

Technical Service Bulletin 140610

IOX/DCX Transmitter Maintenance Schedule

Service Bulletin 140610 applies to Comark IOX, DCX and Paragon transmitters. This bulletin contains important maintenance schedule information and procedures for Comark transmitter systems. It is divided into sections that describe daily, weekly, monthly, semi-annual, and annual maintenance suggestions.

Use this information with the recommended information and/or procedures supplied with vendor components. If information in this bulletin conflict with the information supplied with vendor components, use the vendor supplied information.

General Principles

Two general practices are recommended to make the maintenance of the transmitter easier and quicker. First, have the operators and/or maintenance people become as familiar with the transmitter as possible. The operators need to learn the operation of the transmitter. They also need to know the important parameters to monitor to be able to detect a problem before it can cause damage to the transmitter. Have the maintenance people read the information supplied with the transmitter. Have them become familiar with the location of major assemblies and components in the transmitter. This can be done when the transmitter is not in operation or during normal maintenance.

The second practice is to maintain good records. Good operating and maintenance records can significantly reduce maintenance time, and show trends that may enable a potential problem to be highlighted before it worsens. The record keeping system does not have to be a complicated or time costly process. A good record keeping system will record the history of the maintenance and operation of the transmitter. It can be used as a reference: make entries clear and concise and easily found. The person who does maintenance should sign and date any entry he makes. This permits other people to use that person as a resource for additional information.

A maintenance record book should contain this information:

PROBLEM:	Describe problem or failure. Record information such as; symptoms, meter values, or descriptions relevant to the problem.
SOLUTION:	Record what was done to fix the problem. Include any conclusions about why problem occurred. Add notes as necessary to prevent problem from reoccurring.
PARTS REPLACED:	Identify all parts that were replaced. Include reference designators, schematic drawing numbers, part numbers of the part and the assembly.
METER VALUES:	Periodically record a complete set of meter readings from all meters on the transmitter. Compare these readings to the previous set of meter readings to find any significant changes. Look for long-term trends (a meter reading that changes over a period of time). You may want to record these readings in chart form to permit easy comparison between old and new readings.
DATE:	Identify person who did repair and date it was done. Also record filament hours.

Scheduled Maintenance

Use this section as a guide to the types of maintenance to be done. You can do these maintenance procedures more often than suggested if your environmental conditions are less than ideal.

Dirt, heat and power-line variations may degrade the transmitter operation.

It is very important to keep the transmitter and the surrounding area clean. The transmitter can fail if it operates in an overheated and/or dirty environment. Parts with an accumulation of dirt will not be efficiently cooled. This can shorten their useful life. Dirty air filters reduce the amount of cooling airflow to the transmitter. This can cause components to overheat.

Daily Maintenance

Transfer Meter Readings

Record a complete set of meter readings. Do this when you operate the transmitter with a standard test signal (color bars, black picture). Using the same test signal eliminates variations caused by picture content. The readings supply a reference on the transmitter operating conditions at a given time. Compare the latest set of readings to previous readings. Analyze any variations between old and new readings to determine if an abnormal condition exists. Note any trends, such as readings that slowly change in one direction over a long period of time, to identify a potential problem. This will help direct preventive maintenance to keep a potential problem from becoming a failure.

Also record a set of meter readings and counter settings after a major repair or tuning procedure. Significant changes in readings may have occurred as a result of the repairs or tuning procedures.

Operating Temperatures

During transmitter operation, feel the transmission line components, waveguides and other exposed components for abnormal temperatures. Touch the components quickly to avoid burning your hand. Then you can place your hand on the component for a longer time to determine if the operating temperature is too high. The location of an unusually hot spot will usually give some indication of its cause.

Weekly Maintenance

WARNING

Perform these checks with all power removed from the transmitter. Use the grounding hooks to discharge capacitors and to verify voltage is removed before you touch components inside the transmitter.

Visual Inspection

Visually examine as much of the transmitter as possible. Look for loose connections, damaged components (discolored, charred, melted, broken leads) and dirty areas. Replace all components with obvious damage. Give thought to the cause for a defective component. If a component is overheated, determine what caused the overheating. This can lead to finding the cause, rather than just replacing the component, which could fail in the same manner. If you cannot thoroughly examine the complete transmitter during one maintenance period, concentrate on one or two sections. Examine the remaining sections during the next maintenance period.

Cooling System

Since the cooling system is comprised of moving parts and is critical to transmitter operation, it requires close attention. The operation of the cooling system can be checked by observing the flow rate of the cooling air through the various air-cooled compartments and components in the system. If any of the flow rates are lower than normal a problem may exist. You should ensure that all air filters are cleaned and unobstructed.

Observe the flow rate of the cooling liquid through the various liquid-cooled components in the system. If any of the flow rates is lower than normal, a problem may exist. If so, check the pump pressure. If it is normal or higher than normal, one or more of the cleaning screens may be clogged or starting to clog. Check each screen and clean if necessary. Don't forget to check the liquid-cooled loads in the system as some have screens in the liquid inlet.

Monthly Maintenance

Perform these checks on a monthly schedule. They do not all have to be performed at the same time. For example, you can divide the list into four groups and perform one group a week each month.

Meter Calibration

Examine all meters for correct calibration. Do not adjust the meter drivers or mechanical zero unless necessary. Check all metered parameters for calibration. If you are unsure of the proper calibration procedure, contact Comark Communications for instructions. Permit only authorized, trained personnel equipped with accurate test equipment to adjust the meters.

Your system will include most or all of these metered parameters:

Grid Bias Voltage	X	Forward Power
Grid Bias Current	X	Reverse Power Aural
Heater Voltage	X	Forward Power Drive
Heater Current	X	Power System
Ion Voltage	X	Forward Power System
Ion Current	X	Reverse Power Diplexer
Focus Voltage	X	Reject Power
Focus Current	X	V1 + V2 Combiner Forward Power
Body Current	X	V3 + V4 Combiner Forward Power
Beam Voltage	X	Combiner Reject Power
Beam Current	X	Collector Current (#1 - #5)

This is also a good time to check all of the remote controlled metering, command and status functions and calibrations.

Cleaning and Lubrication

It is very important to keep the transmitter and its related support equipment clean. For example, a dirty air filter reduces cooling airflow and can cause a thermal runaway problem inside the transmitter cabinets. High-voltage circuits attract dirt more rapidly: an accumulation of dirt on high voltage components and circuits may cause arcing. The dirt makes a low-resistance path across insulators and wiring.

WARNING

Be careful!

Perform these procedures and checks only when the high voltage is removed from the transmitter. Open the disconnect switch that connects input ac mains voltage to the high-voltage power supply.

Use a vacuum cleaner, small brushes, clean, lint-free wiping clothes and mild-detergent cleaning solutions or denatured alcohol. Do not use compressed air. Compressed air tends to blow dirt around, rather than remove it. Use a small brush to dislodge dirt while using the vacuum to remove it.

Where practical, use cloths to wipe dirty surfaces. Using a cloth to clean a meter face may cause a static buildup that leads to inaccurate readings. Use a special antistatic cleaner to prevent this problem.

Clean or replace air filters. Clean the fans that pull air through the air filters. The amount of air the fan can move is reduced if the impellers are dirty. Also clean the motors. Dirt may accumulate on the windings and bearings, which can increase the operating temperature and decrease the life of the motor.

Clean or replace the screens in the lines that carry coolant.

Lubricate pumps according to the manufacturer's recommended schedule, with the recommended grease.

Safety Device Checks

The safety devices can be divided into two groups: Equipment Protection and Personnel Protection. Examine each device at least monthly.

Examine the equipment protection devices. Push the reset button on the Amplifier Control panel after each check to clear the indicated fault. Remember that some fault functions can affect more than one amplifier cabinet.

The following fault checks must be done for equipment protection. If you are not familiar with the proper method of testing these functions, contact Comark for instructions.

Body Current	X	Collector Coolant Temperature
Beam Current	X	Drive Power High Trip
Beam Voltage	X	HPA Reverse Power High Trip
Ion Voltage	X	System Reverse Power High Trip
Ion Current	X	HPA Normal
Filament Voltage	X	Fil/Bias/Ion Lockout
Filament Current	X	Crowbar Triggered & Fired
Bias Voltage	X	Focus Current Cabinet
Bias Current	X	Airflow
Collector Coolant Flow	X	Cavity Airflow

These checks must be done to verify the operation of the Personnel safety devices of the amplifier cabinet. If you are not familiar with the proper method of testing these functions, contact Comark for instructions.

- HV Compartment Door Interlock
- HVPS Tap Switch Cover Interlock HVPS Cover Interlock
- IOT Input Cavity Cover Interlock Transmitter Int/Ext Control
- HV Interlock Key Switch on Ground Switch Assembly
- Ground Switch Assembly Integrity

The following checks will verify the operation of various operational or status indicators that may prevent the HPA from attaining full ON mode. If you are not familiar with the proper method of testing these functions, contact Comark Communications for instructions.

FO Loop	X	Filament Timers
GND Probe Interlock	X	Filament Standby
Soft Start Interlock	X	Crowbar Ready
Forward Power High	X	HV ON
HV Disconnect Operation and Status	X	Driver Amplifier Status

Semi-Annual Maintenance

Perform these checks on a semi-annual schedule. They do not have to be performed at the same time. For example, you can divide the list into three groups and perform one group every other month during the year.

High Voltage Power Supply

WARNING

Perform these checks with all power removed from the transmitter. Use the grounding hooks to discharge capacitors and to verify voltage is removed before you touch components inside the transmitter.

Check the high-voltage power supply by removing the front cover and doing a complete visual inspection. Examine the large oil-filled capacitors for leaks and other physical damage. Remove accumulated dirt from wires, insulators and other components. Look for signs of corrosion or arcing inside the connection box. Correct as necessary. Contact Comark if further details are necessary.

Emergency Mode Checks

The Emergency Modes of operation should be checked to verify that they function. Since these modes are custom designed for each installation there will be variations in the procedures. Each mode available in the transmitter system should be checked for proper operation.

Cooling System Cleaning

Thoroughly clean the cooling system. The best time to clean the system is in the Spring, after any possibility of freezing weather has passed. Flush the cooling system, then add a mix of ethylene glycol and distilled or demineralized water.

Check the entire cooling system for leaks before and after flushing. Leaks observed before flushing will be easier to repair while the system is drained, but leaks often will appear after flushing.

Thoroughly clean the radiators and fans in the heat exchanger. Radiators should be washed with soap and water or a commercial air conditioner cleaner and rinsed thoroughly with a hose to remove any accumulated dirt, leaves or any other material that may reduce the unit's cooling capacity. Remove accumulated dirt from the fan blades. In extreme cases, a high-pressure washing unit may be required.

Annual Maintenance

Annual maintenance should consist of verifying that the transmitter is operating in accordance with licensing authority Rules and Regulations. This is commonly referred to as Proof of Performance. A Proof of Performance was conducted when the transmitter was installed. It can be used as a guide to completing the necessary tests and as a comparison to data recorded during the tests. Comark offers services to conduct these tests. For more information, contact Comark Customer Service Department.

Here at Comark, we are constantly striving to improve the satisfaction of both our new and existing customers. Continually working to improve the reliability of the installed fleet of Comark transmitters in the field is another way in which we demonstrate our commitment to you, our valued customer.

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