

BELL SYSTEM PRACTICES
Outside Plant Construction
and Maintenance

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AT&T Co Standard

PRESSURE TESTING

CHARGING CABLE WITH FREON 12 GAS

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1. GENERAL

1.01 This section covers the preparations and procedure involved in charging cables with Freon 12 gas, to permit using the B Leak Locator for finding gas leaks in aerial cables and associated terminals, loading coil cases, etc.

1.02 The section also covers the procedure for flushing the cable with nitrogen gas following the tests with the B Leak Locator.

2. QUANTITY OF FREON REQUIRED

2.01 The following table indicates the approximate volume and weight of Freon required to charge paper insulated cables of various diameters. The table also shows the approximate lengths of gas-tight cables of various sizes that can be charged to 9 p.s.i. with one cylinder.

Cable Diameter (Outside) Inches	Freon Required per 1000 Ft. of Cable		Approx. Length of Cable per Cylinder	
	Approx. Volume* Cu. Ft.	Approx. Weight Lbs.	25 lb. Cylinder	145 lb. Cylinder
up to 1	4	1.5	16,000 Ft.	—
over 1 to 1-1/2	6	2	12,000 "	—
over 1-1/2 to 1.5	10	4	6,000 "	36,000 Ft.
over 1.5 to 2	15	6	4,000 "	23,000 "
over 2 to 2.25	20	7	3,500 "	20,000 "
over 2.25 to 2.5	25	8	3,000 "	17,000 "
over 2.5 to 2.8	30	11	2,200 "	13,000 "
over 3.0	45	15	—	9,000 "

* Volume is given in Cu. Ft. at 60° F. and sea level pressure.

2.02 If the section being charged consists of two or more sizes of cable or two parallel cables, estimate the length of each cable to the nearest 1000 feet, determine the individual quantities from the above table and add them to find the total quantity of Freon needed.

2.03 In ordering Freon, add 10 to 15% to the quantity indicated to allow for the loss through cracks in the sheath.

2.04 **Size of Cylinder:** For cables of 1 inch to 1-1/4 inches outside diameter, as well as for charging relatively short lengths of larger size cable, the 25-pound Freon cylinder can be used, if available.

2.05 The 25-pound cylinder may also be found useful where right-of-way conditions make it preferable to use small cylinders spaced at shorter intervals, as indicated in the table in Paragraph 2.01.

3. CHARGING TIME

3.01 In order to make effective use of the B Leak Locator the nitrogen gas (or air) in the cable to be treated must be forced out and replaced by Freon. This is done by connecting the Freon cylinder to the cable at one point in the test section and forcing the nitrogen along the cable, generally in both directions, toward open valves at the distant ends of the test section.

3.02 The following table indicates the approximate length of time required for the Freon gas to reach the open valves, provided the cable has no large cracks and no restric-

tions, such as sometimes occur due to paraffin filled sheath ends at splices or paraffin filled sleeves. The table is based on a Freon admission pressure of 10 p.s.i. and zero pressure at the bleed point.

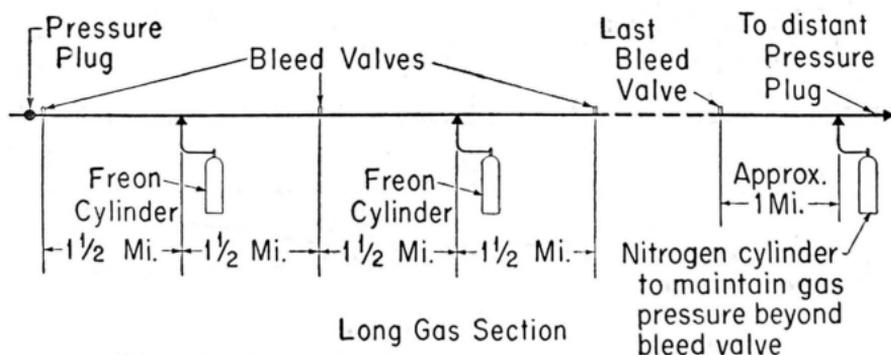
Distance from Freon Admission Point	Approx. Elapsed Time	Distance from Freon Admission Point	Approx. Elapsed Time
1,000 Ft.	1.5 Hours	7,000 Ft.	50 Hours
2,000 "	4 "	8,000 "	65 "
3,000 "	10 "	9,000 "	80 "
5,000 "	25 "	10,000 "	100 "
6,000 "	35 "	11,000 "	120 "

3.03 It is usually advisable to prepare an over-all pressure gradient of the gas section, or of the portion to be tested, if a recent gradient is not available.

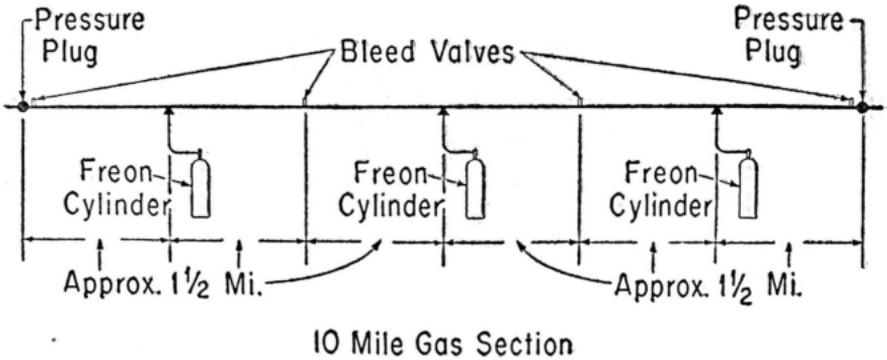
3.04 If zero pressure leaks are apparent, they should preferably be cleared before introducing Freon gas. This will prevent excessive loss of Freon and will avoid delay after charging is started.

4. CHARGING LAYOUT

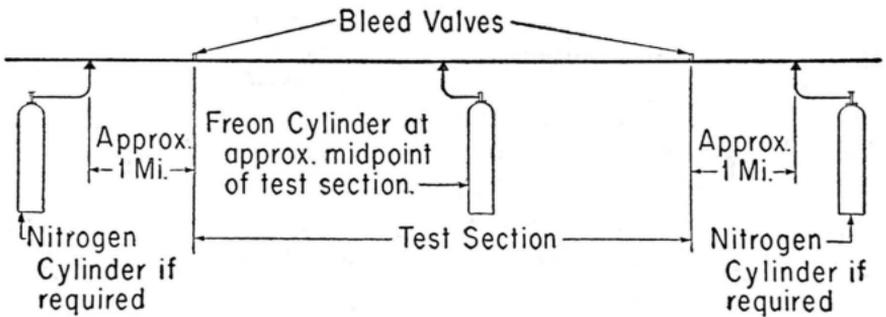
4.01 **Long Cable Sections:** It is ordinarily advisable to locate charging points about 3 miles apart, as illustrated below. Each Freon cylinder will thus supply gas for about 3 miles of cable.



4.02 If the cable is subdivided into 10 mile gas sections, use 3 charging points in each gas section.



4.03 **Short Cable Sections:** If the length to be tested is not in excess of 2 or 3 miles, use one Freon cylinder placed at the approximate midpoint, as illustrated below.



4.04 If it is necessary to maintain pressure in the cable beyond one or both of the bleed valves, a nitrogen cylinder can be installed as indicated in the sketches. The regulator on this cylinder should be set to approximately cable pressure at the location of the nitrogen cylinder.

4.05 When the Freon reaches the bleed valves, replace the valve cores and disconnect the Freon cylinder. The nitrogen cylinders can be left in place.

5. CHARGING PROCEDURE

5.01 Since charging proceeds very slowly whereas the testing can usually be done at walking speed, it is necessary to schedule these operations carefully so that the job can proceed in an orderly manner.

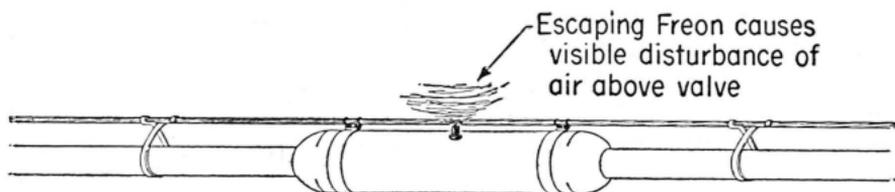
5.02 Charging should be started well in advance of testing and the progress of the Freon in the cable checked to avoid excessive gas loss and to ensure that the test will be effective.

5.03 Select the charging points and bleed points as indicated. Remove the valve cores at the bleed points and, if necessary, install the nitrogen cylinders.

5.04 Then place the cylinders and set the charging pressure at 10 p.s.i. Record the starting time.

5.05 Reset the regulator pressure to 10 p.s.i. after about 1 hour, at which time the gas flow will be fairly stable.

5.06 **Detecting Freon:** The arrival of Freon gas at the ends of the section under test or at intermediate points can be determined by observing the escaping gas at an open valve. When viewed against the sky, escaping Freon produces a shimmer in the air above the valve; escaping nitrogen or air has no effect.



5.07 The progress of the Freon along the cable can be checked by temporarily removing the valve core at an intermediate valve and observing for the presence of Freon.

5.08 If the Freon gas does not reach the end valves in the time indicated or if the progress is slow, the trouble may be due to the existence of a large leak or a restriction between the Freon admission point and the open valves.

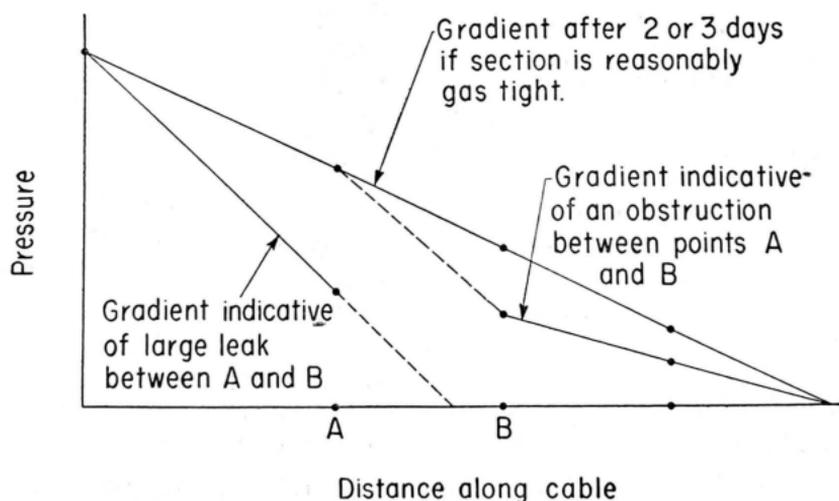
5.09 **Continuous Flow Gradients:** Under ordinary conditions the pressure gradient of the cable between the Freon admission point and the bleed valves will stabilize within the period of time indicated in the following table.

Distance between Freon Cylinder and Bleed Valve	Approximate Time for Stabilization of Continuous Flow Gradient
1000 Ft.	1/2 to 1 Hour
2000 "	1 " 1-1/2 Hours
3000 "	3 " 4 "
5000 "	6 " 10 "
7000 "	15 " 20 "
9000 "	24 " 36 "

5.10 It is generally advisable to measure the pressure at several valves and plot the gradient on each side of the Freon admission point when the gradient has stabilized.

5.11 If there are no restrictions and no large leaks, the curve will be a relatively straight line (except for the effect of changes in cable elevation at measuring points—the correction for Freon is .25 p.s.i. per 100 ft. difference in elevation; add correction to valve readings at higher elevation. See G73.205.4.)

5.12 The following sketch shows typical continuous flow gradients, which may be helpful in analyzing the behavior of the cable under test.



6. FLUSHING CABLE WITH NITROGEN

6.01 After the cable has been tested with the B locator and the indicated troubles marked (as covered in a separate section) the Freon must be removed by flushing the cable with nitrogen.

6.02 This is done by removing the Freon cylinders and replacing them with nitrogen cylinders.

6.03 The approximate quantity of nitrogen to be introduced at each point is indicated in the following table.

6.04 The completion of flushing can be determined by observing the escaping gas as covered in Paragraph 5.06.

Cable Diameter Inches	Nitrogen Required per 100 Ft. of Cable
up to 1	10 Cu. Ft.*
over 1 to 1.25	15 " "
over 1.25 to 1.5	25 " "
over 1.5 to 2	35 " "
over 2 to 2.25	45 " "
over 2.26 to 2.5	55 " "
over 2.5 to 2.8	70 " "
over 3.0	100 " "

* Volume is given in Cu. Ft. at 60° F. and sea level pressure.