had various cover versions released, with Roger Williams' version selling the best.



Despite the success of his own records, Petty began construction of his Clovis recording studio in late 1954. The new studio was state of the art, estimated to have cost around $100,000 (US$1,198,885 in 2025 dollars). "Throughout his life, Petty remained a member of the Central Baptist Church in Clovis, a religious man who advised all of his acts to carry a bible with them on tour and forbade alcohol and cigarettes (and even swearing) within the studio complex."

With the success of "Almost Paradise", the structure was completed in mid-1957. In his original 7th Street studio, aside from songs for his own musical group, he also produced singles (several which were hits) for West Texas musicians Roy Orbison, Buddy Knox, Jimmy Bowen, Waylon Jennings, Charlie "Sugartime" Phillips, Sonny West, Carolyn Hester, Johnny "Peanuts" Wilson, and Billy Walker. Sizeable hits such as "Torquay", "Bulldog", "Quite A Party", "Sugar Shack", "Bottle of Wine" all by The Fireballs,"Wheels", and "Brass Buttons" by the String-A-Longs were recorded at Petty's studio.



Due to the success with instrumental groups, Petty was a reputable producer for bands of that genre and his Clovis Studio was one of the top "go-to" studios for the guitar instrumental (surf) sound in the early 1960s. Notable musicians who visited during the 1960s were the Champs (featuring members Seals & Crofts and Glen Campbell), JD Souther (& the Cinders), Johnny Duncan, and Eddie Reeves.

Petty produced the majority of Buddy Holly's studio recordings from 1956 through 1958 at his Clovis studio, with the remainder being recorded at Bell Sound Studios in New York. According to Petty, he took an "immediate liking to Buddy from the very first moment" they met, although in an earlier interview with journalist Norman Mark, he had delivered a possibly more pragmatic response:



Petty was asked by Holly to act as the band's "personal manager after "That'll Be The Day" started to break in July 1957", although he "signed no management contract with either Buddy or the Crickets, who were therefore free to leave whenever they wished". "In addition to taking control of Holly's career and finances, he added his name to the songwriting credits—a dubious but not uncommon practice in those days". Other sources claim that this "was unusual for the 1950s, but today is quite common and even the standard practice in some genres." Petty "was an innovative producer who charged a fixed fee per recording rather than the hourly rate that was standard then and now, and did not take a fixed payment from mechanical royalties. To compensate for his risks and to recognize his contribution to creating the song, Petty was often listed as a cowriter of the songs he produced, and the songs were published by his music publishing company, Nor-Va-Jak Music. ... No doubt Petty took risks as the producer and deserved greater compensation for his efforts, but his percentage of performance royalties was greater than Holly's and the question is whether this was more than Petty deserved. Those who would defend Petty's greater share would point to the fact that Holly and the Crickets did not produce any hits before they recorded with Petty in his ... studio." Larry Holly, Buddy's brother, acknowledged that "Norman was responsible for getting Buddy out."

However, Petty was also accused of withholding "royalty payments to Holly", who eventually found out that the band's "recording royalties had not been banked under their name but under Petty's." However, at the time, "records sold in shops for between just sixty-nine and eighty-nine cents each, while the royalty was often as low as one cent per side." While "unable to deny that they were due sizeable sums, Petty kept on stressing the slowness with which record-companies, in particular, paid out artists' royalties." In 1958, after

"Holly suffered disappointing sales for such tunes as "Rave On" and "It's So Easy!", he grew resentful of Petty's control. The cash-strapped musician and his new wife, Maria Elena [Santiago], visited Petty at the studio to end their partnership, and seek his unpaid royalties." Santiago insisted that Holly get his "finances in order" before she would marry him, stating: "I don't want to sit around all the time, waiting for handouts from Norman Petty." She "recounted that Petty told his young protege, "You know what, Buddy? I'm gonna say this to you. I'd rather see you dead than to give you the money now."

According to Santiago, Petty "tried to break us up ... He told Buddy not to marry me because I was a whorish kind of woman, that I'd slept with all kinds of other men who'd come in to Peer-Southern. Buddy knew that wasn't true, of course. He got so mad, he wanted to leave Norman right there and then." According to Petty's recollection of the meeting, "Elena did all the talking. She said, 'Buddy and I have decided that Buddy can do better—that you're not fit for Buddy's manager.' And I said, 'What's this—is it something I've done?' She said, 'It's what you haven't done—you haven't done near enough for him.'" Petty would recall the split rather more amicably, claiming that "When I asked Buddy if there was anything that I had done to cause the split—I think the question was answered by his wife that time. It wasn't necessarily anything I had done, I had not done enough to exploit Buddy, the world did not know enough about Buddy Holly. I was not doing a competent job of promoting him as an artist. That to me was the basic reason. ... As far as musically speaking goes, I don't think there ever was a rift between Buddy and myself". The remaining Crickets, Joe B. Mauldin and Jerry Allison, chose to remain with Petty.

In 1999, Holly's widow, Maria Elena, along with Holly's siblings, filed a lawsuit against MCA Inc. in which she alleged that Petty "conspired with MCA to defraud the Holly heirs." It was eventually determined through extensive auditing that "MCA owed the Petty estate and the Holly heirs a combined $251,325 in additional royalties".

Petty purchased the Mesa Theater on Main Street in Clovis in 1960. In 1963, he launched the FM radio station KTQM starting as an easy-listening station, later switching to country-and-western music, and then in 1968 to top-40 rock. The country genre had local appeal, so he applied for a new station license and started KWKA 680 AM in 1971, airing country-and-western music. Petty ran both stations until 1979. The stations were sold by Curry County Broadcasting to Zia Broadcasting in 2010. The Recording Studio is preserved as a museum and can be visited to this day.



Petty died in Lubbock, Texas, in August 1984, of leukemia. Later in 1984, he was posthumously named Clovis Citizen of the Year. His wife, Vi, died in March 1992. She helped start the "Norman and Vi Petty Music Festival" in Clovis in 1987, which ran until 1997. It featured many artists who had recorded at the Clovis studio and also popular hit makers. Robert Linville requested the name from the Chamber of Commerce and started the festivals again from 1998 until his death in 2001.

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Pressure Under Control:

Maintaining Dielectric Integrity in High-Power RF Systems

In high-power RF infrastructure, the structural integrity of rigid coaxial lines and waveguides is only half the battle; the true limiting factor to system reliability is often the invisible dielectric medium inside them. When dealing with kilowatt- or megawatt-level transmitters, intense electromagnetic fields demand an absolute, predictable voltage breakdown threshold.





Figure 1: Rigid transmission line (top) and Gas barrier adapter (left)

Unpressurized lines are highly susceptible to ambient thermal cycling, creating a "breathing" effect that draws in humid air, leading to moisture condensation, impedance discontinuities, and elevated VSWR. Left unchecked, this moisture alters the local dielectric constant and drastically lowers the ionization threshold of the air, causing catastrophic voltage arc-over. Maintaining a continuous, positive pressure of dry air or nitrogen is not a secondary maintenance consideration—it is a critical operational baseline required to stabilize the system's power-handling capacity and insulate the RF path from environmental degradation [1], [2].

The Physics of RF Pressurization: Paschen's Law and Moisture

The core operational mandate of pressurization is explained by "Paschen's Law", which dictates that breakdown voltage is a function of gas pressure (P) and gap distance (d) [3]. By introducing a controlled, positive pressure into a coaxial line or waveguide, we artificially increase the density of the air molecules. This dense molecular packing drastically reduces the mean free path of free electrons, raising the ionization threshold and preventing voltage arcs at extreme power levels.

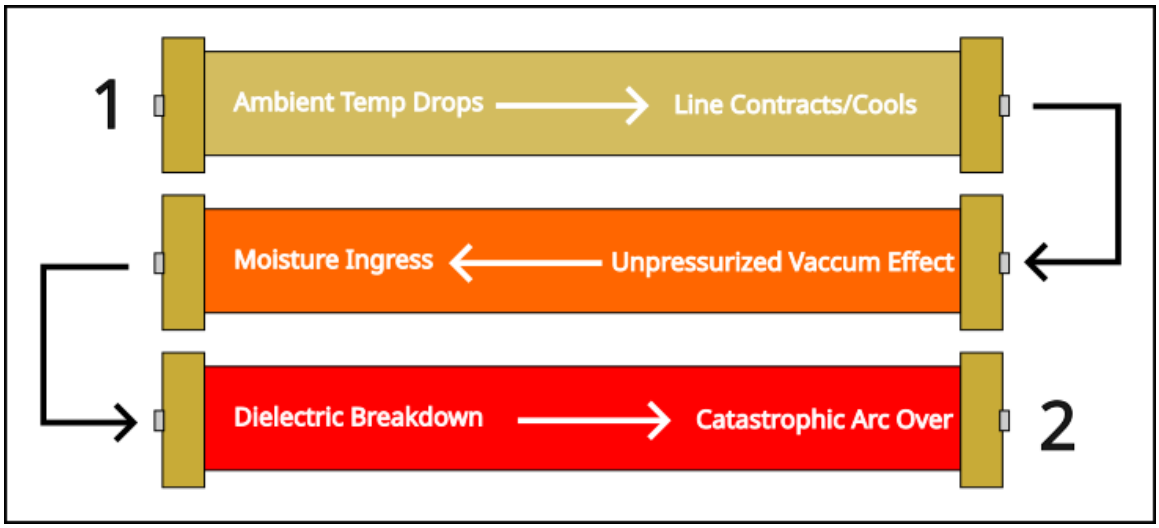


Figure 2: Catastrophic Arc path.

The primary catalyst for dielectric breakdown is moisture [4]. When a transmitter undergoes power adjustments or changes state, internal temperatures fluctuate wildly. In an unpressurized environment, this cooling creates a vacuum effect, sucking in ambient, humid air. Once inside, this humidity condenses into liquid water droplets on the inner conductor or waveguide walls, shifting the characteristic impedance (Z_0) and causing destructive energy reflections back into the transmitter cavity.

To counteract this, systems must use either bottled Nitrogen (N_2) or automated desiccant dehydrators to maintain an internal dew point of "-40°F/-40°C" or lower, effectively eliminating any potential for condensation.

System Mechanics and Precision Measurement

Implementing a robust pressurization strategy requires precise mechanical regulation combined with an active telemetry layer. Because high-power lines operate under tight tolerances, manual pressure gauges are insufficient to prevent failures.

Standard systems are regulated to a nominal pressure of 3.0 to 5.0 PSI (20.7 to 34.5 kPa). This specific window ensures a sufficient safety margin against atmospheric moisture ingress—even during rapid cooling cycles like a sudden rainstorm hitting a hot outdoor line—without exceeding structural limits. Exceeding 10 PSI risks blowing out delicate gas barriers, ceramic bullets, or waveguide windows [4]. Therefore, dual-stage mechanical regulators and over-pressure relief valves must be calibrated to vent safely before reaching maximum structural limits.

To transition from static mechanical gauges to digital monitoring, systems utilize industrial-grade piezoresistive or capacitive pressure transducers. These sensors must feature a Total Error Band (TEB) of ≤ ±1.0% FS (Full Scale) across the entire operating temperature range (-40°C to +85°C) and provide a measurement resolution of 0.1 PSI. High resolution allows monitoring systems to differentiate between normal diurnal thermal fluctuations and a true micro-leak.

Remote Telemetry and Commercial Hardware Options

Modern broadcast and telecommunications sites rely on automated telemetry to capture system degradation before a hard failure occurs. The pressure monitoring system should feed directly into the site's Network Management System (NMS) via SNMP (v2c/v3) or Modbus TCP [5].

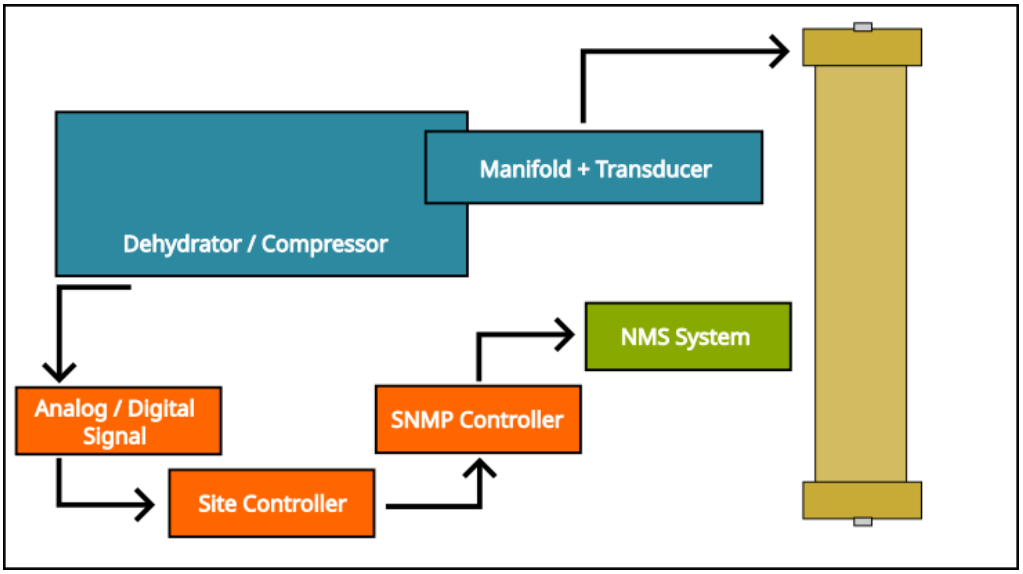


Figure 3: Pressure data flow.

Engineers should configure their NMS to track three primary telemetry points:

1 **Static Pressure Alarms**: Low-pressure thresholds must be set hierarchically.

A **"Low Pressure"** warning at 2.5 PSI indicates a developing issue, while a **"Critical Low"** alarm at 1.5 PSI implies imminent danger of moisture ingress and should automatically interlock with the transmitter to throttle or mute RF output.

2 **Dehydrator Duty Cycle Tracking:** A slow leak will initially be compensated for by the dehydrator cycling on more frequently [5]. By monitoring the run-time log or current draw of the compressor, the NMS can flag an anomalous duty cycle long before the line pressure actually drops. If the compressor run-time exceeds 20% over a 24-hour window, a proactive maintenance alert is generated.

3 **Dew Point Telemetry:** Continuous electronic dew point sensors inside the manifold must feed data to the NMS. Any rise above -40°F/°C signals desiccant saturation or a dryer failure, indicating that wet air is actively being pumped into the RF path.

When selecting commercial hardware to deploy at unattended facilities, the following systems represent industry standards for automatic, network-ready desiccant dehydrators [5]–[7]:

BRAND	RANGE	DESCRIPTION	PRICE
ETI ADH NETCOM	200 to 600	Configurable 0.10 to 7.50 PSIG increments, native Web UI, Ethernet, SNMP alarms.	~$2,200
Altec AIR P550W	550	IP Network connectivity, dedicated SNMP traps, web configuration interface	~$5,783
Altec AIR P1500W	1500	Full network IP capabilities, high/low-pressure dry contact overrides, compressor logs.	~$7,141
RFS BD4200W	4200	Humidity sensing accuracy within ±0.1% RH, real-time data logging, web dashboard.	~$10,661+

Modern units in this tier utilize a "bullet" or heatless regenerative dual desiccant chamber design. One chamber dries the air while the other purges collected moisture back into the atmosphere, yielding a continuous, on-demand stream of dry air without requiring manual desiccant replacements. [ETSILINE COMPACT 1500]

Pressure Drop Profiling and Leak Localization

In long transmission line runs—especially vertical runs going up a multi-hundred-foot broadcast tower—leaks rarely happen inside the transmitter building. Instead, they occur at remote flange connections, waveguide elbows, or at the antenna feed horn window due to structural wind load straining or physical vibrations. Finding these points requires Pressure Drop Profiling [4].

Because air experiences friction as it moves through a hollow waveguide or rigid coax line, a dynamic pressure gradient develops when a leak introduces airflow. This behavior is defined by the following relation:

$$\Delta P = P_{source} - P_{terminal}$$

By establishing a baseline pressure drop under sealed, static conditions (which should ideally be a 0 PSI delta), field engineers can use any sudden delta to calculate exactly where a leak resides. For example, if P_source drops marginally while P_terminal drops dramatically, the leak is located closer to the antenna array. If both pressures drop identically, the leak exists near the gas barrier or manifold inside the shelter.

DIY Engineering: Budget Telemetry via KEYENCE AP-30K and ESP32-C6

Commercial SNMP-enabled dehydrators provide an all-in-one solution, but retrofitting legacy hardware or adding redundant monitoring points on a budget does not require spending thousands of dollars. Engineers can design and deploy an open-source, industrial-grade remote telemetry unit (RTU) using a KEYENCE AP-30K pressure sensor [8] paired with an Espressif ESP32-C6-DEV-N8 microcontroller [9]. This approach provides high-resolution data logging, a local web interface, and native network alerts for under $350.

1. Hardware Integration & Technical Blueprint

The KEYENCE AP-30K provides a rated gauge pressure range of 0 to 14.50 PSI (0 to 100.0 kPa) with a sharp, dual-color LED display and an analog output channel [8]. The ESP32-C6 Development Board anchors the compute stack, driving local processing alongside low-latency Wi-Fi 6 (802.11ax) connectivity [9].

Because industrial equipment runs on a 24V DC topology while the ESP32-C6 handles a maximum logic threshold of 3.3V DC, direct connection will instantly destroy the microcontroller module. To scale the analog voltage and pass the emergency interlock trip signals safely, use the specific electrical schematic below:

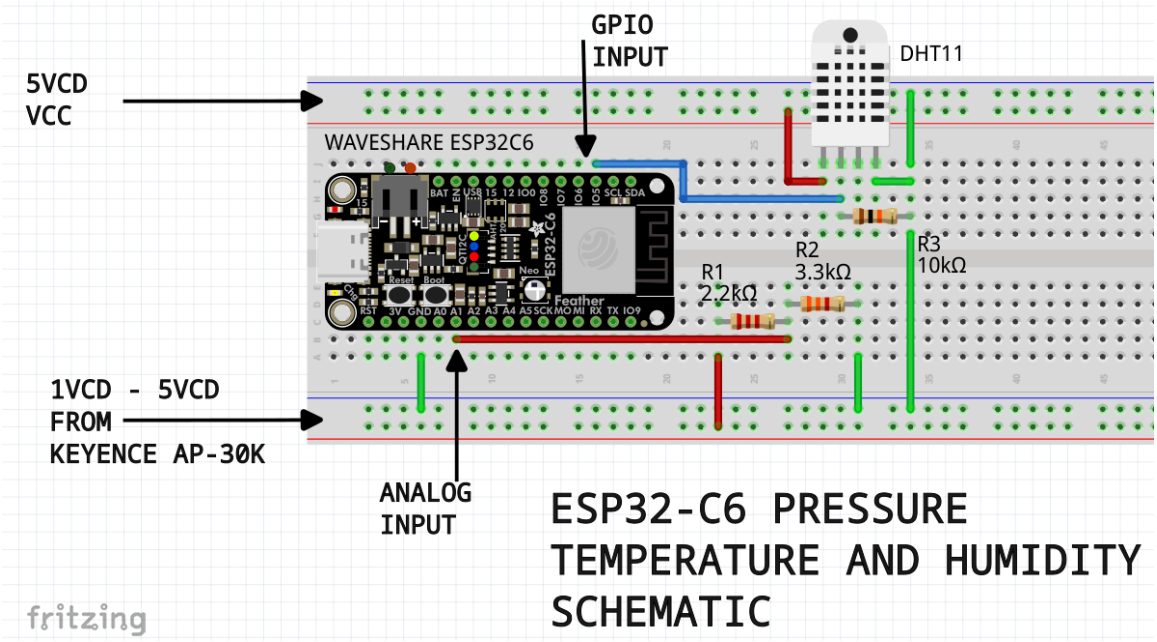


Figure 4: ESP32 Interfacing schematic for KEYENCE AP-30K output voltage and DHT11 Temperature and Humidity sensor.

2. Signal Conditioning Specifics

- The Analog Voltage Divider: The pink wire from the AP-30K outputs a 1V to 5V analog signal proportional to the detected line pressure [8]. Passing this through a voltage divider using a 2 kΩ resistor on the high side and a 3.3 kΩ resistor on the low side divides the signal exactly by 3. This maps the 1–5V output down to a completely safe 0.62VCD to 3.11VCD window, matching the optimal linear detection zone of the ESP32's internal 12-bit Analog-to-Digital Converter (ADC).

Sensor Output	Voltage at ESP32 Pin (via Divider)	Pressure (kPa)	Pressure (PSI)
1.0 V	0.62 V	0.0 kPa	0.00 PSI (Atmospheric Baseline)
2.0 V	1.25 V	25.3 kPa	3.67 PSI
3.0 V	1.87 V	50.65 kPa	7.35 PSI
4.0 V	2.49 V	76.0 kPa	11.02 PSI
5.0 V	3.11 V	101.3 kPa	14.69 PSI

3. Network Integration and Dashboard Topologies

Once data is securely inside the ESP32-C6, engineers can leverage its native Wi-Fi 6 capabilities to interface with central facility monitoring systems through several software architectures [9]:

Option A: MQTT Protocol + Grafana Visualization (PUBLIC INTERNET)

Using the lightweight publish-subscribe MQTT protocol, the ESP32 can publish pressure readings as a string payload to a central broker (such as an on-premise Eclipse Mosquitto server). A data aggregator stores this stream in a time-series database (InfluxDB), which feeds a Grafana dashboard. This topology excels at trend tracking, allowing engineers to visualize subtle multi-week pressure declines that signify developing micro-leaks.

Option B: Node-RED (Logic Control Engines)

For facilities requiring bidirectional control capabilities, the ESP32 can stream telemetry directly into a Node-RED runtime environment. This visual node-based engine can display live gauge graphics while executing automated logic scripts—such as triggering automated email alerts or firing an emergency mains relay if a line drops below its safe pressure limit.

Option C: Home Assistant & ESPHome (Low-Code Frameworks)

By flashing the ESP32-C6 with the **ESPHome** open-source framework rather than custom C++ code, the node becomes natively discoverable by a **Home Assistant** server. This setup handles database creation, logging, and mobile dashboard creation automatically with zero custom application development.

Option D: Local MariaDB Server Integration (PRIVATE NETWORKS)

In highly secure, air-gapped engineering networks where third-party IoT software or unencrypted brokers violate facility policy, the ESP32-C6 can write data directly to a local, private MariaDB (or MySQL) server over the LAN.

By executing a direct `INSERT INTO` command via a native SQL client library on port 3306, data is stored permanently without intermediate middleware. For network resiliency, the ESP32 can be paired with an external MicroSD slot via the SPI bus. If the network drops, the chip enters a local cache routine, appending data to a “backup.csv” file, and batch-uploads the missing records once connectivity is restored.

Conclusion

Maintaining continuous positive air pressure inside high-power RF transmission lines is an absolute requirement for long-term operational availability. As modern broadcasting and telecommunication sites transition toward unattended, remote-managed topologies, the reliance on passive, mechanical inspection methods introduces severe risk. A single moisture-induced arc-over event can result in tens of thousands of dollars in ruined rigid components, burned waveguide windows, and extended station downtime.

Whether deploying enterprise-grade, self-purging desiccant dehydrators or retrofitting older facilities with low-cost, open-source telemetry nodes using an ESP32-C6 and precision industrial sensors, the core engineering goal remains identical: replacing reactive maintenance with proactive data analytics. By continuously monitoring real-time pressure deltas, tracking compressor duty cycles, and routing telemetry to unified local dashboards, engineering teams can detect and localize line degradation weeks before it poses a threat to the transmitter plant.

References

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[2] O. Ben-Dov and F. Spinelli, "Rigid Coaxial Transmission Lines for High-Power TV Broadcasting," *IEEE Transactions on Broadcasting*, vol. 34, no. 2, pp. 112–118, Jun. 2017.

[3] F. Paschen, "Über die zum Funkenübergang in Luft, Wasserstoff und Kohlensäure bei verschiedenen Drucken erforderliche Potentialdifferenz," *Annalen der Physik*, vol. 273, no. 5, pp. 69–96, May 1889.

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[10] *PC817 Series Photo-coupler Characteristics and Application Guide*, Sharp Microelectronics, Camas, WA, USA, 2020.

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