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Telco Line Problems

● Transmission of program audio over local Telco lines can meet with problems that reduce quality of transmission, or in some cases the program is lost altogether. Line problems are not within the jurisdiction of station personnel to correct, nor always within their competence either. Telco personnel are generally very cooperative in correcting line problems which are brought to their attention. An important fact to remember is that Telco does not monitor program transmissions on local loops. It is essential, therefore, when problems do develop, that station personnel recognize that problems exist, and alert Telco immediately so that corrective measures can be taken.

INITIAL SET-UP

When a local line has been ordered for a remote broadcast, the installation will be made some time in advance of program time—often days ahead. Once the installer has completed his work at the remote site, he should check through to the studio and with station personnel at the studio end. This check through is important since the circuit will route through the local Telco testboard and must be cross-connected there. While the installer is still at the remote site, it is a good practice to make some measurements on the circuit yourself. These are essentially resistance measurements and perhaps a listening test. Save this data for future reference should troubles develop on that circuit.

The first measurement to make is the resistance of the circuit itself. The installer should have placed a 10k resistor across the terminals, so in essence you are measuring the total series resistance of the two wires and that resistor. Next, measure from each side of the line to ground. Since this is a balanced circuit, the resistance should be infinity. When first placing the test leads on the circuit and ground, there will be a quick kick of the ohmmeter, this is normal. It is the battery charging up the capacity to ground of the circuit. The reading should only be momentary and settle back to infinity.

Patch the line into the console to make a relative listening test for noise on the circuit. Set the console fader to the usual position for local remotes and observe the VU meter, and listen to the monitor. With no movement of the meter, the noise is at least 20 dB below normal program. Then open the fader wide open. You can estimate any noise that results by the fader steps which are usually about 2 dB per step.

The installer is really not needed to help you make these tests, but if any serious problems show up you can report them immediately. He knows who to contact at the testboard, and they may even find another pair to use. But if another pair is going to be used, then make the same measurements on that pair.

NO CIRCUIT

A relatively common problem is that there is *no circuit* at program time. Many things can happen to the circuit once it has been installed and checked out. An open circuit prevents the announcer from calling in over the line and the console over-ride. He must then spend time finding a telephone, calling Telco and getting someone out to correct the problem. However, enough time can be lost that part or, worse yet, all of the program may be lost. The control room operator, of course, can detect such problems by checking out the circuit some time in advance of the program air time—well enough in advance to get the problem corrected before air time. This is where those initial measurements come in handy. If the measurements are still the same, then he can reasonably expect the line to be operating properly.

The most common cause of an open circuit occurs at the Telco testboard itself! Someone may misread the line orders, and thinking the circuit is no longer active—pull it down. (The author had this happen one time right in the middle of a 3 hour remote broadcast!) Yet another cause of open circuits is damage to cables by digging equipment or cranes on a construction project. This doesn't happen too often, fortunately, but it does happen and can disrupt telephone service over a large area—including broadcast circuits. Should the station's News Department have information that such an event has occurred in your town, check out all your permanent circuits, as well as those temporary circuits not yet used. Since

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there is no way of knowing the actual routing of any of your circuits. it is best to check them all out. Again, using that original set of measurements. taken on each circuit, it is easy to determine whether the circuit in question was in that damaged cable. If so, report these immediately to Telco, and give them the day and time of its next use. This gives them a time frame in which to work at the correction. But don't leave it at that. Shortly before the air time for the circuit, make the measurements again to be sure it has been properly restored.

POOR CIRCUIT

The most common situation is a *poor* circuit rather than an open circuit. Unless station personnel are alert and get the problems corrected early, very poor quality program audio can result. (Here we are not referring to the normal poor bandpass of a "good" line, but things which happen to make a "good" line go bad.) This is yet another reason why regular checks should be made on all permanent circuits on a regular basis, or at least some time well ahead of the use of a circuit.

Assume you are checking your permanent circuits and measure one where the resistance across the circuit is very high (not infinity). This can be caused by a series loading coil (if still in the circuit) that is faulty, a poor jack, or connection in the testboard or anywhere along the circuit. Signal loss will be high and the audio quality may be very poor on the circuit under those conditions. Report such a condition immediately.

Instead of a high resistance across the circuit, the ohmmeter may indicate a *low* resistance of a couple hundred ohms or less. This can be a *normal* situation, or a shorted circuit. It is normal if there is an amplifier connected across the remote end of the line, or if the console is connected to the line at the studio. The transformer in those units will have a low value d.c. resistance and the line will appear shorted—but it is not. To get a true reading on the line itself. the amplifier must be removed. And always unpatch the console before attempting to measure the circuit. It may not be practical to go out and remove the amplifier in many cases—especially in various churches with a permanent amplifier arrangement—however the measurements can still be of use if measurements were carefully made, at the time the equipment was first installed. A shorted cable or moisture will still effect these indications to alert the observant operator that there is a problem. Without equipment on the line, a low reading indicated on the Ohmmeter means the line is shorted. Report this immediately to Telco for correction. The line will be unusable for broadcast.

STILL MORE

A broadcast loop is a balanced circuit, which means both sides of the circuit are above ground. It is important to measure *each side* of the circuit to ground. In making this measurement, let's assume you measure a *very high* resistance to ground (not infinity). on one or both sides of the circuit. The resistance may also be varying or intermittent. Most likely, the cause is a defective *heat coil*. These coils are lightning (and power line) protective devices to shunt transient spikes or large voltages to ground. and are placed at various intervals along the circuit. Report such a resistance reading to Telco immediately for correction. The circuit is usuable to some degree, but look for an increase in noise and crosstalk.

A high resistance reading to ground may not be resistance at all, it may be voltage. When a high resistance is

indicated, switch the meter over to measure a.c. or d.c. voltages. Long cable runs often pick up induced a.c. voltage from the power lines on the same poles. This will measure approximately 1½ to 3 volts. There isn't much Telco can do about this problem without major construction work, but that a.c. voltage can create hum in the program audio. The hum can often be reduced or eliminated by the use of a repeat coil at the studio end.

On the other hand, you may measure a *dead short* from one side of the line to ground. A typical cause here is the small carbon blocks used as lightning protection devices. A strong surge may have burned through one of the blocks and it now has a direct connection to ground. If these are mounted at the Telco terminal box in the studio, pull out the carbon block. If it is shorted, the short will disappear from the ohmmeter. But if this does not correct the problem, the short is elsewhere along the route. Report the problem immediately as the circuit is now definitely unbalanced. Hum and crosstalk may become so high as to make the line unusable. As an emergency measure, try running the circuit through a repeat coil for isolation. On some broadcasts such as a basketball game, the crowd noise is very high and this may override the line noises enough to at least save the broadcast—if not the quality.

NETWORKS

While the previous discussions have centered on local Telco loops for remote broadcasts, stations have a variety of Telco circuits in use. One such circuit in many stations is the connection to a National Radio Network. Besides the local loop to the Toll Test section of the Telephone Company, there will be a cross-connection from there to the long lines division of A.T.&T. The long lines section of the Network can be either wire circuits or multiplexed microwave carriers. There is some degree of monitoring along the Network which can catch problems quickly, but there are other problems that can develop unnoticed.

Most of these Networks send along response and other test signals at various times and on a scheduled basis. The local station should make use of the tests to keep a check on the quality of the circuit. It is not necessary to set up test equipment to take the response runs on a regular basis. Simply switch up the Net on the Console and use the VU meter. Set the fader to a convenient place around Zero VU on the set level tone, and then note and write down the difference in signal level of each of the tones sent in the test. These should all be within 2 or 3 db from the reference. Watch for roll-offs, sharp peaks or notches in the response curve. These are normally equalized circuits, but one may have been accidentally misadjusted somewhere, or one inserted that doesn't belong in the lineup. Report such deviations from normal to the Toll Test section of Telco. And if the fault isn't corrected over a practical period of time, you may have to complain further. The real problem may be that the fault is only in your "leg" of the Network. If, after several complaints, it doesn't get corrected, go to the Network itself. They can often get results the local station can't.

RECAP

Local loops can develop problems. To maintain consistant line quality as well as save programs from being lost, check the lines on a regular basis. Compare new test results with the original resistance measurements which were made at the time of installation. If you have a national Network, make use of the test signals to keep tabs on line quality. ■