

Suggested Continuous Opacity Monitoring Systems (COMS) Diagnostic Tests

Suggested maintenance and repair procedures are described below. These procedures may be performed at the manufacturer's facility, a service provider's facility, the user's instrument laboratory, or at the stack/duct at the discretion of the owner/operator and within the recommendation of the manufacturer. They should be performed by persons either skilled and/or trained in the operation and maintenance of the analyzer.

Table 1 (attached) outlines suggested tests.

- **Routine/Preventative Maintenance.** Routine/preventative maintenance includes the routine replacement of consumables, cleaning of optical surfaces, and adjustment of monitor operating parameters as needed to maintain normal operation. Replacement of consumables that have the possibility of adversely affecting the performance of an analyzer may cause the nature of the maintenance procedure to fall within one of the classifications described below.
- **Measurement Non-Critical Repairs.** Measurement non-critical repairs include repair and/or replacement of standard non-critical components, the unique characteristics of which do not materially affect the performance of the monitor. These components include, but are not limited to, resistors, capacitors, inductors, transformers, semiconductors, such as discrete components and integrated circuits, brackets and machined parts (not associated with internal optical components), cabling and connectors, electro mechanical components, such as relays, solenoids, motors, switches, blowers, pressure/flow indicators, tubing, indicator lights, software with the same version and/or revision level, glass windows (uncoated or anti-reflection coated, but with no curvature), lenses with mounts where such mounts are not adjustable as installed, circuit boards where such boards are interchangeable and without unique adjustments (except offset and gain adjustments) for the specific analyzer of the same model, with such repairs to include the maintenance procedures required to ensure that the analyzer is appropriately setup.
- **Primary Measurement Light Source.** Repair or replace the primary measurement light source.
- **Measurement Critical Repairs.** Measurement critical repairs include repair and/or replacement of measurement sensitive components, the unique characteristics of which may materially affect the performance of the monitor. These components include, but are not limited to, optical detectors associated with the opacity measurement/ reference beam(s), spectrally selective optical filters, beam splitters, internal zero and/or upscale reference reflective or transmissive materials, electro optical light switches, retro reflectors, adjustable apertures used on external zero devices or reflectors, lenses which have an adjustable mount, circuit boards which are not completely interchangeable and/or require unique adjustments for the specific analyzer, with such repairs to include the maintenance procedures required to ensure that the analyzer is appropriately setup.
- **Rebuilt or Refurbished Analyzers.** Rebuilt or refurbished analyzers include analyzers for which a major sub-assembly has been replaced or multiple lesser sub-assemblies with different revision levels from the original have been replaced and/or modified. This also includes major changes to the analyzer measurement detection and processing hardware or software.

TABLE 1—SUGGESTED COMS DIAGNOSTIC TESTS AFTER VARIOUS REPAIRS

Description of event	Optical alignment	Optical alignment indicator assessment (Note 1)	Zero calibration check	Clear path (off-stack) zero assessment (Note 3)	Upscale calibration check	Calibration error check	Fault status indicator check	Averaging period calculation and recording	7-Day zero and up-scale drift check (Note 2)	Recertify per PS-1	New MCOC per ASTM D 6216-98, 07	Comments
(1) Replace or repair components described as routine and/or preventative maintenance..	X	—	X	—	X	—	X	—	—	—	—	Includes replacement of blower, cleaning optical surfaces, resetting adjustable parameters to maintain normal per-
(2) Replace or repair primary measurement light..	X	X	X	X	X	X	X	—	—	—	—	Light source uniformity and position are key source to many performance parameters.
(3) Replace or repair components which are measurement noncritical..	X	—	X	—	X	X	—	—	—	—	See text description.
(4) Replace or repair components which are measurement critical..	X	X	X	X	X	X	X	—	X	—	—	See test description.
(5) Replace or repair components which are measurement critical but do not involve optical or electro-optical components..	—	—	X	—	X	X	X	X	—	—	—	Includes changes of components involving data acquisition and recording.
(6) Rebuild or substantially refurbish the analyzer..	—	—	—	—	—	—	—	—	—	X	—	See text description.
(7) Change to, or addition of, analyzer components which may affect MCOC-specified performance parameters..	—	—	—	—	—	—	—	—	—	X	X	Significant changes which are not part of the MCOC-designated configuration.

Notes: (1) Optical alignment indicator assessment requires the operator to verify during an off the stack clear path zero assessment that the beam is centered on the reflector/retro reflector when the alignment indicator indicates on-axis centered alignment. If not, the analyzer optical train must be adjusted until this condition is met.

(2) 7-Day zero and upscale drift assessment. Opacity measurement data recorded prior to completion of the 7-day drift test will be considered as valid provided that the first 7-day drift test is successful, that it is completed within 14 days of completion of the repair, and that other QA requirements are met during this time period.

(3) Requires verification of the external zero device response, or recalibration of the same, after the off-stack clear path zero has been re-established.