Analyzer Team Updates

Chris Eidsvik & Austin Green

Analyzer Technicians

SIEMENS

THERMO FISHER SCIENTIFIC

TELEDYNE

SIEMENS

- 7 Series discontinued by 2027 (10 years of support afterwards)
- 6 Series continuation designated as the “Pro” with modern advancements.
- Updated Comms, Onboard Web Servers, & Predictive Diagnostics
- Straight forward component replacements.
  IR Source will have quick connect terminals. (No soldering required).
  Hot swappable mainboard (No longer needs to be programmed)
- Availability for the Pro Series near the end of 2027

THERMO FISHER SCIENTIFIC

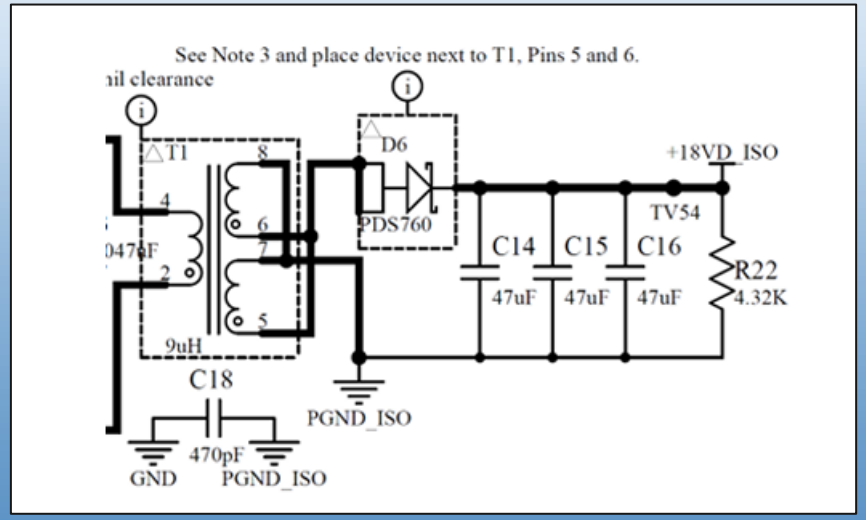
Agile (Auburn)

TJL (Clear)

Ozonator: Cracked Glass Cause & Fix

- On initial inspection of the 42iQ Ozonators CiSCO found cracked glass on a majority of the new analyzers received during H22024.
- Thermo's team found that the cause was due to the harder TJL epoxy being used in these units which could crack the glass during shipping, especially in cold temperatures.
- Ozonators which did crack during shipment would fail quickly on startup and ozonators that did not crack during shipment work fine in application
- Supplier switched from the TJL epoxy (clear) to an Agile epoxy (auburn) which was fully implemented in May 2025.
- The Analyzer Shop has not seen any further issues with Ozonators since the implementation has taken place.

THERMO FISHER SCIENTIFIC CONT.



Analog I/O Board: Channel Failures Causes & Fix

- I/O Boards had constant channel failures overtime causing inaccurate, erratic, or no output readings.
- Power rail failure was the cause for the majority of these boards. The D6 component allowed for a higher voltage surge which could cause the diode to fail under constant operation over time.
- Replacement of the D6 component with a higher rated specification and lower reverse voltage surge diode has helped mitigate the issue.
- Rev. B boards have shown to be significantly more reliable than previous models after the component upgrade was introduced.

THERMO FISHER SCIENTIFIC CONT.

DMC Board Communication Failures Causes & Fix

- All internal boards (Flow/Pressure, Peripheral Support, Ozonator, PMT Cooler, Etc.) encountered this issue causing the boards to lose their functionality and/or prevented other components in the analyzer from operating.
- Software lockup by oscillator interference causing boards to throw the Communication Failure alarm.
- Firmware updates across all DMC boards in progress to rectify this issue. Some examples; Added a CPU Fault handler for O2 Sensor & Ozonator BD, Improved transition from applications to bootloader on analyzer reboots, & Retry FLASH read if communication with DMC boards fail.

THERMO FISHER SCIENTIFIC CONCLUSION

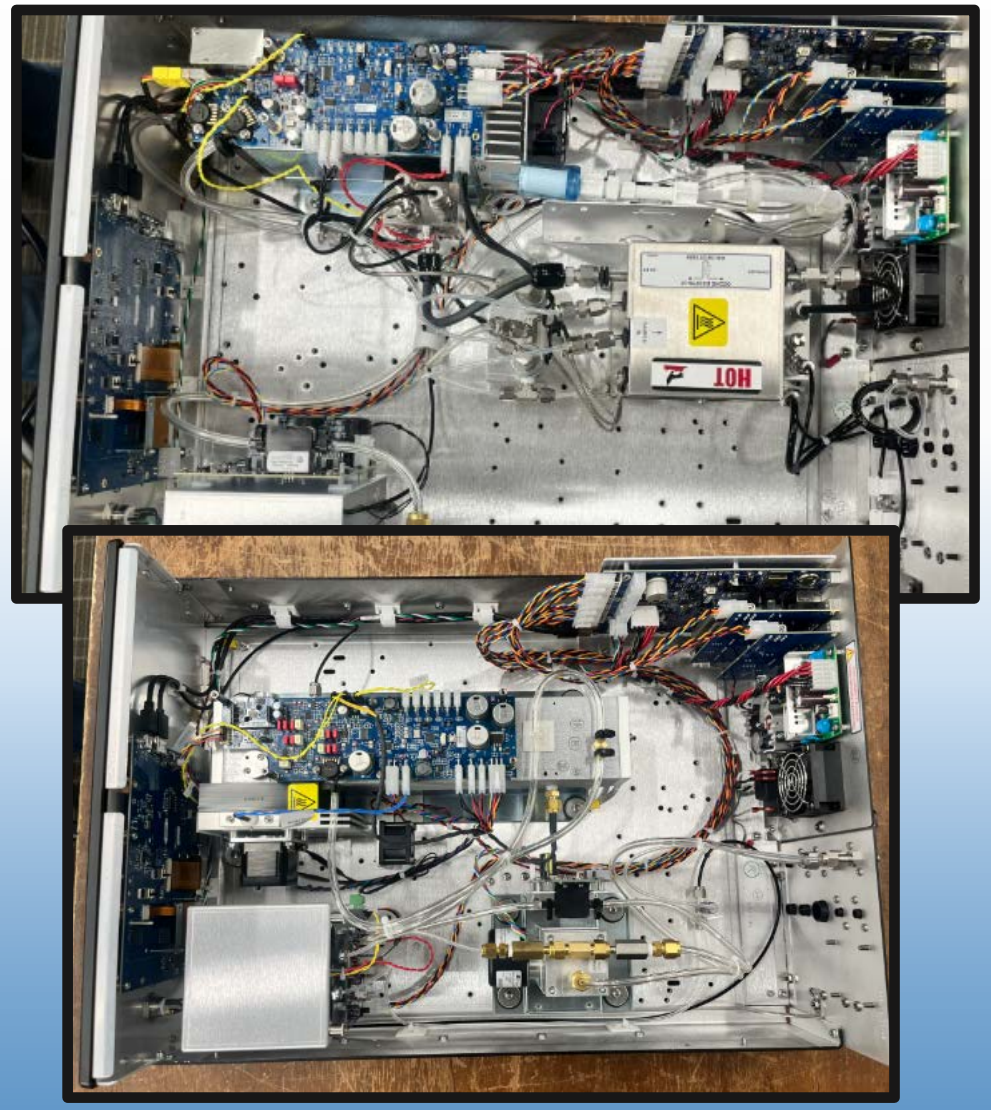
Thermo has shown themselves to be transparent and forthcoming with CiSCO by allowing us to tour their manufacturing facility which provided us with detailed information as to how they have addressed/fixed several major issues with the iQ series as shown above.

As of today, Thermo's iQ analyzers have shown significant improvement over the year with new analyzers performing as expected with no new or previous issues.

We will continue to monitor and support the iQ series going forward and provide updates as needed.

*****iSeries has officially been obsoleted as of June 2026 for spare parts by Thermo. Analyzer Shop will still maintain and repair the iSeries to the best of our abilities with the parts we have on hand for the time being.**

TELEDYNE



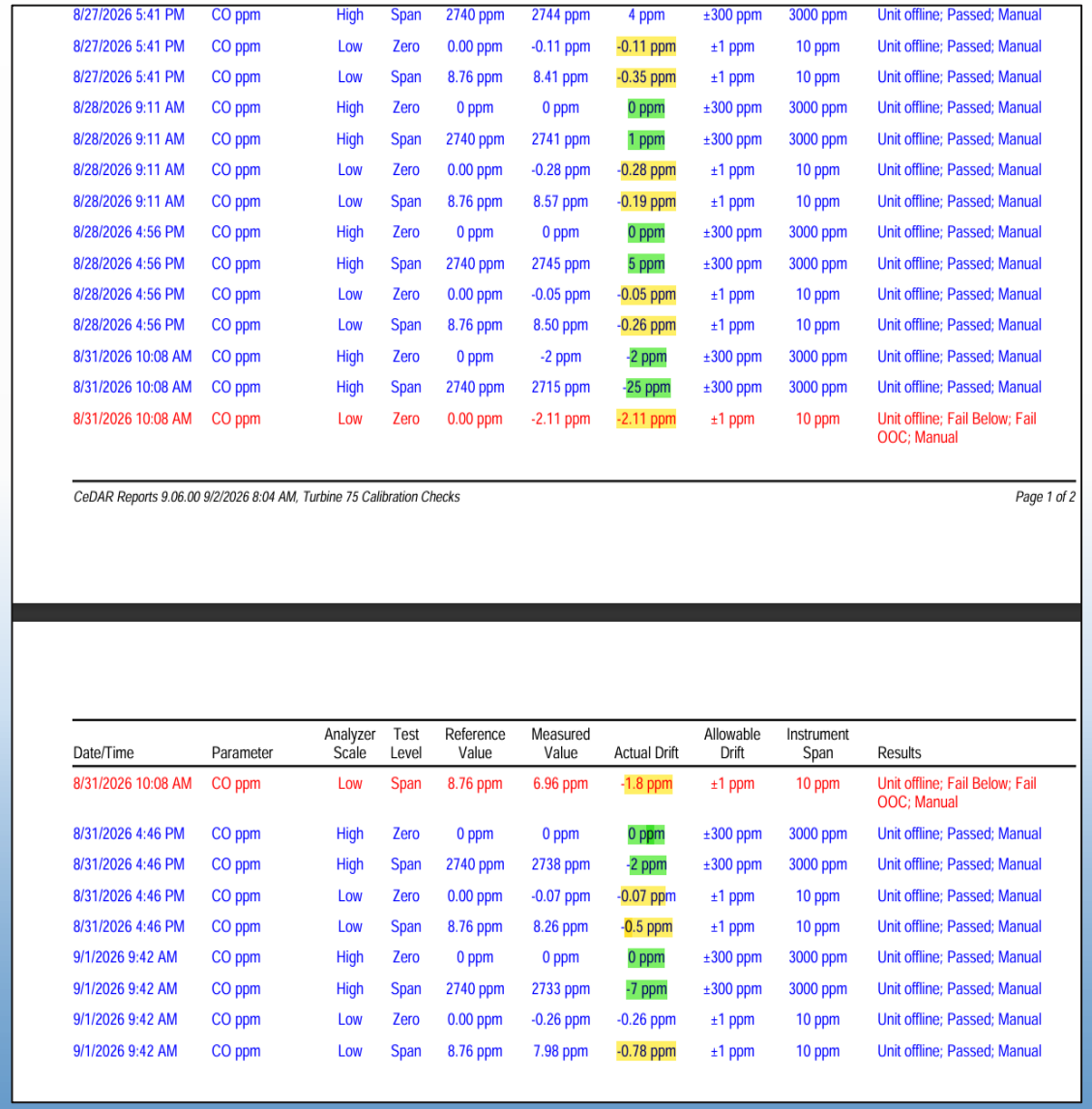
N200M (NOx) & N300M (CO) One-Year Updates

- NOx repeatability for Low and High span on-point, just as good as the T Series if not better.
- All adjustments are done digitally on the NumaView Software. (Calibration, HVPS, Slope, Amplification, & No more potentiometers)
- Familiarity and easy of use features.
  Majority of components are of similar design to T Series (Thermocooler, Reaction Chamber, IR Source, CO Bench, Converter Assembly, Etc.).

  Single 24V Power Supply

  Universal cable design for microprocessor boards across the entire instrument.
- Concerns: Several Auto Zero Valve failures with brand new analyzers, cause unknown.

TELEDYNE CONT.



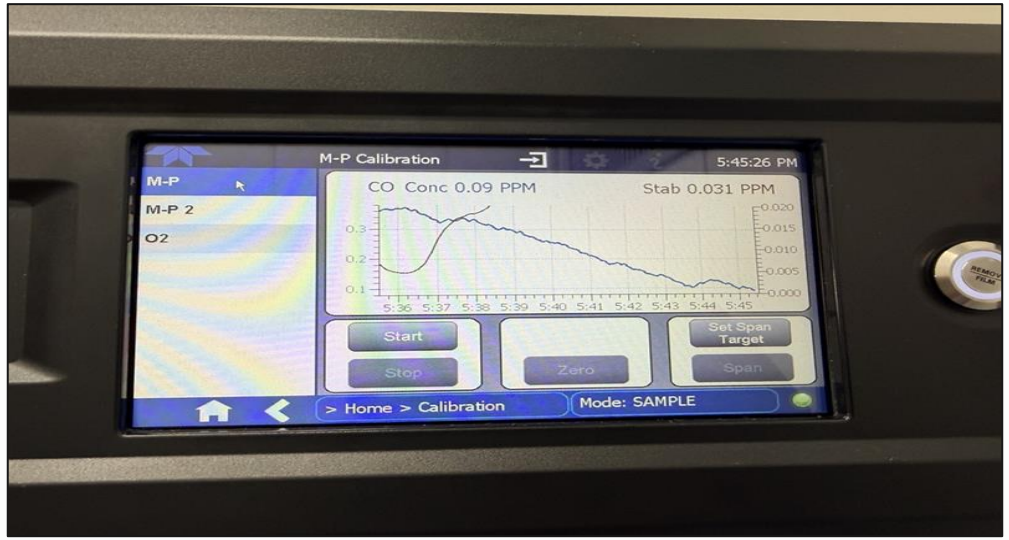
Date/Time	Parameter	Analyzer Scale	Test Level	Reference Value	Measured Value	Actual Drift	Allowable Drift	Instrument Span	Results
8/27/2026 5:41 PM	CO ppm	High	Span	2740 ppm	2744 ppm	4 ppm	±300 ppm	3000 ppm	Unit offline; Passed; Manual
8/27/2026 5:41 PM	CO ppm	Low	Zero	0.00 ppm	-0.11 ppm	-0.11 ppm	±1 ppm	10 ppm	Unit offline; Passed; Manual
8/27/2026 5:41 PM	CO ppm	Low	Span	8.76 ppm	8.41 ppm	-0.35 ppm	±1 ppm	10 ppm	Unit offline; Passed; Manual
8/28/2026 9:11 AM	CO ppm	High	Zero	0 ppm	0 ppm	0 ppm	±300 ppm	3000 ppm	Unit offline; Passed; Manual
8/28/2026 9:11 AM	CO ppm	High	Span	2740 ppm	2741 ppm	1 ppm	±300 ppm	3000 ppm	Unit offline; Passed; Manual
8/28/2026 9:11 AM	CO ppm	Low	Zero	0.00 ppm	-0.28 ppm	-0.28 ppm	±1 ppm	10 ppm	Unit offline; Passed; Manual
8/28/2026 9:11 AM	CO ppm	Low	Span	8.76 ppm	8.57 ppm	-0.19 ppm	±1 ppm	10 ppm	Unit offline; Passed; Manual
8/28/2026 4:56 PM	CO ppm	High	Zero	0 ppm	0 ppm	0 ppm	±300 ppm	3000 ppm	Unit offline; Passed; Manual
8/28/2026 4:56 PM	CO ppm	High	Span	2740 ppm	2745 ppm	5 ppm	±300 ppm	3000 ppm	Unit offline; Passed; Manual
8/28/2026 4:56 PM	CO ppm	Low	Zero	0.00 ppm	-0.05 ppm	-0.05 ppm	±1 ppm	10 ppm	Unit offline; Passed; Manual
8/28/2026 4:56 PM	CO ppm	Low	Span	8.76 ppm	8.50 ppm	-0.26 ppm	±1 ppm	10 ppm	Unit offline; Passed; Manual
8/31/2026 10:08 AM	CO ppm	High	Zero	0 ppm	-2 ppm	-2 ppm	±300 ppm	3000 ppm	Unit offline; Passed; Manual
8/31/2026 10:08 AM	CO ppm	High	Span	2740 ppm	2715 ppm	-25 ppm	±300 ppm	3000 ppm	Unit offline; Passed; Manual
8/31/2026 10:08 AM	CO ppm	Low	Zero	0.00 ppm	-2.11 ppm	-2.11 ppm	±1 ppm	10 ppm	Unit offline; Fail Below; Fail OOC; Manual
8/31/2026 10:08 AM	CO ppm	Low	Span	8.76 ppm	6.96 ppm	-1.8 ppm	±1 ppm	10 ppm	Unit offline; Fail Below; Fail OOC; Manual
8/31/2026 4:46 PM	CO ppm	High	Zero	0 ppm	0 ppm	0 ppm	±300 ppm	3000 ppm	Unit offline; Passed; Manual
8/31/2026 4:46 PM	CO ppm	High	Span	2740 ppm	2738 ppm	-2 ppm	±300 ppm	3000 ppm	Unit offline; Passed; Manual
8/31/2026 4:46 PM	CO ppm	Low	Zero	0.00 ppm	-0.07 ppm	-0.07 ppm	±1 ppm	10 ppm	Unit offline; Passed; Manual
8/31/2026 4:46 PM	CO ppm	Low	Span	8.76 ppm	8.26 ppm	-0.5 ppm	±1 ppm	10 ppm	Unit offline; Passed; Manual
9/1/2026 9:42 AM	CO ppm	High	Zero	0 ppm	0 ppm	0 ppm	±300 ppm	3000 ppm	Unit offline; Passed; Manual
9/1/2026 9:42 AM	CO ppm	High	Span	2740 ppm	2733 ppm	-7 ppm	±300 ppm	3000 ppm	Unit offline; Passed; Manual
9/1/2026 9:42 AM	CO ppm	Low	Zero	0.00 ppm	-0.26 ppm	-0.26 ppm	±1 ppm	10 ppm	Unit offline; Passed; Manual
9/1/2026 9:42 AM	CO ppm	Low	Span	8.76 ppm	7.98 ppm	-0.78 ppm	±1 ppm	10 ppm	Unit offline; Passed; Manual

CeDAR Reports 9.06.00 9/2/2026 8:04 AM, Turbine 75 Calibration Checks *Page 1 of 2*

N200M (NOx) & N300M (CO) One-Year Updates

- CO instability still a concern on all N300M units.
- Zero drift is consistent over the course of several days causing calibration checks to eventually fail.
- Analyzer takes a significant amount of time (5 minutes – 10 minutes) to return to Zero from Span. Dropping from High Span gas to single digit PPM readings is quick however getting to near Zero is not.
- IR Measure is inconstant and steadily climbs to 2900mv which causes CO to spike above 800ppm while on Ambient Air or Zero Gas.
- Zero readings will flash and readings will be erratic jumping from 10 to -10ppm until Adaptive Filter variable is cycled.
- Teledyne recommended adjusting the Adaptive Filter Percentages & Deltas to help with response times. Response times improved however the above issues remained.

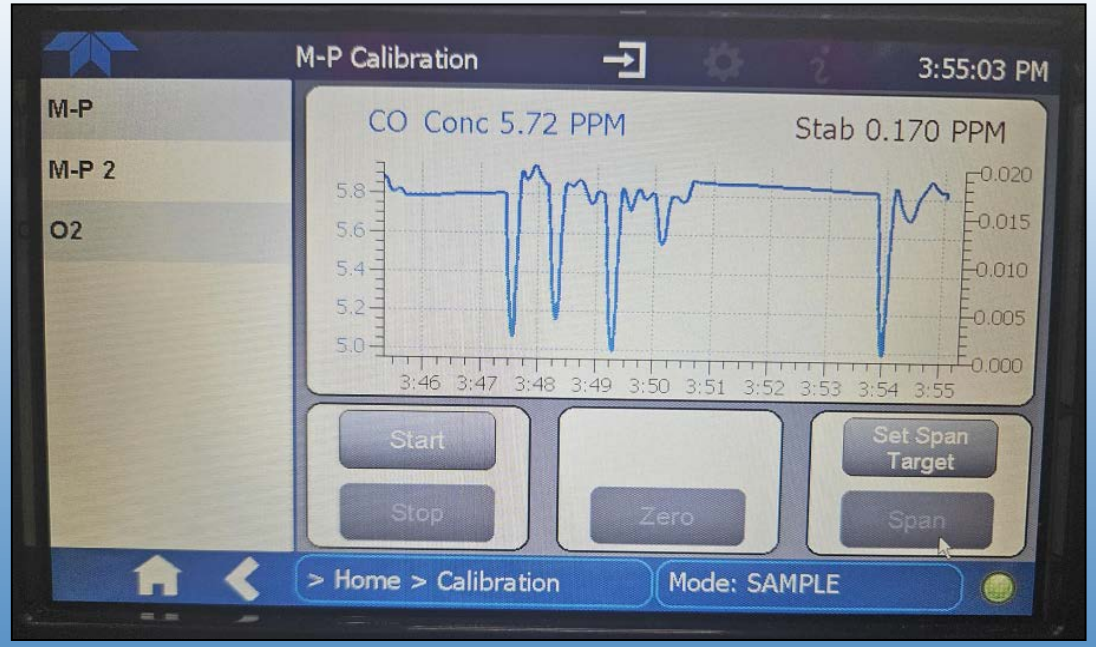
TELEDYNE CONT.



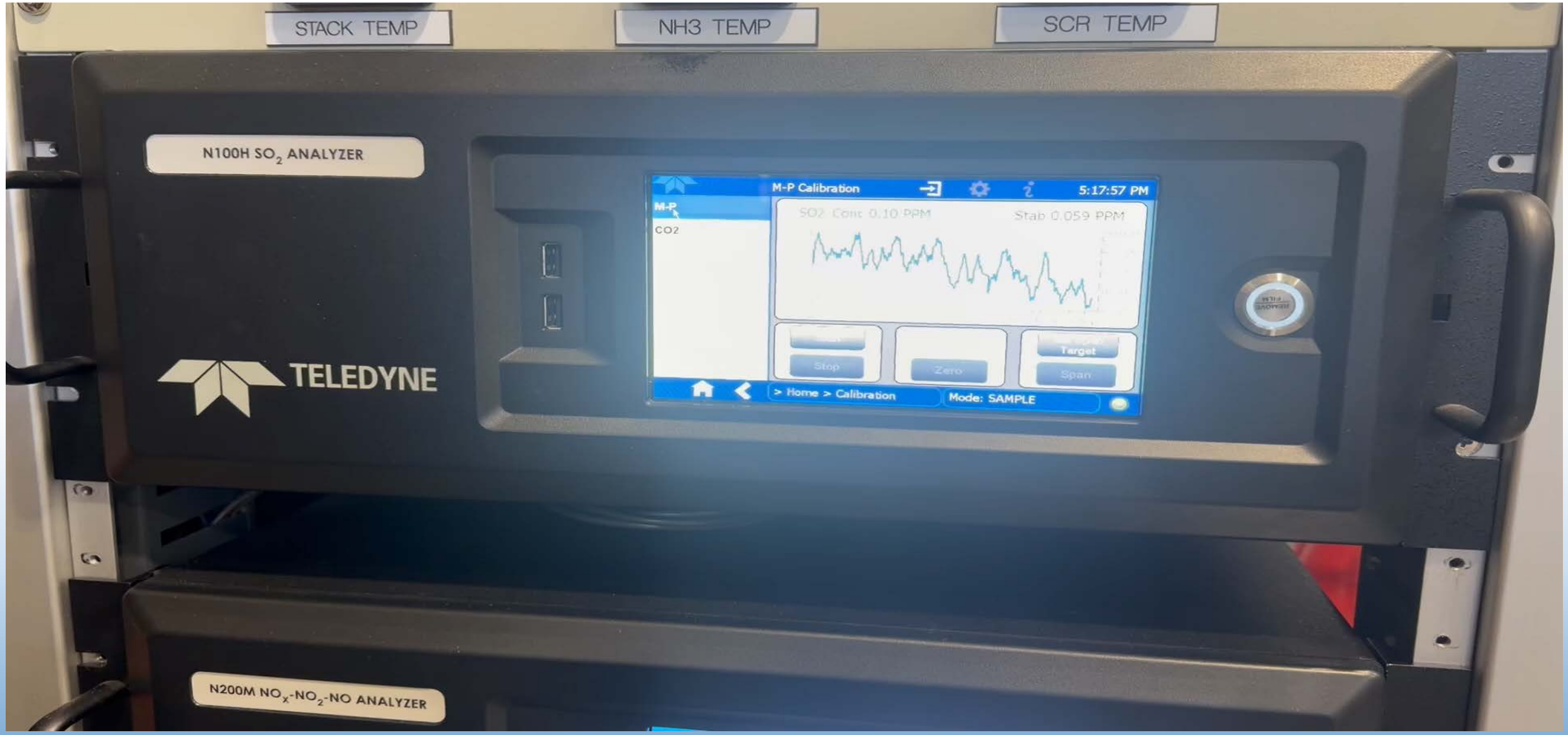
(Extended Span to Zero times)

(Zero instability pulling ambient air)

(PPM spikes after CO Wheel/Mask inspection)



N100H SO2 Touch Sensitivity



N100H SO2 Rack Pull Sensitivity

TELEDYNE CONCLUSION

The N Series has shown that despite these concerns it's been reliable during span calibration checks. Low/High calibrations for both the CO & NOx analyzers are accurate and repeatable. Operational units have been passing daily calibration and have passed a seven-day drift tests.

Response times for replacement parts when submitting an RMA are within one to five days.

N Series spare parts lists are being created by CiSCO.

CiSCO is working with Teledyne to address these concerns going forward.

*****T Series will be discontinued by the end of 2026, parts support will continue for 10 years going forward.**

Comments, Concerns, Questions?

Feel free to contact either of us at

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Thank you for your time!