APPENDIX 6
POSITIVE AIR FLOW

INTRODUCTION

Areas with high sustained temperatures face a unique plant problem. A combination of high manhole temperatures and high humidity results in moisture diffusion through a cable sheath. Since the air within the cable is relatively stagnant (at least in pneumatic sections where there are no leaks) and the air contains high relative humidity, condensation occurs when the cable is cooled. For example, if a water main crosses the conduit structure, cable temperatures would drop, causing the internal cable humidity to reach the dew point. In a sense, it "rains" in the cable. This can cause high resistance trouble, even in cables that are pressurized. While high cable pressure, by itself, does not reduce this moisture problem, the moisture can be "dried out" when cable pressure is combined with the movement of air through a cable (caused by artificial leaks).

The Positive Air Flow System, developed by System Studies Incorporated, is the solution to the moisture entry problem. This system integrates familiar cable pressurization hardware with a unique design concept. Pressurizing underground cables with a standard air pipe delivery system is fundamental to the Positive Air Flow System, but rather than using a 6,000 foot spacing for air sources (with pressure transducers at the midpoints), the spacing is reduced to 3,000 feet. The concept behind this design is that leaks will be identified by flow increases rather than pressure drops. The air pipe manifolds in this 3,000 foot system are each monitored by a flow transducer. At the last manifold location, the air pipe is also monitored with a pressure transducer.

The key to the design is the establishment of controlled leaks throughout the system. Controlled leaks are placed at the midpoints between the source manifolds (see Figure 1). Rather than bleeding into the atmosphere, these leaks are directed into a manifold via plastic tubing. The manifolds are connected to an air pipe that "returns" the air back to the central office. Installed on the "return air pipe" in the office is a humidity detector and leak controller, both of which are monitored and controlled from PressureMAP software. The air flow from each of the "leak manifolds" is monitored with flow transducers.

HOW POSITIVE AIR FLOW WORKS WITH PressureMAP

As a result of the changes the Positive Air Flow System makes to the standard pressurization system, several changes have been made to the PressureMAP software. One of the changes that is very important to the future management of the system is the SQI, or System Quality Index. This index measures the quality of cable protection being offered by the pressure program.

An SQI value is provided for each wire center in the system and for each route in a wire center. SQI information is displayed by selecting option #4 of the PressureMAP Master Menu.

Since the Positive Air Flow System emphasizes air flow (with its controlled leaks), a new formula is needed to adjust the typical SQI to reflect the air usage caused by controlled leaks. This new index design requires the use of some new device types which are described in detail below.

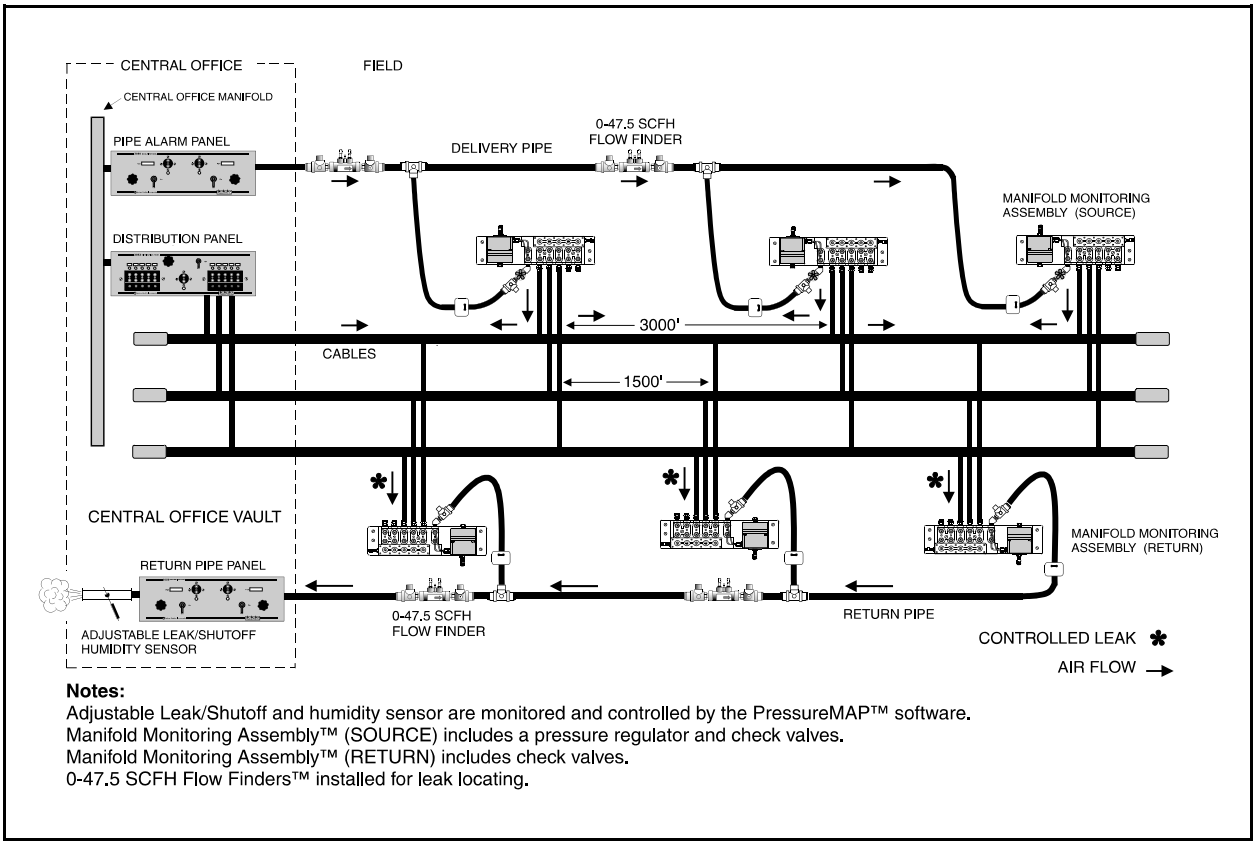

FIGURE 1: THE POSITIVE AIR FLOW SYSTEM

New Device Types

While the Positive Air Flow System uses the standard devices described in Appendix 1 of the Data Entry Manual, there are three new device types unique to this type of office.

Return Manifold Flow Transducer

The Return Air Pipe Manifold Flow Transducer or XR, measures the flow rates at return manifolds. These devices are installed at the return manifold for each return air pipe.

The sheath mileage for this device is calculated by first adding the distances from this return manifold to the first source manifold toward the CO and to the first source manifold toward the field. This sum is then multiplied by the number of cables supplied by the manifold. The sheath mileage can also be obtained from the OAU worksheets generated by the System Studies Engineering Department.

All flow transducers are calibrated to a pressure of 10 PSI. Under certain circumstances, a transducer may operate with a higher or lower pressure. When the operating pressure is not 10 PSI, the flow needs to be calibrated to the actual PSI. The default PSI value for a XR device is 6.0 and 5.0 for the SR device described below.

Return Pipe Flow Transducer

The Return Pipe Flow Transducer or SR, is connected to the return air pipe in the CO. This flow transducer measures the combined flow rates of all the controlled leaks. This measured flow should be the sum of all the XR devices on the pipe.

Return Pipe Pressure Transducer

The Return Pipe Pressure Transducer or ZP, is connected to the return air pipe in the CO. It measures the return air pressure in the CO.

Realtime Device Readings

Through Specific Device Information, it is possible to obtain a realtime reading for most devices entered into the Positive Air Flow Office. A realtime reading is simply a device reading which is made at the time of the inquiry. When a realtime reading is requested, a call will be made to the device chosen and a reading will be obtained at that time. The value returned from a realtime reading is the actual current reading of the device. The following monitors do NOT support this feature: Sparton 5310, Chatlos L1, and Trius. In addition, individual realtime readings are not available for the following addressable devices monitored by the 289H LSS: Lancier, Nicotra and Inelcom. For these time-addressed devices it is necessary to use the Pair Realtime Reading Test, described in the Diagnostics section.

The realtime readings from Lancier and Nicotra monitors are obtained slightly differently. Nicotra realtimes are available for the first 12 devices (addresses) on a line pair, but the remaining transducers (13-127) are taken from the last polled reading in the monitor's memory, due to the amount of time needed to read these devices. Requirements for Lancier realtime capability are outlined in the Lancier Device Data section of the MAP Data Entry manual.

To take advantage of this feature, follow the regular procedures for obtaining a Specific Device Report, option 3 of the PressureMAP Master Menu. However, at the **`Device number?`** prompt, enter the keyword ***REAL*** followed by a comma, and then the device number(s) for which you want a realtime reading. As before, be sure to follow your selection with a <Return>.

Procedure:

1) To obtain a realtime reading, enter the device number (or numbers), followed by **<*Return*>** at the prompt. For example, if you desire a realtime reading for the device numbered 102, then enter the following command at the prompt:

```
Device number?  real, 102
```

As with the regular Specific Device Reports, you may specify a list or range of device numbers at the **`Device number?`** prompt. To obtain realtime readings for more than one device, enter the desired devices, separated by commas, at the prompt. Also, a range of devices may be specified by using a forward slash to separate the range of device numbers (as described in the Preface of this manual). You may also type "all" to see realtime readings for all devices in the office.

When requesting a realtime reading of a MF device type, all associated XR devices will first be read realtime, and their readings will be reflected in the reading for the MF device. Pressing the **<*Esc*>** key will stop the processing of information and display the following prompt:

```
Device number? <MF Device Number>
Reading related device <Device Number>

Device number?
```

A new device number may now be entered, or press the **<*Return*>** key to exit from realtime readings.