

BELL SYSTEM PRACTICES
Outside Plant Construction
and Maintenance

SECTION G73.306.1
Issue 1, July, 1953
AT&T Co Standard

PRESSURE TESTING

INITIAL CHARGING COAXIAL CABLE

WITH SF6

Contents	Page
1. General	1
2. Quantity of SF6 Required	1
3. Charging Cable with SF6 Gas	2
4. Tool List	7

1. GENERAL

1.01 This section covers the procedure to be followed in the initial charging of coaxial cables with sulfur hexa-fluoride gas (SF6) to prevent corona discharge within the coaxials.

2. QUANTITY OF SF6 REQUIRED

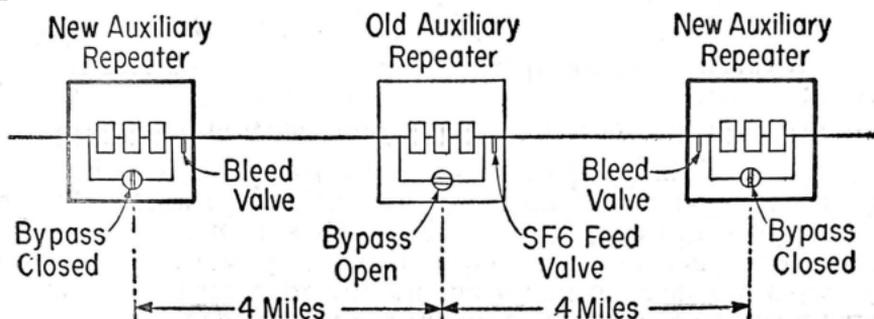
2.01 The quantity of SF6 gas required to fill a length of cable depends on the diameter of the cable, plus a small amount to ensure expelling all the nitrogen from the cable. As the SF6 gas moves through the cable, there is a tendency for the advancing SF6 to mix with the nitrogen. The nitrogen, as well as the mixture of nitrogen and SF6 must be expelled from the cable before the pressure is allowed to build up.

2.02 The following table indicates the quantity of SF6 required to expel the nitrogen and charge the three sizes of coaxial cable in general use, to an average pressure of 25 psia.

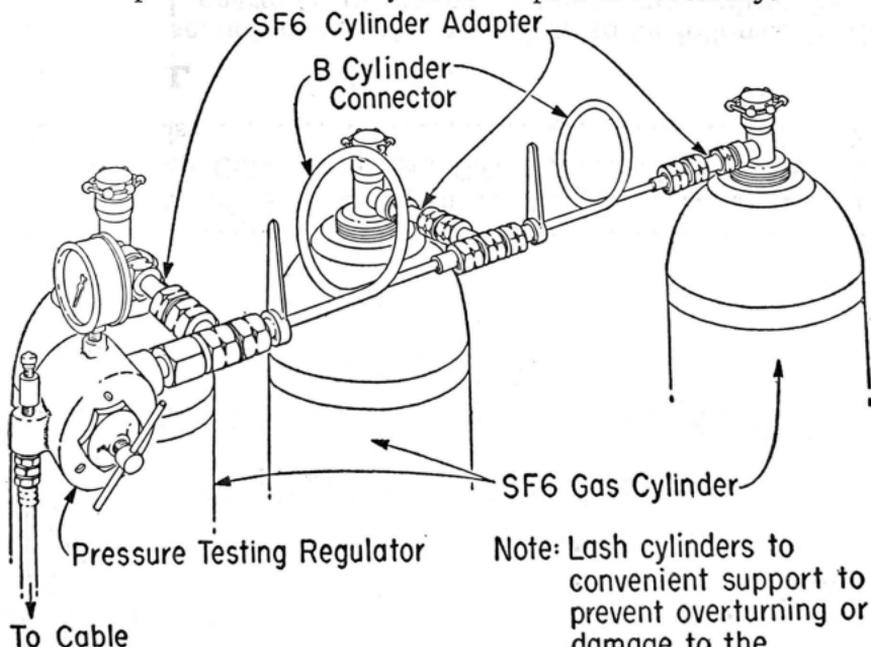
Cable Diameter Over Sheath (Inches)	Gas Weight per 1000 Feet (Pounds)	Cylinders Required to Fill 8 Miles of Cable (100 lb. cyl.)
1.9	8.5	3-1/2
2.2	12	5
2.6	16.5	7

3. CHARGING CABLE WITH SF6 GAS

3.01 The following shows the layout for charging two 4-mile auxiliary repeater sections from one charging point where new auxiliary repeaters are being installed between existing auxiliary repeaters. A similar arrangement can be followed where the auxiliary repeaters are initially installed 4 miles apart.

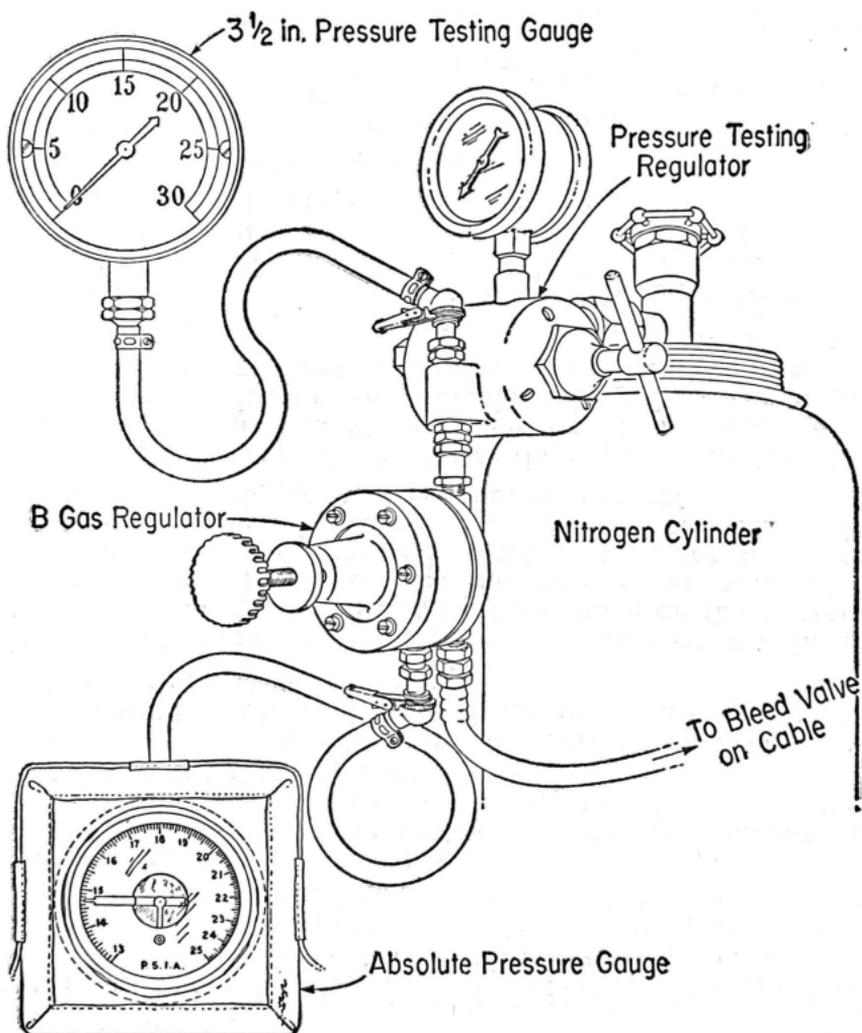


3.02 The cylinders containing SF6 gas should be connected to the cable, as shown in the following figure. The gas should be fed into the cable at a pressure of about 25 psia (pounds per square inch absolute, measured with a gauge or manometer reading absolute pressure). After about 2 days, check the pressure and readjust to 25 psia if necessary.



Note: Lash cylinders to convenient support to prevent overturning or damage to the connections.

3.03 In order to prevent the operation of contactors while the cable is being charged with SF₆, the nitrogen is discharged from the cable at each bleed point through a B Gas Regulator which is set to maintain a pressure of about 20 psia. The B regulator must be connected to a nitrogen cylinder, which supplies gas for operating the B regulator. The arrangement of the apparatus at the bleed point is shown in the following illustration.



3.04 After the nitrogen cylinder and regulators have been installed and the hose has been connected to the cable, proceed as follows:

- (1) Set the Pressure Testing Regulator at 15 psi, using a 3-1/2-inch Pressure Testing Gauge.
- (2) Set the B Gas Regulator at 20 psia, using an Absolute Pressure hand gauge or manometer to determine the pressure.
- (3) Carefully lower the outlet pressure by adjusting the Pressure Testing Regulator until the B Gas Regulator pressure drops by 0.2 pound.
- (4) Then carefully adjust the Pressure Testing Regulator until the 0.2-pound drop in the pressure of the B Gas Regulator has been restored.

3.05 Make weekly readings of the volume of gas in the nitrogen cylinder (high pressure gauge on the Pressure Testing Regulator) and replace the cylinder as required to ensure continuous operation. This cylinder must not be allowed to empty completely because the cable pressure will quickly drop to zero thereby reducing service protection.

3.06 The following table indicates the approximate length of time required to fill an 8-mile length of coaxial cable with SF₆ gas admitted at the midpoint at a pressure of 25 psia and the B Gas Regulators at the bleed point set at 20 psia.

<u>Cable Make-up</u>	<u>Cable O.D. (Inches)</u>	<u>Cylinders Required to Fill 8 Miles of Cable</u>	<u>Time Required to Fill 8 Miles (Days)</u>
8 Coax. ; Control Pairs	1.9	3-1/2	29
8 Coax. ; Control Pairs ; 1 layer Quads	2.2	5	31
8 Coax. ; Control Pairs ; 2 layers Quads	2.6	7	34

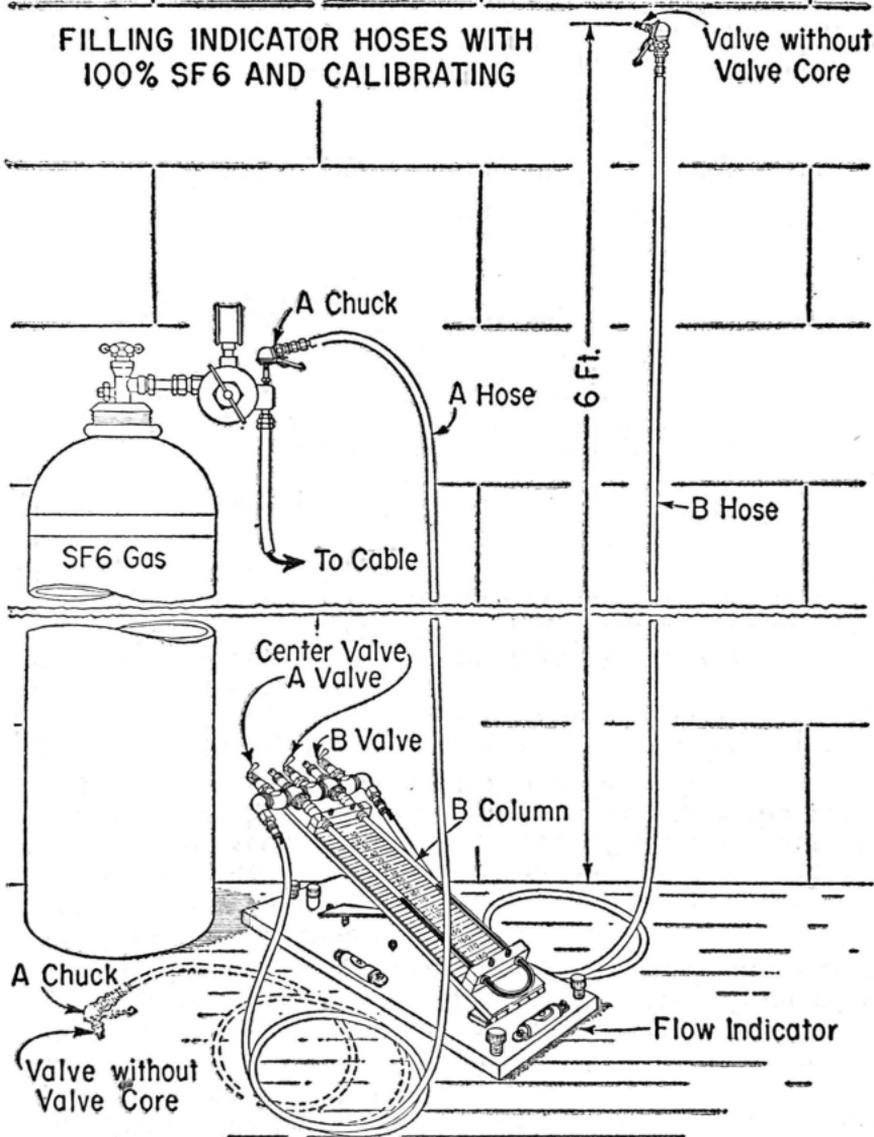
3.07 Charging with SF₆ gas is continued until the gas escaping from the cable at each bleed point shows a concentration in excess of 90 per cent SF₆ gas.

3.08 The percentage of SF₆ at the bleed points should be determined before the apparatus at these points is removed.

3.09 The percentage of SF₆ is determined by comparing the pressure developed by a 6-foot column of 100 per cent SF₆ from the SF₆ cylinder with that developed by a 6-foot column of the gas escaping at the bleed point. The B Flow Indicator is used to measure the pressures.

- (1) Set up the B Flow Indicator at the charging point as illustrated and level the instrument.

FILLING INDICATOR HOSES WITH 100% SF6 AND CALIBRATING

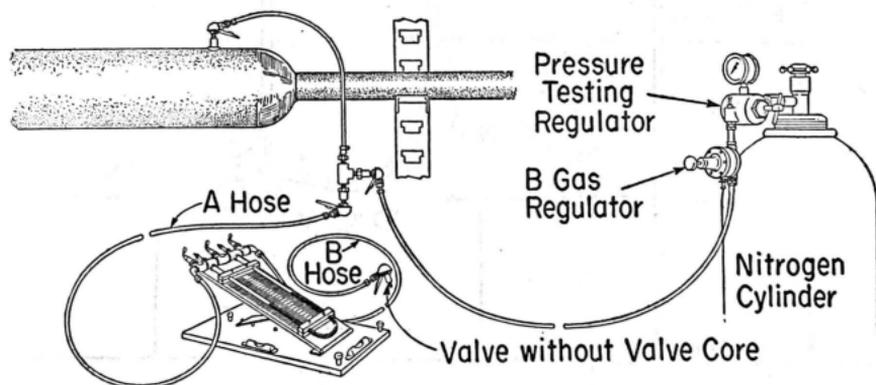


(2) Close the three valves on the B Flow Indicator.

(3) Place in the chuck of the B hose a valve from which the core has been removed and support this chuck 6 feet above the floor. Connect the chuck of the A hose to the regulator as illustrated above.

- (4) Set the U tube at the 8° position, open the center valve and check the levels of the liquid in the tubes to ensure that they are approximately the same.
- (5) Raise the U tube to the 45° position, leaving the center valve open.
- (6) Open valve B. Then **very slowly** open valve A part way and observe the U tube to avoid losing the liquid. Allow SF6 gas to pass through the instrument 8 to 10 seconds.
- (7) Close valve A and remove the A hose chuck from the regulator and place in this chuck a valve from which the core has been removed; then lay this chuck on the floor.
- (8) Lower the U tube to the 8° position.
- (9) Close the center valve; then open valve A and read the instrument. The difference in the readings between scale B and scale A should be about 60 small divisions for 100 per cent SF6. (The B column should give the higher reading.) Record the difference in scale readings.

3.10 Move to the bleed point and set up the apparatus, as shown below. Then determine the difference in the scale readings for the gas that is being discharged, in the same manner as outlined in Paragraph 3.09, (2) to (9), inclusive. Record this difference. The gas in the cable is satisfactory if the difference in the two readings is about 5 less than the difference obtained at the charging point (about 55 divisions).



3.11 After the apparatus at the bleed points has been removed, allow the pressure to build up by feeding gas into the cables from the charging point. About 2 days are required for the pressure to build up to 24 psia. Then remove the apparatus at the charging point.

4. TOOL LIST

4.01 The standard listing of the tools follows:

Adapter, Cylinder, SF6

(One required for each SF6 gas cylinder connected to manifold.)

**Gauge, Testing
Pressure, 3-1/2-in.**

**Gauge, Pressure, Absolute,
Wallace and Tiernan
FA160191**

Indicator, Flow, B

Connector, Cylinder, B

(Number required is one less than number of cylinders connected together.)

Regulator, Gas, B