

# Corrosion Test Racks

500-C0191.88, 500-C0192.88

Analytical Procedure



AP-19

## SPECIFICATIONS, Nalco Corrosion Test Rack 1", 500-C0192.88, Nalco Clear View Corrosion Test Rack, 500-C0191.88

Assembled size: 24 in. x 20 in. x 2 in.

### Flow Rate: for 1" Rack

1.5 gpm:	0.6 ft/sec
3.0 gpm:	1.2 ft/sec
5.0 gpm:	2.1 ft/sec
7.0 gpm:	2.9 ft/sec
8.0 gpm:	3.3 ft/sec
10.0 gpm:	4.1 ft/sec
12.0 gpm:	4.9 ft/sec
20.0 gpm:	8.2 ft/sec

Maximum temperature: 130°F @ 50 psi

100°F @ 100 psi

Water Pressure: 15 to 100 psig

## DESCRIPTION

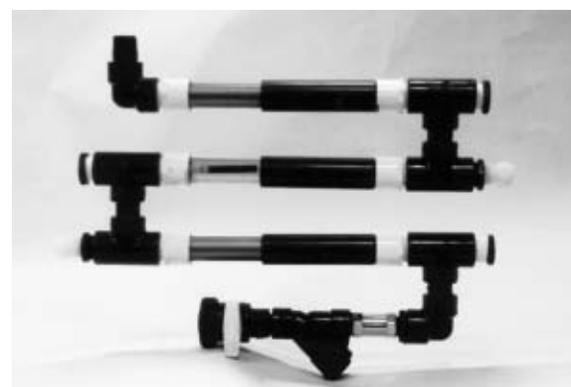
The Nalco Corrosion Test Racks, Part Numbers 500-C0191.88 and 500-C0192.88 are used to evaluate the effectiveness of chemical treatment programs on non-heat transfer surfaces. It is designed to be used with corrosion coupons and Corrat<sup>®</sup> probes. Coupons and probes are available in a variety of metallurgies.

The racks come complete with valves, strainers and plumbing, ready for connection to a 3/4-inch sample tap and a 1-inch discharge line. The test racks are constructed of PVC pipe and require a 15 to 100 psi pressure differential across the flow control valve orifice for proper operation. Selecting the proper flow control valve size is important for representative results. An 5 gpm flow control valve is supplied with the unit. 1.5, 3, 7, 8, 10, 12 and 20 gpm flow control valves are available as separate items.

The flow control valve should be sized so that the flow rate in the rack is approximately equal to the rate in the equipment to be evaluated.



Nalco Corrosion Test Rack 1", 500-C0192.88



Nalco Clear View Corrosion Test Rack 1", 500-C0191.88

## ORDERING INFORMATION

Order all replacement parts and reagents by their part numbers. To be sure this product is compatible with your treatment program, contact your local Nalco representative. Items marked with an "\*" are included with the kit or set. **To place your order**, please contact your local customer service department.

Description	Part No.
Nalco Corrosion Test Rack 1"	500-C0192.88
Nalco Clear View Corrosion Test Rack 1"	500-C0191.88

## Replacement Parts

### Rack Components

	Part No.
1" pipe plug assembly for coupon holding rod (PVC)	500-P5077.88*
1" Clear View tube assembly (for 500-C0191.88)	500-P5093.88
6" nylon holding rod with screw and nut	500-P5006A.88*
<sup>3</sup> / <sub>4</sub> " Corratier probe fitting	500-P1632.88*
Nylon screw and nut set (10/set)	500-P5070.88*
Corrosion Study Tag (12/set)	500-P0160.88*

### Flow Valves

Part No.	Size (in.)	Size (gpm)
741-P1627.88	1/2	1.5
741-P1641.88	1/2	3.0
741-P1643.88*	3/4	5.0
741-V00475.88	3/4	7.0
741-P1644.88	3/4	8.0
741-V00478.88	3/4	10.0
741-V00480.88	1	12.0
741-V00482.88	1	20.0

### Flow Rate Calculation

Flow rate (ft/sec) =  $0.41 \times \text{gpm} / d^2$   
gpm = gallons per minute  
d = inside pipe diameter (inches)

Pre-Weighed Corrosion Coupons	Part No.
Admiralty brass 3" x 1/2" bar-style coupon	500-P5040A.88
Aluminum 3" x 1/2" bar-style coupon	500-P5039A.88
Copper 3" x 1/2" bar-style coupon	500-P5038A.88
Cu-Ni (70-30) 3" x 1/2" bar-style coupon	500-P5034A.88
Cu-Ni (90-10) 3" x 1/2" bar-style coupon	500-P5049A.88
Galvanized hot dip 3" x 1/2" bar-style coupon	500-P5057A.88
MS 1010 3" x 1/2" bar-style coupon	500-P5035A.88
MS 1010 passivated 3" x 1/2" bar-style coupon	500-P5054A.88
MS 1010 (6 holes, scaling) 3" x 1/2" bar-style coupon	500-P5048A.88
SS 304 3" x 1/2" bar-style coupon	500-P5037A.88
SS 316 3" x 1/2" bar-style coupon	500-P5036A.88

## SUPPORT

If you have any questions regarding this procedure, please contact your Nalco representative. In North America you can also contact the Nalco Equipment Solutions Help Desk at 1-800-323-8483.

## ASSEMBLY AND INSTALLATION

Some assembly of the Nalco Corrosion Racks is required. The PVC sections of the Nalco Corrosion Test Rack may be assembled using either Teflon® tape or pipe joint compound.

When using the Teflon tape, *do not wrap the tape over the open end of the pipe*. Start about one thread back from the open end and apply the tape in the opposite direction of the pipe thread. Five to six wraps are sufficient in most cases. Wrapping the tape over the end of the pipe may get Teflon onto coupons or probes and may also allow the pipe sections to unscrew easily from the tees with vibrations. Teflon tape should always be used between any metal to PVC points.

Pipe joint compound can be used to ensure a stronger continuous seal; however, it may not allow disassembly of the corrosion rack. Pipe compound should not be used on pipe plugs, clear view tube assemblies, or other components that require future disassembly.

If a Corratier fitting is not used, the opening should be sealed with the 1" pipe plugs included in the kit.

After assembly, install the rack at the desired location in the cooling water system. Water should flow upward through the unit. Water passing through the unit can be returned to the cooling system or discharged into any convenient disposal point.

After the test rack is installed, measure the flow using any convenient container to catch the effluent water.

\*When the 1.5 gpm (P1627) or the 3.0 gpm (P1641) flow control valve is required with the Corrosion Test Rack, the following additional parts must be ordered:

- (1) P1744 <sup>3</sup>/<sub>4</sub> to 1/2 in. CPVC reducing coupling
- (1) P1745 <sup>3</sup>/<sub>4</sub> in. reducing bushing
- (2) P1746 close CPVC pipe nipples

- A. If flow rate is less than desired:
1. Strainer needs to be flushed.
  2. Flow control valve orifice is partially blocked.
  3. Supply water pressure is less than required 15 psi.
  4. Effluent discharge line is too high. This can create sufficient head pressure that the pressure differential is less than 15 psi through the system.

- B. If flow rate is greater than desired, the supply water pressure is greater than 100 psi.

Proper flow must be established prior to starting tests. The flow should be checked periodically to ensure meaningful test results.

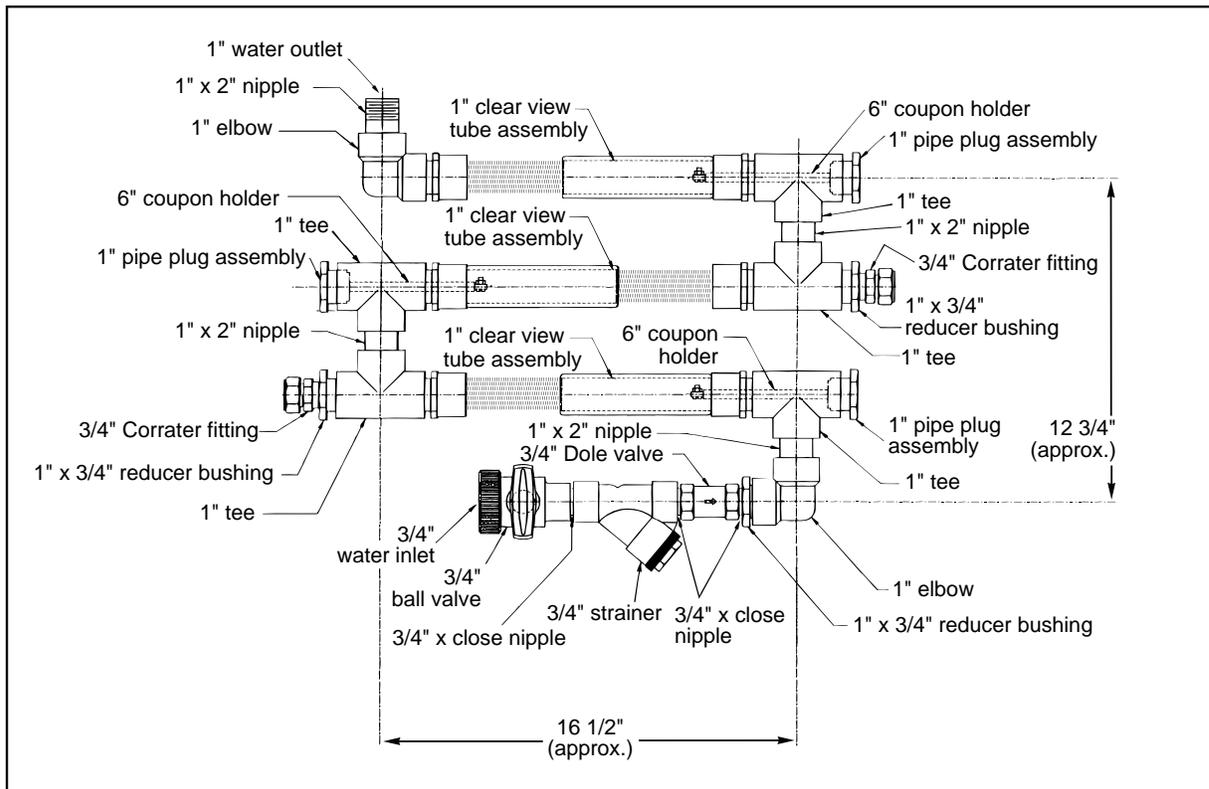
- C. Do not use the on-off valve to control flow at any time.

The strainer must be routinely flushed to prevent plugging the flow control valve and losing flow through the coupon rack. Reduced flow will give falsely high corrosion rates.

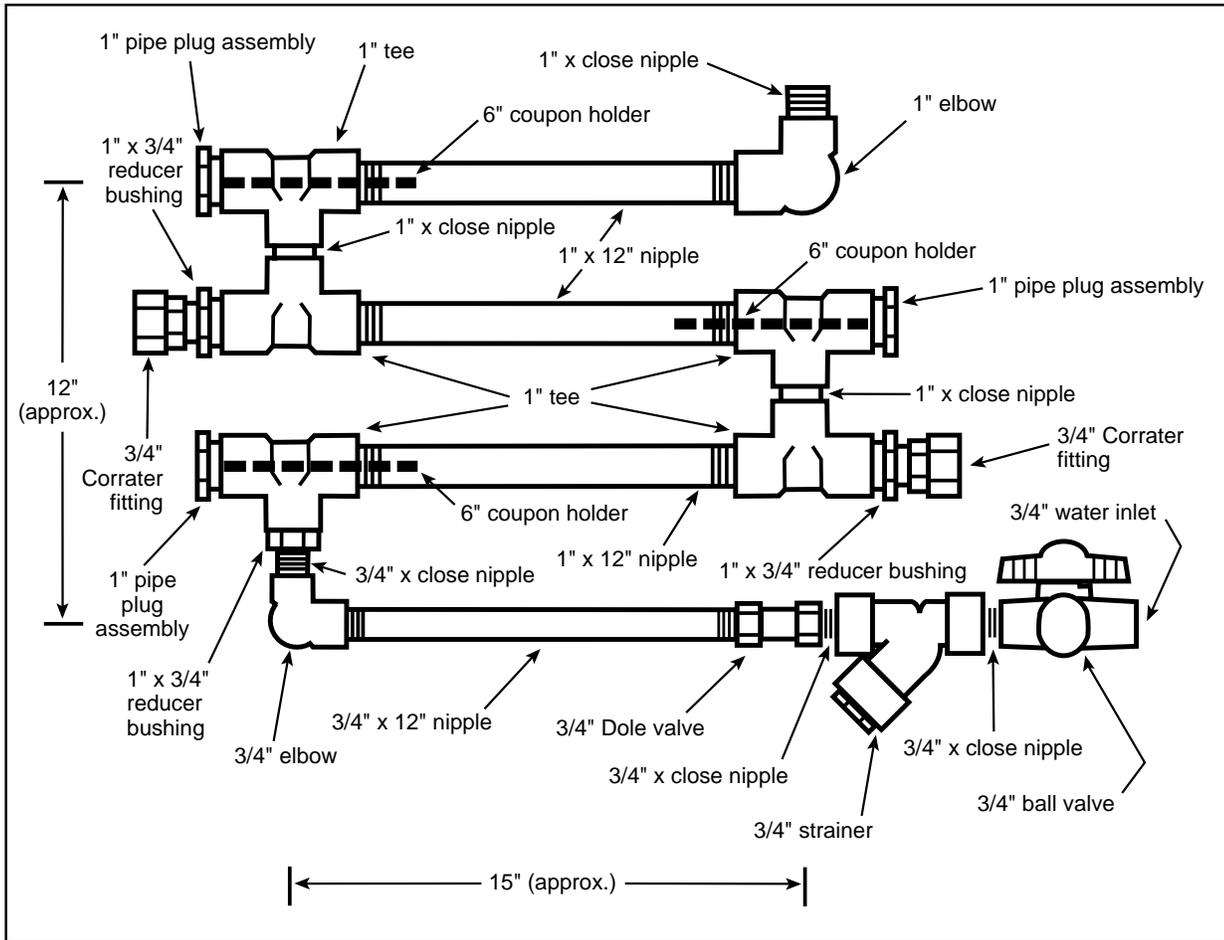
### START UP AND SHUT DOWN

Start up and shut down water flow as required by operating the ball valve. Always use the valve in the full "on" or full "off" position. After each installation or inspection, be sure to turn the valve "on" again.

**Note:** Make sure to keep the sliding tubes over the clear view sections of the Nalco Clear View Corrosion Test Rack, 500-C0191.88, when any inspection of the corrosion coupons is completed to avoid exposing the corrosion coupon to prolonged sunlight.



*Nalco Clear View Corrosion Test Rack 500-C0191.88 installation*



Nalco 1" Corrosion Test Rack 500-C0192.88 installation

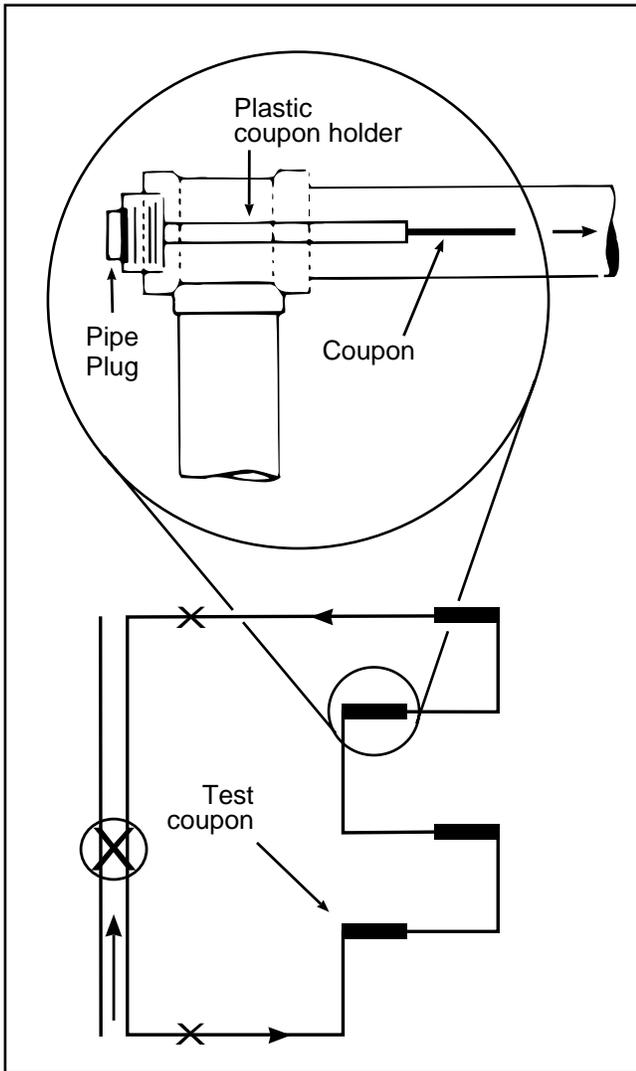
## CORROSION COUPONS AND CORRATER PROBES

The Nalco corrosion test racks are designed to accept corrosion coupons and Corratier probes of any metal desired. Coupons and probe tips should be ordered to reflect the metals present in the system. A Corratier adapter is included with the unit. The remainder of the Corratier assembly must be ordered separately.

Corrosion coupons should always be installed so that the water flows over the plastic rod and then the metal coupon. Water flowing directly onto the coupon may cause erosion-corrosion and false weight loss measurements. The coupon should be installed at a location in the system where the cooling water conditions are most critical, i.e. the

exit of the exchanger with the highest outlet water temperature. Mark the end of the pipe plug holding the coupon to indicate coupon orientation, preferably vertical in the water stream parallel to the water flow. Coupons oriented horizontally will tend to show higher corrosion rates and may be used to show worst case results for a system.

Corratier tips should always be installed so that water flows directly onto the tips, to prevent fouling between the electrodes. Insert the Corratier probe into the special Swagelok fitting until you feel movement restricted by the PVC pipe tee. Push the probe just beyond the restriction. This securely seats and properly aligns the probe.

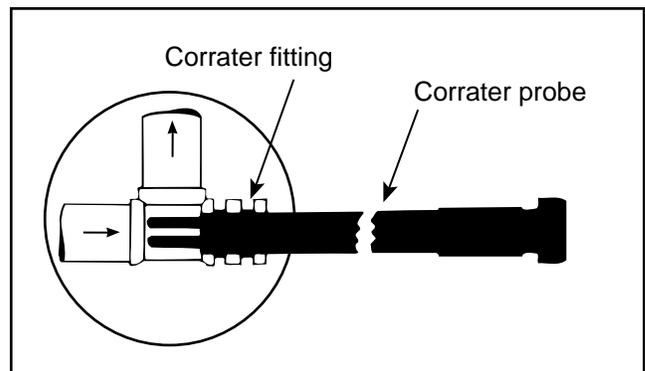


*Installation of corrosion coupons*

**Note:** It is critical that coupons be oriented consistently to ensure representative, meaningful results. For vertical flow corrosion monitoring, the only requirement is that the coupon be mounted parallel to the flow, not perpendicular to it.

Thirty-day exposures are the minimum to avoid flash corrosion rates. 60- and 90-day exposure times are also practiced. Intervals longer than 90 days are not necessary in the > 1 mpy realm. In the <1 mpy realm, 90 days exposure is required, and in the <0.1 mpy realm, 360 days are necessary to eliminate extraneous influences.

Corrater tips should always be installed so that water flows directly onto the tips, to prevent fouling between the electrodes. Insert the Corrater probe into the Corrater fitting until you feel movement restricted by the PVC pipe tee. Push the probe just beyond the restriction. This securely seats and properly aligns the probe.



*Installation of corrosion probes*

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