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SIMPLE PREVENTIVE MAINTENANCE FOR TRUNK AND FEEDER LINES

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Keeping your CATV system in top condition requires a preventive maintenance program that is easy to perform, uses common test equipment, and does not affect the subscriber. The following steps are critical to a good maintenance program:

- 1) Keep accurate records.
- 2) Set up a maintenance schedule that fits into the work flow.
- 3) Make consistent checks on signal levels, voltage, distortions, and picture quality.

The first step is to keep accurate records for each amplifier in your system. By recording and keeping the data, you can compare current performance measurements to those you made in the past. Significant changes in the readings you take indicate problems in your system. Not only should you be careful to record measurements, but you need to maintain these records so they are easy to find.

Second, you need to set up a weekly maintenance schedule. You cannot check every end-of-line or last amplifier every day, but you can create a program that fits into your work week. For example, take the number of last amplifiers in the system and divide by the number of work weeks per year you can do some maintenance (about 40). This is the number of amplifiers you should check per week. Then, divide this number by the number of technicians available. This is the number of amplifiers each technician should check per week.

Then, organize your last amplifiers by geographical area so you can assign technicians to amplifiers in the same area, saving drive time between amplifiers. When setting up your schedule, keep in mind that you should check every last amplifier at least once a year, you should check different amplifiers in the same geographic area at least once a quarter, and you can expect to spend about 10-30 minutes at each amplifier (unless you uncover a problem).

Finally, at every last amplifier you'll need to measure and record signal level at all channels, voltages, carrier-to-noise ratio (C/N), composite triple beat (CTB), and composite second order (CSO). To perform these tests you'll need, at minimum, a signal level meter (SLM), graph paper (or use an SLM with memory and a printer) and a voltmeter. For more accurate measurements, consider using a spectrum analyzer with a printer and a tunable bandpass filter instead of the SLM.

Once you've finished each test, record your results and compare them with your records for that amplifier. Do the levels you've just measured match those previously taken? If you uncover changes that could cause problems for your subscribers, backtrack and find the source. To pinpoint a problem, try the "binary" method of troubleshooting. Determine which amplifier is halfway between your location and where the cascade begins. For example, if you're at Amplifier 16, check Amplifier 8. Continue to halve the distance until you find the

amplifier you need to repair.

Check and record the levels of all channels. You can make a simple sweep trace using an SLM to measure the level at each channel and graph paper to record the measurements. A broadband sweep system is the best approach to evaluating the full spectrum because an SLM won't show what's going on between carriers.

Although you can expect small changes in signal levels over time, significant changes can indicate one of these problems: suck-outs, low signal levels, high signal levels, incorrect tilt in the signal, cracked cables, or bad connectors. When recording the measurements, note the outside temperature as well, so you can see how it affects signal levels.

MEASURE THE VOLTAGE

Although you need a true RMS voltmeter for an accurate voltage reading, you can use a standard voltmeter for these maintenance tests because you are only looking for changes. But, you must use the same standard voltmeter whenever you test that amplifier. Even small changes in voltage should be checked. Voltage changes indicate cracked cable, corroded connectors or a line power supply in need of repair.

CHECK THE C/N

To measure the C/N, you need a reference signal that is at least +20 dBmV and an SLM. Then, follow the instructions shipped with the meter's manual, or try this method. Tune the SLM to a channel that has no lower adjacent channels and is not next to the bandsplit; record the carrier level. Then, setting the SLM to the space where there is no channel, tune back and forth for the lowest reading you can find. Reducing the attenuation, tune back and forth again, until you get a constant reading, this is the noise floor. The difference between the carrier level and the noise floor, minus a correction factor, is the C/N value. For best results, subtract the correction factor published in the meter's manual. A tunable bandpass filter probably will be necessary to avoid overloading the SLM when measuring noise.

A bad C/N reading indicates you have a low input to one or more amplifiers in the cascade. Low input to an amplifier can have several sources, including water in the cable, water in the splitter, a corroded connector, or an improperly set or defective amplifier.

CHECK THE CTB

With the same reference signal you used for the C/N measurement, tune the SLM to a vacant channel, where you would find the carrier frequency. The signal you find there is the CTB. A low CTB ratio indicates you have too high of an output from one or more amplifiers, which can be caused by an AGC error in the amplifier or an improperly set or defective amplifier. A tunable bandpass filter probably will be necessary when measuring the CTB.

CHECK THE CSO

Using the same reference signal, tune the SLM 0.75 or 1.25 MHz from the vacant carrier. (CSO is found ± 0.75 and ± 1.25 MHz from the video carrier.) This is second order. If you subtract this reading from the video carrier reading at the adjacent channel, you have a good indication of the CSO. A poor CSO measurement often indicates a defective or improperly set amplifier or problems with a fiber link. You can perform these distortion tests with a spectrum analyzer, but you need a tunable bandpass filter set to a vacant channel. When using a spectrum analyzer, remember that since you are working with active video, you need to take measurements when sync is high. You can use a slow sweep and wider resolution bandwidth setting to see when sync is high, and you may want to set the spectrum analyzer in "max hold" mode.

Now that you've made all these measurements, make sure that you record the levels and keep your records. You'll need to refer to them when you check the amplifier again.

PICTURE QUALITY

The final check is picture quality. Use a good quality portable TV set and a converter to tune the channels. (This will minimize direct pickup from affecting the pictures.) Make sure the signal levels at the input to the converter do not exceed +5 to +10 dBmV. Record comments about the picture quality along with the measurement results from you other tests.

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